Horticulture Innovation Australia

Final Report

Technical Communications and Policy Development for the Australian Nursery Industry

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Nursery & Garden Industry Australia

Project Number: NY12012

NY12012

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Summary

Project *NY12012 Technical Communications and Policy Development for the Australian Nursery Industry* ran from April 2013 to April 2016. This project was intrinsically linked with project *NY12011 Nursery and Garden Industry Communications 2013-2015* and formed the foundation of communication within the nursery and garden industry.

The impetus for the project was identified initially through the Industry Development Needs Assessment (NY08014) and later the Nursery Industry 2010–2015 Strategic Plan and the Nursery Industry Strategic Investment Plan 2012- 2016 which noted that industry must have communication to be aligned to a longer-term strategic plan which addressed growth capacity issues.

The key focus of the project was to fund a Policy and Technical Officer (PTO) addressing the following areas;

- 1. Participation in the development of industry policies and submissions on relevant and emerging environmental and technical issues.
- 2. Development of technical communications and resources on industry policy as well as research, development, market development and extension programs.
- 3. Development of collaborative links with stakeholders on relevant and emerging environmental and technical issues.
- 4. Provision of research and technical support to the National Research and Market Development Manager/CEO (NY13000) on current and emerging nursery industry issues.

The PTO provided support for policy development having delivered 4 policies over the reporting period on Water, Environmental Sustainability, Industry Communication and Plant Labelling. Communication to industry was executed through a number of channels including; the Nursery Papers, the Your Levy At Work blog and Electronic Direct Mail and industry social media (Facebook, Twitter, LinkedIn). The PTO was also engaged in a number of other communication mechanisms including industry and government committees as well as various forums, workshops and conferences. Additionally the PTO also developed responses and submissions on behalf of industry to government and other stakeholder requests.

The PTO also provided research and technical support to the National Research and Market Development Manager (NY13000) and in the later stages of the project to the NGIA CEO.

The project underwent an independent review conducted by RM Consulting Group (RMCG) in late 2015 through project *NY15000 Review of the Australian Nursery Industry Communications.* The review surveyed industry and reported that participants felt that the approach and delivery of the project was appropriate, valuable and good value for money. The review commented upon the diversity of the industry and its impact upon the lack of engagement with R&D outcomes as a noted concern. Likewise observations were noted around the communications channels preferences with limited engagement with social media being identified as a future opportunity.

Some of the recommendations from this review were incorporated into a new communications project *NY15006 Nursery Industry Communications* and the PTO has assisted in the transition to this

new industry program.

The project saw significant change operationally due to changes in management of the NGIA CEO and resignation of the NGIA National Research and Market Development Manager; however a good level of continuity with the project was seen due to the consistency of the PTO role, which was also observed in the project review. This project also operated against a backdrop of transition with the cessation of Horticulture Australia Limited and the establishment of Horticulture Innovation Australia.

The recommendations from the project are noted below:

1) A workable solution is explored to support the ongoing development of industry policy research to improve the industries engagement with government, and other key stakeholders in the value chain without undue agripolitical focus. Such industry policy research would also be invaluable in providing a holistic approach to future R&D direction, addressing current and anticipating future industry strategic issues.

2) The peak industry body retains input into future communications programs due to their intimate understanding of the issues facing industry and the wider value chains which they represent.

3) The publication of nursery papers is continued given their demonstrated popularity and usefulness within industry.

4) The NGIA website be retained and further engineered as a repository of industry research and development outputs.

5) Future R&D project proposals should incorporate an analysis of which sectors of the industry will benefit as this can then be used to advise communication and extension activities in support of said R&D. This can also be used in holistic approach in decision making ensuring equity amongst levy payer R&D output dividends.

Keywords

Nursery & Garden Industry; Communication; Policy; Extension; Adoption; Practice change; Technical.

Introduction

The Australian nursery industry is a diverse industry located in all states and territories across urban, peri urban, regional and rural localities. Unlike other horticultural industries the nursery and garden industry also operates in a range of markets that are not dependent on share of plate but space for plants within the urban environment, planting of property developments, natural landscape rehabilitation and exports of products or technologies to all countries.

The diversity of the industry has presented a number of challenges which include environmental legislation and controls which act as barriers to production in some areas. Similarly, while also a strength, the diversity of growing regions and distance from major markets makes cooperation and improving efficiency difficult.

The Australian nursery industry has risen to this challenge through targeted focus of levy investment on priority areas of the Nursery Industry Strategic Plan (SIP) 2012-2016. The key focus of this strategic investment plan is based on three key principles:

- Growing the market for plants and greenlife in the urban environment.
- Communicating the benefit of plants to all industry sectors and influencers at all levels of government and consumers
- Ensure industry has processes in place with respect to governance and biosecurity enabling businesses to operate effectively.

This project was aligned with both the Nursery Industry 2010–2015 Strategic Plan and the Nursery Industry Strategic Investment Plan 2012- 2016 to ensure the Australian nursery industry has the capacity to respond to opportunities and challenges that impact on its growth and sustainable development. This relates predominately to market development opportunities by creating a need for more green life in urban environments.

In addition to market growth, the Strategic Plan identified several key issues that are of an environmental or technical nature which require focus including how regulatory pressures in relation to biosecurity policies restrict market access and plant movements and how increasing input costs relating to energy, water and fertiliser use impact on the long term sustainability of the nursery and garden industry.

A key component of this project was to ensure targeted and focussed communication mechanisms are in place for all industry activities to assist the industry in making better informed decisions. This is achieved through the engagement of industry and building constructive relationships with the industry's diverse stakeholders and partners.

This project aimed to proactively address these challenges through the appointment of a National Technical and Policy Officer.

The Industry Development Needs Assessment (NY08014) identified the need for industry communication to be aligned to a longer-term strategic plan and identified the need to develop a more encompassing and longer-term communication plan to carry the industry into the future.

Consequently, this project was identified in the Strategic Investment Plan under Objective 3 (70%) and 4 (30%). Three broad domains of the role include:

- 1. Develop communications with regards to industry research and market development projects including advocacy and policy positions
- 2. Develop, analyse and execute of policy on current and emerging issues
- 3. Participate in technical and environmental issues management that impact the sustainability of the industry

Methodology

To address the objectives and priority investment areas identified in the Nursery Industry Strategic Investment Plan, this project funded the PTO. This position reported initially to the National Research and Market Development Manager (NY13000) and in the later stages of project to the NGIA CEO.

The primary roles of this position include:

- 1. Participation in the development of industry policies and submissions on relevant and emerging environmental and technical issues.
- 2. Development of technical communications and resources on industry policy as well as research, development, market development and extension programs.
- 3. Development of collaborative links with stakeholders on relevant and emerging environmental and technical issues.
- 4. Provide research and technical support to the National Research and Market Development Manager/CEO on current and emerging nursery industry issues.

Specific aspects of the primary roles of the project are detailed below.

1. Industry policy development and extension

Provide input in the development of key nursery industry policy. The input was provided in the following ways:

- Participation in the development of industry submissions that are called for by stakeholders on a variety of issues covering legislative, market access, environmental, research and development and any other related issues.
- Developing relationships with key stakeholders, including other peak industry bodies, Horticulture Australia Limited, state and territory nursery and garden associations during the development, review and updating of policy positions and submissions.
- Ensure appropriate spokespersons receive all relevant communications and briefed on policy positions and submissions.
- Keep up-to-date with relevant global trends and relevant federal and state government policy positions.

2. Industry environmental and technical support

The support was provided through the following activities:

- Participation in the development and implementation of plans that facilitate the adoption by industry of suitable on-farm tools and resources including the Nursery Production Farm Management System.
- Assisting the National Research and Market Development Manager in facilitating the NGIA

Board Environment and Technical Committee and National Accreditation and Certification Committees which may include preparation of agendas, minutes and ongoing communication.

- Providing support and information to National Environmental and Technical Policy Manager and other appropriate personnel with regard to raising the awareness of the environmental credentials of the industry with key external bodies and the community.
- Providing support to the relevant Committees in order to develop, implement and promote policy.
- Participation in the development of technical training programs including e-learning.

3. Industry technical communication

The PTO developed technical communications on industry policies and research, development, extension and market development programs targeting a range of stakeholders including nursery businesses, other industry groups and government bodies. This was achieved through the following media and communications channels:

- Managed industry Nursery Papers including scheduling, editing and guidelines.
- Where appropriate, wrote articles, undertook conference and workshop presentations and participated in other relevant forums which informed, educated and motivated industry to improve environmental practice.
- Contributed to nursery industry social media channels including Facebook and Twitter.
- Established and maintained an effective communication networks with Levy payers.
- Consulted with and ensured effective liaison with internal and external stakeholders using a range of appropriate communication strategies.
- Prepared and assisted other Association staff to disseminate information relevant to levy payers of the Association.

Funds for the delivery of these communication material and activities was funded through the separate project NY12011.

4. Provide research and technical support through project management

The PTO was responsible for the management of a range of projects that contributed to the outputs from this project. This was achieved through the following project management activities:

- Participation in the development of research, development, extension, communication and market projects.
- Completed all relevant reports as required
- Completed all funding reports required by bodies providing funding to environmental projects.
- Looked for and where available, took up opportunities to extend funding through leveraging

with other funding bodies.

Outputs

The contracted outputs of the project are listed below;

- Development of key internal and external communication resulting in better decisions informed by industry knowledge and consistent messages
- Development of targeted communications at governments to facilitate better understanding of the industry
- Targeted, relevant and factual communications developed utilizing a variety of communication channels detailing relevant project outputs
- The development of clear and complete policy solutions that deliver the needs of industry
- The development of clear and concise industry position papers on issues covering legislative, market access, environmental, research and development to Local, State and Federal Government, discussion papers for public release and briefing papers for industry

The details on how the outputs were achieved are listed and briefly explained below:

Committees

Throughout the course of the project the PTO was engaged in a number of committees.

The PTO provided secretariat support to and was engaged with the industries Environment and Technical (E&T) Committee. The committee focus was to track key environmental and technical issues as they impact upon the industry and to provide governance and direction to future industry research directions based upon emerging issues. Minute of the Environment and Technical (E&T) Committee can be found in appendix 1. The industry E&T committee was funded through projects *NY12001 Nursery Environmental and Technical Research and Extension and NY13029 Research and Development program 2014/2015* for the production nursery industry and further information can be found in the associated HIA final reports.

The PTO also provided secretariat support to and was engaged with the national Nursery Accreditation and Certification Committee (NACC) which oversaw the governance of the Nursery Production Farm Management System (NPFMS) which incorporates;

- 1. The industry best management practice program Nursery Industry Accreditation Scheme Australia (NIASA).
- 2. The industry specific environmental management system EcoHort
- 3. The industry specific on farm biosecurity security management program BioSecure HACCP

Minutes of the NACC can be found in Appendix 2. The NACC was funded through projects *NY12002 Building Industry Capacity through the Nursery Production Farm Management System 2012/2013* and *NY12016 Industry Capacity and development building using the Nursery Production Farm Management System 2013-2015.* Further details can be found in the HIA final reports for these two projects.

Since 2012 the PTO engaged with the federal Department of Agriculture and Water Resources

(DAWR) Post-Entry Plant Industry Consultative Committee (PEPICC) including acting as industry chair. The committee is the principal advisory and consultation forum for the federal Department of Agriculture and Water Resources on relevant quarantine issues with plant importing industries. The PTO in this capacity was able to raise issues of industry concern with government and provide a conduit of information back to industry on government quarantine issues and activity. Information on the PEPICC can be found here

http://www.agriculture.gov.au/biosecurity/partnerships/consultative-committees/pepicc.

Building on from engagement with the PEPICC the PTO has recently (2015) represented industry through the DAWR Horticulture Export Industry Consultative Committee (HEICC). This committee acts as the principal consultation and engagement forum for the DAWR to discuss issues with industry around horticultural export including certification and inspection. Further information on the HEICC can be found here <u>http://www.agriculture.gov.au/biosecurity/partnerships/consultative-committees/heicc</u>.

From 2012 the PTO has served as the chair on the GS1 Australia HGAG GreenLife Work Group. The workgroup which is a subcommittee of the Hardware GS1 Action Group (HGAG) has the aim of improving adoption rates of the GS1 standards within the nursery industry. These standards are international and are common across many sectors of production and logistics for identifying, capturing and sharing information across the supply chain. Selected minutes of the GS1 Australia HGAG GreenLife Work Group can be found in appendix 3. Further information of the GS1 Australia HGAG GreenLife Work Group can be found here https://www.gs1au.org/for-your-industry/greenlife/the-hgag-greenlife-working-group/

The PTO currently acts as an industry representative on the steering committee for HIA project *NY15001 Evaluation of nursery treestock balance parameters.* Prior to this the PTO provided support in the development of the Australian Standard AS2303:2015 Tree stock for landscape use to the previous NGIA National Research and Market Development Manager who drafted the standard. The PTO has also authored a nursery paper (Oct 2015) on the topic of AS2303 to promote and highlight the benefits of the standard to industry.

Study Tour - United States

The PTO led an industry study tour to the United States in 2014. The tour focused on urban greening opportunities for the industry and production nursery operations in California as well as providing opportunity to view new commercial advances at the 2014 Cultivate trade show in Ohio. The opportunities seen with urban greening were significant in the novel applications of greenlife in water sensitive urban design and strongly supported the industries 202020 Vision program. Further detail on this project can be found in the HIA Final Report *NY13700 Adopting international market growth opportunities for the Australia nursery industry.*

Conferences and Forums

The PTO was actively engaged in the development and management of the National Industry Conferences in Sydney (2014) and Adelaide (2016). Support included having sat on the conference committee for the Sydney Conference and provision of support for the Adelaide Conference.

As part of the Sydney conference the PTO led a tour of Sydney's green infrastructure with special focus on the market opportunities this provides for industry. The PTO also presented as part of the levy payers update at this conference. Further information can be found in the HIA final report

NY13702 Nursery industry national conference and regional technical conferences.

The PTO also represented industry at the 29th International Horticultural Congress held in Brisbane 2014 where the industry maintained a booth showcasing the Australian nursery and garden industry to attendees from across the globe. The PTO was also able use this opportunity to engage with current industry researchers from across the globe.

The PTO has also presented at regional industry conferences in Melbourne, Perth and Sydney in 2013 on improving relationships and identifying requirements of retail buyers. In 2014 the PTO presented at the Nursery and Garden Industry Queensland (NGIQ) supply chain forum on levy funded work conducted on the industry supply chain (projects NY08006 and NY99038) and its continuing relevance to industry. In a additional presentation at this forum the PTO discussed supply chain expectations of the retail sector in relation to greenlife.

The PTO has also been engaged in a number of workshops and forums to provide input on behalf of industry and act as a conduit of information back to industry. Examples include; CSIRO Green Infrastructure Workshop, The Clean Air and Urban Landscapes Hub (CAUL) workshop and the HAL Direction setting forum for a horticultural education strategy. These forums and workshops also provided opportunity to network and promote industry messages. Details of the various conferences and forums attended and or presented at by the PTO can be found in appendix 4.

Future Leadership Forum

As part of project NY13017 the PTO facilitated the first industry Future Leadership Forum. Hosted in the lead up to the Adelaide 2016 industry conference, nineteen future leaders attended the forum. This provided an opportunity for a selection of industry young leaders to discuss topics of industry strategic importance and to contribute their ideas to the current industry leadership. Topics covered included; the promotion of industry as a career of choice; Training, education and development; industry communication; structure of the industry and the research and investment opportunities for industry. Further information can be found in the HIA final Report *NY13017 Young Leader Development Program*

Crisis Management Plan

The PTO conducted a review and update of the Industry Crisis Management plan. The plan which was initially developed as an industry adaptation of work done through *AH07033 Horticulture Industry Crisis Management Guidelines* provides a response mechanism for managing industry wide crisis. Information on this was highlighted to industry in the Nursery Paper; Crisis Management in the Australian Nursery Industry (March 2013)

Validation of Horticulture Units of the AHC Training Package

Conducted through Agrifood Skills Australia, the PTO was part of the Technical Reference Group for the review and validation of horticulture components of the Agriculture, Horticulture and Conservation (AHC) training package. The focus of this reference group was to streamline existing units and qualifications in response to requirements form the National Skills and Standards Council. The PTO focus in this committee was on Production Nursery and Retail Nursery Vocational Education and Training (VET) level qualifications.

Responses to government

The PTO was involved in a number of responses to government on behalf of industry including; a response to the draft review of policy: importation of Phytophthora ramorum host propagative material into Australia: April 2015; and a response addressing the draft cost recovery implementation statement biosecurity in August 2015.

eLearning

The PTO established a dedicated eLearning hub for industry. The eLearning hub holds a number of courses available online including;

- Growing Media 1
- An introduction to the Farm Management System
- Introduction to weeds in container nurseries
- Australian Standard 2303: Tree stock for Landscape Use

The eLearning hub is available and accessible at https://ngia.talentlms.com/index

The PTO presented on the industries exploration of eLearning at the HAL industry development forum held in the lead up to the 29th International Horticulture Congress (Brisbane, August 2014).

Plant Safely website

The PTO established the Plant Safely website as a tool for both consumers and the industry with consideration of the potential hazards associated with gardening the site is available at http://www.plantsafely.com.au/. The development of this website was facilitated through HIA project *NY12001 Nursery industry environmental and technical research and extension 2012/2013* and further information can be found in the associated HIA final report.

Transition to the new industry communication project

The PTO has been extensively involved in the transition to the new nursery industry communication projects *NY15006 Nursery Industry Communications* and *NY15009 NGIA - Consultation on NY15006 - Nursery Industry Communications* which commenced in early 2016.

Additionally the PTO engaged in a number of other activities which were covered through the NY12011 project, these activities are detailed below.

Social Media

The PTO contributed to the industries social media including Facebook

(www.facebook.com/nurseryandgardenindustry) Twitter (https://twitter.com/ngi_news) and LinkedIn. Of note the PTO established a dedicated discussion forum; Nursery & Garden Industry - Business Improvement. Currently standing at 207 members with representation from across industry both in Australia and internationally, the forum was established by the PTO to provide opportunity for the industry to engage in professional discourse and networking. The link to the forum is www.linkedin.com/groups/5121115

Your Levy At Work

The PTO contributed to the industries "Your Levy At Work" (YLAW) blog (http://yourlevyatwork.com.au/) and Electronic Direct Mail (EDM). The YLAW blog and EDM focused upon communicating levy related research and outcomes appropriate to industry.

Nursery Papers

The PTO coordinated the writing, scheduled, managed and edited the industry Nursery Papers, which are a series of semi technical papers covering research outcomes and issues relevant to industry. Additionally the PTO has authored 4 nursery papers and co-authored 1 paper. Details of the Nursery Papers can be found in appendix 5. Metrics on page views of the Nursery Papers via the NGIA website can be found in appendix 6.

Policy Development

The PTO developed 4 key policies during the project.

- National Plant labelling policy
- NGIA communications Policy
- Water Policy
- Environmental Sustainability Position

Copies of these policies can be found in appendix 7.

More detail on each of these outputs can be found in the final report for *HIA project NY12011 Nursery and Garden Industry Communications 2013-2015* and the final report for *HIA project NY15000 Review of the Australian Nursery Industry Communications.*

Outcomes

The project had the following contracted outcomes.

- Improved internal and external communication resulting in better decisions informed by industry knowledge and consistent messages
- Increased communications targeting governments need for better understanding of the industry
- Improved uptake of tools and resources developed and extended to the whole of industry through traditional and non-traditional means
- Strengthened government relationships resulting in strong support for industry initiatives, programs and policy positions
- Improved perception of the value of the industry's products by key stakeholder groups
- Improved awareness of the contributions made by the industry towards better environments and wellbeing in Australian communities and among industry circles
- Increased awareness of industry policy priorities across all stakeholder groups
- Increased awareness of industry position papers on key issues across all stakeholder groups

The review conducted by RM Consulting Group through *NY 15000 Review of the Australian Nursery Industry Communications Program* reported a number of project outcomes, which are detailed below:

The nursery papers were seen as being the most useful communications resource (3.76/5 weighted average) with the majority of survey respondents being aware of the resource (3.97/5 weighted average). Continuing on from this 41% of survey respondents had made changes their business as result of the nursery papers contrasted with 32% of respondents changing practices due to the NGIA website.

The nursery papers in addition to providing a resource at the time of writing are a significant contributing factor the usefulness of the NGIA website as a repository of industry information and as a tool for improving the communication of industry resources. Past editions of the nursery papers are indeed reviewed and revisited by industry and this is apparent in the available metrics for online access to past papers. Across the reporting period of this project nursery papers have been accessed more than 230,000 times indicating that the nursery papers are providing a useful and long lasting industry information legacy. This level of exposure has driven practice change through the industry and this was confirmed in the review of this project by RMCG (NY15000).

In terms of direct practice change this however contrasted favourably compared to the newer forms of electronic communication such as the Your Levy at Work blog and industry social media. In this instance the project review suggested that while these communication channels were not responsible for wide scale practice change, they were invaluable in raising awareness and allowing industry to further investigate issues of relevance to their business. The review did note that the open and click rates of the Your Levy At Work EDM were above industry averages and that the Your Levy At Work EDM was the most popular way to receive information representing 65% of

preferences. Social media reflected the least preferred information source with only 2% of respondents preferring this communication channel.

The use of newer forms of electronic resources is reflected in the, to date, limited uptake of eLearning with many respondents noting that they were unaware of the resource or have not yet engaged with the resource. This perhaps reflects that industry has not yet broadly embraced these new and non-traditional mediums for the uptake of tools and resources. However there has been some examples of success in using these mediums as a mechanism to highlight the availability of the tools and resources as well as providing a level of industry engagement and interaction with industry communications.

Industry policy and tools have seen exposure across many fronts. Over the course of the project period the NGIA website has had in excess of 12,000 views of policy papers with an average of 373 views per month. As an example the Federal Department of Environment references many of the industries polices and tools in support of its actions around threat abatement. Details of this can be viewed at their website <u>http://www.environment.gov.au/biodiversity/threatened/threat-abatement-advices/escaped-garden-plants-existing-plans</u>.

The National Plant Labelling Guidelines have seen much exposure with examples including the NSW Office of Environment and Heritage, which recommends that growers comply with the guidelines as part of its document "The commercial harvest, salvage and propagation of protected whole plants" available through

<u>http://www.environment.nsw.gov.au/resources/wildlifelicences/20130001plantsmp.pdf</u>. Likewise the Queensland Department of Agriculture Forestry and Fisheries noted the document as an alternative to labelling legislation through the new Queensland Biosecurity Act

https://publications.qld.gov.au/storage/f/2014-10-03T04%3A42%3A39.827Z/biosecurity-act-risnurseries-factsheet.pdf.

Within the market place the retailer Bunnings Pty Ltd, requires that its plant suppliers comply with the National Plant Labelling Guidelines placing particular emphasis on plants of health risk.

This broad exposure of industry policy demonstrates that both government and the private sector are aware of industry polices and positions and are promoting the key messages of these policies and positions. Additionally it could be determined that this indicates that key stakeholders perceptions of the industries products and contribution to the environment are viewed in a positive light.

With regards to engagement with government the PTO has been able to develop good working relationships through engagement with committees such as PEPICC. A synergy is evidenced in this role by the PTO also being part of the Industries Environment and Technical Committee and NPFMS NACC. In this capacity the PTO was able to act as the conduit between government and industry committees articulating the needs of each and providing context to communications through these committees. This engagement has resulted in an improved understanding of industry by government and strengthened the relationship which government has with industry.

Evaluation and Discussion

Project NY12012 ran from 18 April 2013 to 29 April 2016 and managed the NY12011 project which was completed in Nov 2015. Both projects underwent a review conducted in August - September 2015 by the RM Consulting Group under project *NY 15000 Review of the Australian Nursery Industry Communications Program.* The review provided a considerable amount of insights and its associated final report should be read in conjunction with this report. The review concluded that the outputs of the project had delivered against the project plan and met the short term outcomes as indicated in the program logic developed by RMCG. Additionally the review indicated that the approach used by NGIA had been an effective and appropriate method for communicating R&D outcomes and issues of significance to the nursery industry.

The project saw significant change operationally due to changes in management of the NGIA CEO and resignation of the NGIA National Research and Market Development Manager; however a good level of continuity with the project was seen due to the consistency of the PTO role. The project review noting that the efforts of the PTO contributed to the efficient management of the project. This project also operated against a backdrop of transition with the cessation of Horticulture Australia Limited and the establishment of Horticulture Innovation Australia.

Towards the end of the project the PTO assisted with the industry communication review conducted by RMCG and played a central role in the transition to the new industry communications project which was awarded to Cox Inall through project *NY15006 Nursery Industry Communications* with consultation support from NGIA through *NY15009 NGIA - Consultation on NY15006 - Nursery Industry Communications*.

Cognisant of the limitations of policy and submission development with regards to agripolitical activity and funding, there still remains a need for this activity to occur. The key consideration is the *intent* of the policy and submissions being developed. In light of current government directions in working towards partnerships with industry and shared responsibility, policy and submissions provide a means for industry to meaningfully engage with government on a coordinated basis in order to achieve a level of consensus and the most beneficial and effective results for both parties. This translates to a more efficient use of limited government and industry time and resources. Additionally industry is better able to fulfil its responsibilities under this new paradigm of government engagement with industry and articulate its responses to government requests.

Along with targeted external communications, the industry is aware of this need for policy, submission development and engagement as an integral part of a communications program. The project review found that 95% of industry respondents believed that their communications program should include industry policy and submission development which benefits the whole of industry. The NY15000 review identified a strength of the project was the synergies provided by the PTO in managing communication activities in conjunction with other NGIA development and communication activities. This strength contributes to the industries engagement with government through relationship development and the PTO being able to provide a more holistic response on behalf of industry, with perhaps deeper consideration of the broader impacts of government actions upon industry. This also applies conversely with the PTO being able to better articulate to industry the

reasons behind government action. An example of this is the seen in the PTO's engagement with PEPICC where they were able to lend support to the government's review of *P. ramorum* host propagative material and provide a deeper explanation to industry on the government's changes to *X. fastidiosa* host material imports.

Continuing on from this theme the PTO role is an enabling role able to provide better leverage to communication outputs. This can be achieved through a number of means; firstly cross referencing of previous industry R&D outputs (both local and international) providing a greater depth to communications and leveraging previous investment. Secondly, contextualising research outputs into multiple formats which would be of merit to industry. And thirdly utilising developed relationships within industry to encourage adoption and technology transfer.

The review highlighted the high degree of diversity amongst the nursery and garden industry with respect to product, production methodologies, markets, geographical location and scale of business. These characteristics in turn influence the level of engagement with, and perceived worth of communications based upon topic and indeed the actual R&D conducted.

For example communication on the research program *NY15001 Evaluation of nursery tree stock balance parameters* would have different levels of perceived worth to a tree stock grower compared with a potted colour grower. The management of this high level of diversity will need to be addressed in future communications programs especially as the industry moves towards more social media based channels which require an enhance degree of engagement from users. Consideration of this diversity will need to be applied to future communication projects as this could be stumbling block to engaging with industry stakeholders who disengage from communications mediums.

The review of this project highlighted the amount of duplication which is apparent with regards to national versus state based representative bodies in communicating R&D outcomes. This issue may be considered in a future industry structure review however in the short term may be difficult to manage given the nature of the operations involved i.e. independent bodies aligned by a memorandum of understanding.

Recommendations

It is recommended that:

1) A workable solution is explored to support the ongoing development of industry policy research to improve the industries engagement with government, and other key stakeholders in the value chain without undue agripolitical focus. Such industry policy research would also be invaluable in providing a holistic approach to future R&D direction, addressing current and anticipating future industry strategic issues.

2) The peak industry body retains input into future communications programs due to their intimate understanding of the issues facing industry and the wider value chains which they represent.

3) The publication of nursery papers is continued given their demonstrated popularity and usefulness within industry.

4) The NGIA website be retained and further engineered as a repository of industry research and development outputs.

5) Future R&D project proposals should incorporate an analysis of which sectors of the industry will benefit as this can then be used to advise communication and extension activities in support of said R&D. This can also be used in holistic approach in decision making ensuring equity amongst levy payer R&D output dividends.

Scientific Refereed Publications

None to report

Intellectual Property/Commercialisation

No commercial IP generated

Appendices

- 1. Minutes of the Environment and Technical Committee Meetings
- 2. Minutes of the National Accreditation and Certification Committee (NACC)
- 3. GS1 Australia HGAG GreenLife Work Group Meeting Minutes
- 4. Forums, Conferences and Workshops
- 5. Nursery Papers
- 6. Nursery Papers Page Views
- 7. Industry Policy

Appendix 1

Minutes of the Environment and Technical Committee Meetings



Environment and Technical Committee Meeting

Date:	06 June 2013 Day 1
Time:	9.00 am - 5.00 pm
Location:	Downtowner on Lygon - 66 Lygon Street, Carlton, Victoria
Attendees	Simon Smith (Chair), John Bunker, Peter Douglas, Steve Burdette, Anthony Kachenko, Chris O'Connor, Stephen Livesley (Melbourne University), Dong Chen (CSIRO), Marco Amati (La Trobe University)
Apologies	Robert Prince

ITEM TOPIC

1 Welcome and Apologies

S Smith opened the meeting at 09:30am and thanked all for their attendance and noted a special welcome to P Douglas new member to the committee. A Kachenko stated that R Prince is to be noted as an apology. A Kachenko gave a brief overview of the committee for the benefit of P Douglas. All committee members introduced themselves and gave a personal background brief.

2 Confirmation of minutes – Nov 2012

A Kachenko asked P Douglas if he had any questions about the previous minutes, at this stage he did not. S Smith asked for confirmation of tabled minutes from the November 2012 meeting. Approval was motioned by John Bunker and seconded by Steve Burdette.

3 Matters arising from last meeting

A Kachenko discussed the action item list. He noted that the Skype or net based meeting has not yet been investigated fully for this committee. With the next meeting focused on discussion of research proposals it would probably be more suited for face to face but the mid-year meeting could be suitable for this format. S Burdette agreed and noted that the face to face would help facilitate this. S Smith asked that the Skype facility be available if a member could not make the meeting.

A Kachenko also noted that the point on working with the mining industry was still incomplete. This has been difficult to achieve and to date has not had any great success.

S Burdette advised that discussion with politicians may prove to be more fruitful to open doors to access funding and establishing connections. S Smith suggested that connections to mining via indigenous projects, employment and education through mine rehabilitation may be an avenue to explore providing triple bottom line results. General discussion on this area followed. J Bunker noted bioremediation for mines as being another avenue to investigate.

4 Matter arising not addressed in this agenda

A Kachenko introduced the Vision 202020 as the new stage of Plant Life Balance. This has potential apart from connections to large development groups and councils to include mining as a component through FIFO villages and improving mining towns green space.

A Kachenko gave brief background on the itree tool for the benefit of the committee and its purpose in supporting vision 202020. Noted was that Multiplex and Lend lease are keen to use this tool as were the major councils.

S Burdette questioned the demographics of Australia and its impact upon 202020. General discussion followed on the target audience for 202020. Issues surrounding consumers working hours, completion for discretionary spend was discussed and the importance of the influencers was noted for the impact it will have.

A Kachenko also discussed the carbon farming initiative and efforts taken to extend nursery into this area. At this stage CFI is very restrictive and there is limited opportunity for industry to engage with this scheme.

5 National Environmental Project Update

5.1 Summary and status of current government enquiries

Biosecurity Bill

A Kachenko discussed the National Biosecurity Bill written submission made to government on behalf of industry. Concerns were raised around the absence of the regulations, and lack of ability to appeal decisions on import lines. There were some good components of the bill however it needs review. The legislation may not be enacted due to the timelines before government goes into caretaker mode prior to the upcoming election.

Included was the Hansard transcript of R Princes representation at a senate hearing on the issue.

Discussion was had in reference to the Peak Industry Bodies in particular the senate inquiry into the citrus industry. S Burdette provided an overview of Senator Rushton's past involvement with the Citrus Industry Boards.

S Burdette also noted the importance of biosecurity for industry noting experience with the citrus industry. S Smith also observed the concerns around biosecurity.

A Kachenko noted the launch of the 3rd Version of the Industry Biosecurity Plan through PHA at the recent joint NGIV/IPPS conference in Melbourne.

General discussion followed on issues of controlling pests with the view that government may take the approach that the pests become endemic through bureaucracy so avoiding the costs surrounding eradication. The new legislation promoting more industry involvement will allow for industry to self-police this, and may release some funds for research opportunities. General discussion on the biosecurity level and industries relationship with PHA followed.

A Kachenko noted that he is monitoring the policies of the major political parties in the lead up to the election. He also noted that both government and the opposition have been given copies of our policy statement in relation to biosecurity. At this stage this is a watch and brief.

Registration of businesses for biosecurity purpose was discussed as being of importance and a focus for industry. S Burdette noted that Pat Barkley may be a contact to utilise in this area. A Kachenko advised that he has been working with Pat Barkley in this area having worked with her on the CRC for Plant Biosecurity Board. He also noted that Citrus and Ausveg are also motivated to introduce property registrations for horticulture.

Draft National Code of Practice for Chemicals of Security Concern

A Kachenko briefed the committee on the Draft National Code of Security Concern which has been put forward by the Attorney Generals Department in Canberra with a view to increasing security of chemicals which could be used for terrorism purposes. 96 chemicals are noted in the document with 11 selected for incorporation into the Draft National Code. This was originally to be a regulatory instrument but has since been downgraded to a voluntary code only.

Most of the directions in this document are covered through best practice procedures within the nursery industry and that this area is a watch and brief if it becomes more onerous to industry.

S Smith noted that this subject comes back to the issue of property registration.

Horticulture industry Export Consultation Committee

A Kachenko discussed with the committee the recent increases in fees and charges for export and that DAFF were looking at an approved officer arrangement program. The idea is to give approved businesses the ability to self-certify, however internationally there are a number of major countries which do not recognize non –government approved officers.

Registration charges have increased from nil in the past to \$5500. A Kachenko notes that he has broached the subject of self-certifying businesses without the registration fee by using the FMS package and will be continuing to work to this end. He also noted that John McDonald is undertaking a domestic interstate trial of a similar nature using BioSecure *HACCP*.

J Bunker stated that his business has stopped registering their property as the fees did not justify the amount of product exported. It is also prohibitive if a job did come up to include the fee charge in the costs to the client. Freight forwarders are not a viable option for large tree stock.

J Bunker raised the importance of moving towards electronic based certification for quarantine.

Post Entry Quarantine

C O'Connor briefed the committee on the recent PEPICC meeting and the upcoming changes to import. Noted was information on the upcoming build of the new Federal quarantine facility and the impacts that this may have. This new build will see existing facility capabilities merged into one site in Mickleham (Melbourne) and the current facility operations wound down and eventually closed. Pressure on this facility may arise from closure of state government facilities such as QLD Eagle Farm site and the WA Government facility, which is likely to undergo a rebuild. Retention of a plant quarantine capability here is not assured.

ICON alert changes were noted and included that to P.ramorum.

S Burdette questioned the number of detections at the borders. A Kachenko noted that we have received this information previously although had to ask for it. These numbers may not necessarily be detection but of consignments considered suspect. C O'Connor noted that this links back to the recent proposed Biosecurity Legislation and the lack of recourse that importers have to challenge decisions for destruction of non-high dollar value lines.

General discussion on quarantine matters followed. Concerns over the skill sets of quarantine employees was raised in light of a consolidated facility.

S Burdette asked about communications to industry about PEPICC. C O'Connor responded by noting communications to the state associations and via the Your Levy at Work Blog.

C O'Connor also discussed the PEPICC prioritisation process whereby industry can have a voice to influence DAFF and their resource allocation in relation to cases requested by industry. This will be via a ranking process of requested cases based upon industry importance.

S Burdette requested that the committee be included upon the circulation of PEPICC minutes.

Action: C O'Connor agreed that PEPICC minutes will be circulated to the Environment and Technical Committee following future PEPICC meeting.

APVMA Harmonisation

A Kachenko briefed the committee on the APVMA harmonisation initiative. There will be a review of products each ten years. There has been some concern over the potential cost of this from industry due to increased redtape. However as science evolves it may be good to have a structure for review rather than an adhoc basis.

5.2 Australian Standard for Trees / National Best Practice Guidelines

A Kachenko briefed the committee on the Australian Standard for trees and its progress to date. Covered were details of the standard committee members and an overview of the standard writing process.

S Smith asked that once the standard was completed what works need to be done to promote it or will it be adopted because it is an Australian Standard. A Kachenko replied that various industry bodies such as Australian Institute of Landscape Architects (AILA) are aware and supportive of the standard and will promote its use amongst their membership. He noted that if the proposed Standards is approved, Natspec will be superseded. J Bunker enquired if palms were to be part of the standard. A Kachenko replied that they are not, citing limited science or practice available for specifying palms.

General discussion on the standard followed.

A Kachenko noted that updates on the standard will be regularly released.

5.3 Nursery Production FMS and AOP

P Douglas questioned if the standard would be incorporated into FMS/ NIASA as an appendix. A Kachenko replied by noting that it may be included and highlighted that there has been concern about not using NIASA as the standards. A Kachenko advised the committee that the standard is a specification for a tree not the process on how to get to that point. He did advise that NIASA/FMS was referenced in the standard e.g. for management of pests and diseases.

The need for market access to be a driver for FMS was briefly discussed.

A Kachenko stated that in the upcoming NACC meeting that one of the key points will be the discussion on how to expand the FMS program.

A brief discussion on water disinfestation followed noting that some in ground growers have cited this as a stumbling block to accreditation.

A Kachenko briefed this committee on his recent audit trip of New Zealand nurseries noting the variance amongst them, and the expansion of the program to New Zealand.

A Kachenko also advised the committee of the proposed name change to Nursery Industry Accreditation Scheme Australasia, and the updated Heads of Agreement.

The issues of obtaining hard data on FMS benefits rather than anecdotal evidence was discussed followed by general discussion on FMS.

A Kachenko will provide a copy of the Annual Operating Plan (AOP) at the next meeting but advised that the program has been accepted by HAL for the next two years.

ActionL A Kachenko to provide a copy of the FMS AOP at the next Environment and Technical meeting.

5.4 Industry market Development / Plant life balance

Discussion was carried out earlier in the agenda, covering Vision 202020.

6-9 **Presentations**

Presentations on current levy funded research activities were presented by

- Dr Macro Amati La Trobe University Carbon Pollution mitigation potential of Australia's Urban Forests
- Dr Dong Chen CSIRO Mitigating Heat Stress with Urban Vegetation
- Dr Stephen Livesley University of Melbourne Burnley Research update

Copies of the presentations are included with these minutes.

General discussion on the presentations followed.

9 Meeting closed 5pm



Environment and Technical Committee Meeting

Date:	06 June 2013 Day 2
Time:	9.30 am - 5.00 pm
Location:	Downtowner on Lygon - 66 Lygon Street, Carlton, Victoria
Attendees	Simon Smith (Chair), John Bunker, Steve Burdette, Peter Douglas, Anthony Kachenko, Chris O'Connor
Apologies	Robert Prince

ITEM TOPIC

1 WELCOME AND APOLOGIES

S Smith opened the meeting at 0900am.

2 RESEARCH PROPOSALS AND OPPORTUNITIES

A Kachenko walked the committee through the submission and prioritisation process for research projects. A Kachenko covered the recent call for expressions of interest through the Weekend Australian for research that could be of benefit to the nursery and garden industry either by growing the market for Greenlife or removing barriers to production nurseries. This advertisement was also displayed on the HAL website and distributed through their network of researcher contacts. One of the aims of this process is to find new researchers and beneficial projects to address industry needs.

A Kachenko will send through the proposals to the committee, the states and the IAC to review the projects, with final submission to HAL in November.

P Douglas asked about the origin of the projects submitted and if any had come from unexpected areas. A Kachenko noted that a number of projects came out of relationships developed by contacts through conferences and many other connections.

A Kachenko went through the current R&D project for the committee. Detailed were the requirements for full P&L reporting, noting that any remaining funds need to be returned at the end of the project. The salient points of the current program were then covered including:

A Kachenko noted that is likely to be a surplus from this current project which will go back to HAL.

General discussion on the 2013/2014 programs including the IDO project followed, with A Kachenko providing an overview of how projects work including the administrative and financial details and reporting requirements to both HAL and industry.

Noted was that all projects need to show positive change and value.

S Burdette asked if it would be of benefit for this committee to meet at the HAL offices for the November meeting. All agreed that it may be of benefit.

Action: A Kachenko to organise next meeting at HAL offices with meeting with key HAL staff.

J Bunker noted that we need to as an industry to look at more across industry projects. A Kachenko replied that at present Jon Lloyd (CEO HAL) has each year allocated 2% of all levy funds that are directed to across industry projects with a view to rising over the next few years. This presented powerful benefits to all of horticulture although we need to ensure that the benefits to our industry are still tangible.

J Bunker observed that there is potential for BioSecure *HACCP* to be moved across to other industries. S Burdette noted other industries which use Global Gap may be interested in BioSecure *HACCP*, and J Bunker noted that although our industry is focused on amenity horticulture there is scope to move much more focus across to the production side of industry especially in regards to starter crops in this area.

General discussion on biosecurity and risk management systems followed.

A Kachenko provided the committee with details about the BioSecure *HACCP* interstate product certification trial and opportunity for this to be exported to other horticultural industries.

C O'Connor noted that the DAFF international export system ICON is being updated to BICON however is delayed at present.

S Burdette observed that it may be a good idea to remind industry of what tools have been developed for their use, something quick and simple. J Bunker noted that the Your Levy at Work Blog is excellent means of communicating this information.

General discussion on the power and use of online technology followed, including Google analytics.

Input and brain storming on the proposed R & D projects to be sent through.

Action: A Kachenko to send full R&D proposals from the expression of interest call to the committee for input.

Action: Committee members to send their input on the R&D proposals through to a Kachenko

Action: C O'Connor to set up a permanent drop box for the committee for notes and items of interest.

Discussion on presentations from day 1 followed. A Kachenko noted the benefits for industries via these researchers included greater exposure of industry to government and the ability to leverage levy dollars to greater benefit.

P Douglas observed that of the presentation's he could see a lot of benefits with the presentations from Burnley and more practical applications to growers.

Noted in this was also concern for future media inputs with the potential decrease in pine bark media. P Douglas asked if there was potential to direct some funding towards researching alternatives. P Douglas also questioned how we get more NIASA businesses and questioned and asked if there is some scope for funding research into why the numbers have plateaued.

In relation to growing media A Kachenko stated that he would discuss the subject with Stephen Livesley and John Rayner to see if there is capacity and interest for research in this area.

ACTION: A Kachenko to contact S Livesley to determine interest and capacity in further research into growing media.

In relation to NIASA, A Kachenko noted that businesses engaged is always discussed and that the upcoming NACC meeting will discuss this issue in detail. Also cited was a survey of approximately 3 years ago. From this the major barriers reported were the cost of getting to a stage to comply with the program requirements and no market driver. Others saw the tool as being important for biosecurity & environmental perspectives. A Kachenko also discussed a recent cost benefit analysis a project which showed positive results for growers. Market drivers via BioSecure *HACCP* and getting the key retailers and councils to require FMS certified businesses are the key future drivers for FMS.

J Bunker asked could he get information as to market share of FMS certified businesses. S Smith suggested that the rollout of FMS to New Zealand is a great opportunity to get bench line and comparison data for before and after impact of FMS.

A Kachenko also noted that part of the IDO role is market development and looking at opportunities to promote the FMS program. S Smith stated the importance of audits and administering the FMS program to ensure the integrity of the program when promoting it to retailers and government and also internally for a program for growers to aspire to.

The need for a mandatory property/business registration scheme was discussed with focus on the biosecurity benefits it would create.

C O'Connor suggested that a biosecurity drill may be an idea to follow up for our Industry. A Kachenko noted that biosecurity drills have been undertaken in the past in conjunction with PHA and Government and perhaps this should be a discussion NGIA should have with DAFF.

A Kachenko suggested that eBay may be a large biosecurity risk to industry.

ACTION: A Kachenko to approach PHA to run a biosecurity drill.

ACTION: A Kachenko to investigate project for NGI producer list/database.

S Smith noted that the database could be a great opportunity to engage more NGI businesses.

S Smith inquired about Fire Ants. J Bunker related his experiences noting that with state funding being reduced for management there have been more incursions. This spread may also be linked to the recent large flood events.

J Bunker asked if there was a way that we could get case studies of NIASA businesses to help promote the FMS scheme via the blog. A Kachenko replied that we have already done this via Hort Journal and are in the process of collating the previous stories to utilise for the blog and that we are continuing the relationship with Hort Journal.

S Smith broached the subject of encapsulated controlled release pesticides, their increasing use in our industry and potential OHS issue around their use, especially in the tropics.

A Kachenko noted that this could be an ideal nursery paper to highlight awareness.

S Smith also asked about the potential of these pesticides and residuals with vegetable crops/seedlings/herbs especially those plants that are ready to eat for the retail sector. S Smith also noted the use of growth regulators for edible crops.

A Kachenko does not believe there is any legislated requirement for maximum residue levels for plants destined for retailers but there certainly is for vegetables going to supermarkets.

Discussion on pesticide requirements followed.

ACTION: A Kachenko will follow up on plugs going to vegetable production and look at what pesticide requirements they must follow.

ACTION: A Kachenko will review the draft for the Pesticide Best Practice manual and determine if some of the points raised during the discussion should be included.

S Smith broached the subject of water disinfestation in relation to in ground growers and asked if there should be some research to determine from a risk management perspective if there was anything else we could look at.

A Kachenko replied that he has already started investigating this, noting that it is on the agenda for the upcoming NACC meeting. A Kachenko noted that there is some data from QLD in relation to costs of disinfestation. J Bunker observed that in terms of in ground monitoring there is some advantages as monitoring is much easier than in container production.

A Kachenko relates that much of the water disinfestation relates to closed systems and the need to prevent the recirculation of pathogens and agrees that with in ground production this is difficult but the purpose is risk management and controlling the likelihood of pathogens entering the growing site. A Kachenko also noted that this is on the agenda for the NACC meeting and will work towards resolving this issue, in the next 12 months.

P Douglas asked about John McDonald's water scheduling work. Both A Kachenko and J Bunker provided some information on this area.

Environmental Matrix

A Kachenko asked the committee if there were any new inclusions that need to be included on the environmental risk matrix, noting that melioidosis had been included after the last meeting.

From earlier discussions in the meeting A Kachenko suggested that sustainable growing media supply and pesticides residues in relation to the supply to the retail market should be included.

J Bunker suggested that energy especially in relation to costs should be included, noting that if energy costs go up so do water costs.

ACTION: C O'Connor to update the Environmental Risk Matrix.

Training

C O'Connor briefed the committee on the eLearning project currently underway and demonstrated the test site.
S Burdette noted the benefits of the site for onsite training and the flexibility of the system and a great tool for induction training and confirming competence in the workplace. S Smith noted that the potential for up skilling staff is substantial. A Kachenko highlighted the lost cost of the system.

ACTION: C O'Connor to send invite to committee to undertake and review the trial eLearning course when complete.

A Kachenko briefed the committee on the submission from Russell Cummings on an NGIA Learning Academy, as an addition to the HAL next gen program he offered.

Given the cost and limited penetration of the training the committee agreed that this submission is not viable.

S Smith thanked the committee for their attendance and closed the meeting.

The meeting was closed at 3:00pm



MINUTES

Environment Committee Meeting

Date:	07 Nov 2013
Time:	12:00 – 4:00 pm
Location:	HAL Offices Level 7, 179 Elizabeth Street Sydney, NSW 2000
Attendees	Simon Smith (Chair), John Bunker, Peter Douglas, Chris O'Connor, Anthony Kachenko, David Weisz, Craig Perring, Peter Melville
Apologies	Robert Prince, Steve Burdette

ITEM TOPIC

1 Welcome and Apologies

S Smith opened the meeting at 12:00pm, and thanked all for their attendance. Apologies were noted for R Prince and S Burdette

2 Confirmation of minutes – June 2013

S Smith asked for confirmation of tabled minutes from the June 2013 meeting. Approval was motioned by J. Bunker and seconded by P. Douglas.

3 Matters arising from last meeting

A Kachenko discussed the action item list. Skype meetings were noted as still being on the agenda and will still be a potential way of conducting meetings.

Policies of the major political parties were noted as still outstanding due to the late release prior to the election. The coalition's policies appeared to be sympathetic to industry. Staff recruitment across Government is on hold. The carbon farming project which was an across industry HAL project has an uncertain future with change in Government. As new information with government programs comes to hand it will be shared with the committee.

C O'Connor briefed the committee on the last Post Entry Plant Import consultative Committee (PEPICC) meeting. Noted was the review on SOD hosts and the new PEQ facility build project and the potential increases in fees associated with the new facility.

A Kachenko noted that he has had discussion with Steve Livesley from Melbourne University in relation to growing media research. At this stage this is not an area that they are looking at with regards to further research and have limited students interested in this area. A Kachenko noted that he has however been working with S Livesly on gaining an

ARC linkage grant looking at water sensitive urban design. A Kachenko noted that University of Queensland however has a very active researcher; Jitka Kochanek who he met with recently along with other researchers at UQ. A. Kachenko reported that work being undertaken by Jitka and researchers at UQ has some very promising applications for industry including some new diagnostic tools for plant pathogens and new plant growth hormones.

Following this A. Kachenko and John McDonald met with the faculty Dean and had a promising discussion about strengthening ties with Industry, which may result in UQ becoming a body which could champion technical research for industry and provide a complement to the urban forestry work being done by Melbourne University.

General discussion followed on the merits of coir fibre and its place as a growing media component.

ACTION: C O'Connor to follow up on Dept. Agriculture review for coir fibre import conditions.

A Kachenko raised the issue of pesticides and edible crops in particular slow release pesticides incorporated into media mixes as previously queried by S Smith. After discussion with J McDonald, A Kachenko notes that Industry would be covered if there was an issue due to promotion of best practice chemical use and application of chemical as per label requirements. Also noted was the assurance APVMA testing requirements for the health implications of products if applied as per label directions. There may need to be some work from a retailer perspective on chemical application and there is scope for a nursery paper next year to address an education/knowledge gap.

This issue will be kept as a watch and brief if further information comes to light.

A Kachenko also advised the committee of the crisis management hotline and suggested that we may need to promote this again. S Smith notes that it may be a promotable item for retailers.

General discussion on marketing materials to promote programs followed such as calendars and stubby coolers along with the need for communication and the merits of various communication mediums such as linked in, email Facebook and Flipboard.

J Bunker advised that work is still progressing on the collaborative approach to agrichemical requirements for the southern hemisphere and will update the committee as further information emerges.

4 Matter arising not addressed in this agenda

A Kachenko asked the committee if there were any matters which have arose which were not addressed – none were raised.

5 National Environmental Project Update

5.1 Review of R&D 13/14 AOP (Project NY13003) *

A Kachenko covered the annual operating plan of this year's R&D project and explained each of the components of the project.

Noted was the water disinfestation requirements research to validate requirements under the FMS program for pathogens e.g. phytophthora. The intent is for SARDI to head this

research. J Bunker asked if this would involve on Farm trials, A Kachenko noted that it would be lab trials reflecting on farm conditions.

The second aspect is crop monitoring surveillance methodologies looking at numbers required (2% or 600) to be tested for crop movements across different crop types and in different situations.

The third aspect is looking at waste audits for the nursery industry and looking at managing those waste streams. This will also include some case studies and will have results embedded into EcoHort.

The fourth project component is the minor use chemical programs looking at chemistry overseas and ensuring that the chemical can be used legally under minor use provisions.

Finally are the linkage funds to support research students conducting research with application to the Nursery industry.

J Bunker asked how levy fund income was progressing. A Kachenko noted that it has remained static but overall has been reducing. A Kachenko also noted that the IAC will need to consider a number of projects put before them and not all will be able to be funded. S Smith advised that the board is considering alternative levy sources and processes to address the shortage and inequities in the levy. General discussion on the levy and the biosecurity levy followed.

A Kachenko briefly discussed the FMS program and the licencing arrangements for New Zealand. A Kachenko noted that NGIA is currently undertaking a desktop mapping process looking at what other best practice programs are available worldwide and if the FMS program has any gaps.

5.2 Summary and Status of Current Government Enquiries

Apart from earlier discussion at the start of the meeting A Kachenko noted that he has been working along with other organisations e.g. Farmers federation on providing input into government cost recovery guidelines. This feedback will be considered and possibly incorporated. A Kachenko will keep the committee informed of any progress. J Bunker questioned if export fees will increase. A Kachenko noted that they probably will as programs have not been fully cost recovered, but the current government has a focus on export.

A Kachenko also noted that government has a pool of funds to assist horticultural industries to develop export markets which he will work to secure. J Bunker noted some of the issues that he has with export ie small batches and large fees are prohibitive.

5.3 Industry Market Development/ 202020Vision Update

A Kachenko noted that he has been working closely with the advertising agency on this and assisting in providing research data. He also noted that UTS has a supported project looking at the goods line development and the changes associated with the greening of this space.

iTree workshops are being run but some locations have had limited interest. NUFA has draft strategy document aligned to 202020 Vision.

General discussion on the 202020 Vision and launch followed.

5.4 Nursery Production FMS Update (NY12016) and AOP

D Weisz, P. Melville and C Perring of HAL entered the meeting. General discussion followed about their roles at HAL and what they do for Industry along with the role of the Env. & Tech committee.

General discussion on the Nursery FMS /BMP program and comparisons to overseas practices followed.

A Kachenko noted that he is submitting a VC project on biosecurity videos in collaboration with the New Zealand association.

D Weisz commented on the potential of the 202020Vision marketing program, noting that the momentum with the campaign is building and the potential to commercialise the program for example to Canada.

P Melville discussed the need to and questioned the committee on how can HAL better direct researchers to industry? S Smith replied that connecting through A Kachenko and the NGIA office is the best process. P Douglas noted that this also provides a good filtering process.

Discussion on multiple cross industry issues took place such as business skills and OHS which are applicable across all of horticulture. P Melville noted that we should be considering different sector strategies i.e. people already within industry to skill up, the tertiary sector and the school sector. A Kachenko observed that assisting students pays long term dividends as they have loyalty to the industry and in later stages of their careers provide reciprocal assistance.

C Perring questions the E&T committee on its relationship with the IAC. S Smith replied that the two are separate and there is no effort to influence the IAC. S Smith further commented that in regards to information if the IAC needs more that they are supplied by A Kachenko or R Prince.

C Perring, D Weisz and P Melville leave the meeting.

5.5 Australian Standard for Trees/National Best Practice Guidelines

A Kachenko briefed the committee on the Tree Standard to date covering meetings attended and consultation covered. A Kachenko commented that the key issues with the standard are the unknowns moving forward e.g. costs and how it will be audited, the familiarity with Natspec. Also noted was that public consultation was open and that comments provided will help to shape the standard. Also observed was that a possibility is that the standard is released as an interim standard valid for 2 years which will provide more time for consultation, comment, and use of the standard to highlight benefits and deficiencies. After the two year period it may be ceased. A Kachenko noted that another option is an industry standard but this will have significantly less weight than an Australian standard. Following the period of public consultation the standards committee will meet to review the comments and determine next steps.

S Smith commented that he believes that the Australian Standard is the way forward and that it is a good thing for Industry, and that it opens the way for further standards and that it is a marketable attribute, also noting that it is still voluntary. S Smith also noted that as an industry we should be driving best practice.

P Douglas questioned what the likely speed of uptake of the standard will be across councils. A Kachenko replied that many have commented that they will include it in their requirements, but that not all will immediately adopt it.

6 Research proposals

6.2 Review of projects for submission to HAL

A Kachenko noted that there were very little in the way of submissions form the State Associations. The value of the project submitted is \$180,000.

- A Companion document to the Tree Standard was ranked highly and a method for auditing.
- University linkages
- Minot Use Permits
- Committee funds
- Policy Development
- Biosecurity Commitments

A Kachenko also briefly covered other research proposals submitted to the HAL funding call.

A Kachenko departs the meeting.

7 Environment Policy

C O'Connor briefed the committee on the update to the NGIA Environmental policy and the NGIA Water policy. Once the drafts are completed these will be sent to the committee for comment.

8 General Business

J Bunker briefed the committee on the BioSecure *HACCP* interstate market access trial between QLD and VIC. He noted that there is potential for expanding this process to the wider horticultural industry and that we should be considering this and licencing options as the trial develops.

C O'Connor provided some further information on the trial and noted that this is a good driver for adoption of the BioSecure *HACCP* program in industry.

Further general discussion on the trial followed.

J Bunker noted that he will provide further detail to the committee on the trial as it continues.

S Smith noted the benefits of this market access tool for driving uptake of FMS.

P Douglas reiterated S Smiths comments on the potential for this program to be a market diver for FMS.

General discussion on more trees please and 202020Vision followed.

Meeting closed 4pm

Next Meeting TBA May 2014

option for Skype meeting depending upon the agenda weight



Environment Committee Meeting

Date:	Wednesday 18th June 2014
Time:	10:00 am – 3:30 pm
Location:	HAL Offices Level 7, 179 Elizabeth Street Sydney, NSW 2000
Attendees	Hamish Mitchell (Chair), John Bunker, Peter Douglas, Steve Burdette, Chris O'Connor, Anthony Kachenko, Craig Perring (until 10:45am)
Apologies	Robert Prince

ITEM TOPIC

1 Welcome and Apologies

A Kachenko introduced H Mitchell who will be chairing the committee in his capacity as a board member. H Mitchell opened the meeting at 10:00 am and thanked all for their attendance noting that he was looking forward to working on this committee. H Mitchell also noted that S Smith was unable to attend this meeting to hand over however noted that he had spoken with him and that he passes on his thanks to the committee. A Kachenko noted that R Prince would be an apology.

C Perring joined the meeting to provide an update on HAL activities as per agenda item 5.1

A Kachenko also announced that this would be his last meeting as he was leaving NGIA to undertake a new role with HAL.

2 Confirmation of minutes – Dec 2013

H Mitchell asked for confirmation of tabled minutes from the June 2013 meeting. Approval was motioned by J. Bunker and seconded by P. Douglas.

3 Matters arising from last meeting

A Kachenko discussed the action item list. Outstanding items covered include the Skype meetings which are still an option. The other item still outstanding was a synopsis of major political party's policy positions and how they will affect the NGI. A Kachenko note that aspects of this would be discussed today including the direct action plan and some areas where government/regulators had an influence on industry.

A Kachenko noted that there were some potential opportunities that could come in relation to export through the BioSecure *HACCP* program.

4 Matter arising not addressed in this agenda

A Kachenko asked the committee if there were any matters which have arisen which were not addressed – none were raised.

H Mitchell asked if there was an opportunity to discuss what is happening with HAL given C. Perring's time frame.

5 National Environmental Project Update

5.1 HAL Review

C Perring noted that the review of change for HAL had been completed and that there were 9 recommendations. The major being the change of ownership from the Peak Industry Bodies to a levy payer/grower owned RDC which has been accepted. All other recommendations require the change in ownership to occur first and it is not confirmed if they will be accepted, likewise these recommendations are subject to renegotiation. The structure at this stage is as yet undecided but it is likely that there will be changes to the IAC format.

C Perring noted that from the HAL perspective it is business as usual until changes/ new structures are confirmed. C Perring also noted that the statutory funding agreement was up for renewal in November and this would in part drive time lines.

A Kachenko noted that removing IAC will be a large change as their still needs to be a vehicle to channel R&D to industry needs and for advisory mechanisms. Discussion on conflicts of interest was raised with IACs.

C Perring noted that the change is needed as HAL has grown significantly since the time of its inception both with the number of industries and the volume of levy funds and that change is a positive thing.

C Perring noted that with recommendation 3 the rationalisation of the industries observed that for example with the nursery industry there are a number of R&D/marketing objectives which overlap with turf and could be done in conjunction with each other.

With recommendation 4 C Perring noted the update to processes for submitting projects (HALO replacement). This was on time for delivery in late 2014

C Perring noted the need for increased focus on tendering projects where applicable and increased focus on governance.

General discussion followed on the other recommendations.

H Mitchell observed that with greater focus on R&D fund expenditure and ROI then it would seem likely that government will continue to co invest or increase expenditure. S Burdette noted that the work which is being commenced on fruit fly is of the same spirit – greater cooperation cross industry and focus on one goal in a streamlined and effective manner.

General discussion followed in regards to collaboration across industry and engagement with various industry sectors as being essential for HAL. The need for communication from HAL was also discussed.

C Perring provided background on the Across Industry Horticulture fund and the Transformational Fund. General discussion followed in relation to the difficulties of achieving consensus of agreement in relation to project target areas. A Kachenko noted HAL provides funding to the Biosecurity CRC where he sits in an advisory committee, he advised that in this situation it is needed to take a whole of horticulture sector approach rather than an industry approach. A Kachenko noted that this collective approach needs to happen along with more opportunity for industries to come together to focus on this. C Perring noted that the Nursery Industries process of a pre call for R& D was progressive and that it got researchers focusing on opportunity outside of the specific HAL funding call and streamlines projects. C O'Connor noted that the process also gives opportunity to ensure that projects have the best chance of success and to provide opportunity for researchers to refine the scope of their submission.

C Perring departed the meeting at this point.

J Bunker asked if there would be communication on the HAL review to industry. A Kachenko noted that information has been sent out to the states and that further information will be disseminated as it becomes available.

5.2 Review of R&D 14/15 AOP NY13003

A Kachenko provided a background to the project which is essentially a means of grouping some minor projects together and explained the details of the project.

A Kachenko noted the HAL focus on ROI for extension and the need to demonstrate industry gains.

A Kachenko discussed the water disinfestation method validation and efficacy subproject being conducted with NSW DPI. Monitoring methodologies for the nursery industry were also discussed in relation to pest surveillance for nursery operations. The final subproject was an audit of waste streams from nursery operations with a view to look at alternative uses/ management strategies and recommendations which can be incorporated into EcoHort.

A Kachenko also noted the funding for the minor use permit program and that there are some issues with HAL in relation to their engagement with Growcom to manage the remaining industries minor use permits.

A Kachenko advised that the next project, which has just been signed off, will be quite small covering only E&T committee governance, minor use permits, student linkage program and a guide to the tree standard.

J Bunker enquired as to the state of the levy. A Kachenko observed that collection was down, but also highlighted that perhaps there is opportunity to examine how the levy is spent to achieve the greatest ROI. General discussion followed in relation to the levy including collection methods.

A Kachenko observed that many of the technical issues the industry faces have been addresses and suggested that we need to consider what are the top three things that will drive the industry forward and promote change.

A Kachenko observed that there is some scope for longer term legacy projects which will change the game. A Kachenko went further to ask what will the industry to be smarter at

what they do, drive productivity, and what will bring an increased financial return for the product.

H Mitchell observed that focus perhaps should be on results i.e. growing the pie. S Burdette commented that in his opinion the questions should be how do we ensure we are sustainable, how do we promote growth and how do we drive innovation.

General discussion followed on possible future options such as robotics, rapid diagnostics etc. H Mitchell was of the opinion that much of this should be relegated to an individual business decision.

S Burdette suggested that perhaps an ongoing literature review could be good to see what is in the market and on the horizon. A Kachenko noted that a key driver for levy funded R&D is "is there a market failure which needs the pool of levy funds to address" and noted that outcomes must benefit the sector and not just one or two individuals.

J Bunker noted the opportunities for BioSecure *HACCP* to become a cross horticulture project. H Mitchell noted the opportunities we have to focus on the health sector in regards to the benefits of greenlife and the opportunities to quantify value, and that it is difficult to compete in regards to value with the food/fibre agricultural sectors. A Kachenko noted the work of Thomas Astell-Burt and observed that despite the great data surrounding the value of greenlife one big issue is that a quantifiable cost is missing e.g. what can trees take off from the bottom line of state / federal budgets? How does that relate to financial benefit – what is the gain? H Mitchel agreed noting that we need recommendations.

P Douglas observed that the key areas that we need to focus on are 202020 Vision and FMS especially market access via BioSecure *HACCP* as well as the opportunities this has with other industries.

A Kachenko observed that the NGI must take a proactive approach and question how are we going to align to address the big issues, how can we streamline and become more efficient to deliver to industry.

P Douglas noted that issues regarding in ground growers and water disinfestation need to be addressed to progress these growers to FMS compliance.

General discussion followed with focus on how these two vehicles can be more actively driven across all of the NGI's. A Kachenko suggested that a discussion paper developed with how the NGI's can engage or look towards how the industry will be if we are not united.

Discussion followed on the need for market access negotiation between states. S Burdette noted that industry need to do the negotiation and establish what needs to be done, the individual businesses then make the decision to undertake this or not.

J Bunker noted that grower registry is an important aspect to consider, especially in the light of HAL ownership change.

S Burdette summarised and stated that we need to get the state associations on board with realignment of our strategy towards 202020 Vision and the FMS program. Both of which will be supported with a focused push for R&D.

ACTION – H Mitchell to raise at the next consultation meeting the need for increased focus and delivery on these two key strategy mechanisms of 202020 Vision (market development) and FMS (market access).

A Kachenko noted that an independent facilitator may be required at the consultation meeting to get some goals lined up.

S Burdette notes that clear direction must be given as to what needs to be achieved, and the option for the states to provide their roadblocks which need to be overcome. What are the issues for the associations moving forward, considering triple bottom line requirements?

A Kachenko will discuss with R Prince options to formulate a discussion paper for the consultation meeting.

5.3 Summary & Status of Current Government Enquiries

A Kachenko provided an update on the Agricultural White Paper submission. H Mitchell noted that it is of importance to focus on the health capacity of our industry. J Bunker reported that there has been an increased focus on export with government looking towards identifying roadblocks.

A Kachenko noted the inclusions in the recent federal budget including levy changes etc.

C O'Connor briefed the committee on recent changes to import requirements. General discussion on import needs and biosecurity followed.

A Kachenko updated the committee on export including opportunities that has been discussed in aligning BioSecure *HACCP* to government requirements for export. A Kachenko noted that NGIA have had a representative from the Austrade mission to Japan discuss export opportunities.

5.4 Industry market Development/ 202020 Vision update

A Kachenko provided an update on industry market development activities and noted that the NUFA plan will be going out shortly to various stakeholders as well as 202020 Vision material. The 202020 Vision master classes were also covered off which involved local government. Likewise the iTree assessment was commented on which involved a number of local council assessments of canopy cover.

5.5 Nursery Production FMS Update

Discussion points covered previously in item 5.2

5.6 Tree Standard

A Kachenko noted that there were some funds to assist in developing an accompanying guideline.

A Kachenko provided an update as to the discussions held to date with various stakeholders. A Kachenko noted that the draft is close to being finalised and that industry will have the opportunity to review. H Mitchel noted that NGIV has pledged \$20,000 to assist with research on developing a size index. A Kachenko reported that C O'Connor and R Prince will continue involvement with the standard to ensure continuity and that the standard does not falter.

5.7 Industry skills and capacity/ training

A Kachenko briefly addressed this noting that going forward a need will remain for this .

6 Research Proposals

6.1 Environmental Risk Matrix

A review of issues currently flagged on the industry risk matrix was highlighted by A Kachenko

6.2 Review of projects for submission to HAL

The committee discussed the proposals tabled with a view to ranking the projects for the most suitable projects to progress with a mind towards achieving the most value for money and best outcomes for industry. Projects were ranked upon four criteria; Urgency, Importance, Impact and Likelihood of Success. Individual scores were returned between 1 and 3 with 1 carrying the highest rating and 3 the least.

The table below has the top 10 projects ranked by the committee.

Project	Score	Rank
23. People, plants and policy: what affects decision-making about landscaping for communities and governments in Australian cities? 12 Months - \$42,000.		1
16. Exploring the effects of street tree types and diversity on property values in urban areas. 12 months - \$10,000.	32	2
4. What dose of 'green' for healthy ageing? An epidemiological analysis and mapping of the minimum amount of green space needed to promote good health and active communities across Australia. 3 Year - \$553,103.	33	3
5. The 'Green Dollar': Estimating health service dollars saved by investing in local green space to prevent avoidable hospitalisations. 3 Year - \$595,803.	33	4
13. Determining the entry points and opportunities for green-space in urban developments. 12 Months - \$180,000.		5
17. The economic benefit of urban green space for health prevention. 12 Months - \$250,000.	36	6
25. Mainstreaming a Green City approach to urban development in Australia. 5 Years - \$1,980,000.	38	7
3. Linking green space and mental health in Australia's capital cities: a mixed methods approach. 1 Year - \$194,000.	40	8
11. Creating National Rating Tools for Urban Green Infrastructure. 18 Months - \$260,000.	41	9
9. A) Product Integrity - Pathways for growers to achieve Natspec (or AS 2303 Tree stock for_landscape_use) and Council species diversity targets for urban trees (including survey of local government areas for species diversity requirements for urban trees in the next decade). 12 Months - \$200,000.		10

A Kachenko noted that the states will be invited to comment/vote on the submissions. Recommendations will be followed up with the researchers. R Prince will be informed of which projects were considered by the E&T committee to be of merit, in order to inform the IAC of the E&T committee's recommendations.

6.3 Legionella Update

A Kachenko provided a brief update on recent Legionella issues.

6.4 Pesticide residue and edibles

A Kachenko briefed the committee on the Nursery Paper drafted on Pesticide residues and edible crops. The paper has the aim of reminding industry of their responsibilities in regards to pesticide application and withholding periods especially in regards to crops which are ready to eat e.g. advanced vegetables, ready to use herbs etc.

7 Water Policy Update

C O'Connor advised the committee of the update to the NGIA water policy position and provided a brief synopsis. A draft of the work will be sent out in the coming weeks to State bodies Board and IDO network and feedback is sought to be incorporated.

C O'Connor noted that if anything was missed then to please advise him. A Kachenko noted that the draft incorporated the inclusion of greenspace and the link back to the market development campaign.

8 General Business

A Kachenko advised that at the next meeting state submissions for small projects will be discussed. A Kachenko also noted that due to the work done in the past few years he does not expect many project submissions from the States.

S Burdette thanked A Kachenko for his work with the committee and the industry and wished him good luck in his future endeavour; this was echoed by the committee.

Meeting closed 3:30pm

Next Meeting 05 Nov 2014 venue TBA.

Option for Skype meeting depending upon the agenda weight.



Environment Committee Meeting

Date:	Wednesday 12th Nov 2014
Time:	12:00 pm – 1:00 pm
Location:	Teleconference
Attendees	Hamish Mitchell (Chair), Peter Douglas, Steve Burdette, Chris O'Connor, Robert Prince
Apologies	John Bunker

Ітем Торіс

1 Welcome and Apologies

H Mitchell opened the meeting at 12pm and welcomed the attendees. J Bunker was noted as an apology

2 Confirmations of Minutes Jun 2014

Minutes of the last meeting were confirmed by S Burdette and P Douglas

3 Matters arising from last meeting

C O'Connor reviewed the current action item list.

Current Government enquiries. C O'Connor noted that this would be covered in the meeting

Skype facilitated meetings. C O'Connor noted that he would investigate this but may also look at other options such as goto meeting. C O'Connor noted that all participants have businesses to run so if a face to face meeting is not required a phone conference is a better option for an hour or two. C O'Connor commented that this also gives more flexibility in that rather than flying participants in for a full day meeting once every 6 months there is the ability to have more frequent but shorter phone meetings of approximately 1 hour.

Tree standard would be addressed in this meeting. C O'Connor will forward minutes of the PEPICC meeting to the group once received.

H Mitchell will raise the need for increased focus on key FMS and 202020 at the consultation meeting which has been delayed until 20/21 Jan in response to changes with HAL.

4 Matters Arising

R Prince provided the committee with a current update on HAL. R Prince met with John Lloyd CEO of HAL and at this stage it is still uncertain as to how HAL will be structured. R Prince noted that funding would be split into two funds - Pool 1 will be industry levy funds reserved for industry critical issues. Pool 2 will be multiple funds from other sources for large long term industry wide research an example of which is fruit fly.

R Prince noted that whilst not an issue for the nursery industry fruit fly appears to be of concern for a number of other horticultural sectors involved in export. Other possible areas include robotics. R Prince noted that we have pushed for Green Cities to be included noting the health and wellbeing benefits. R Prince noted that there is little information yet as to how projects will be managed and what will happen with existing projects.

Likewise the information/consultation feedback mechanisms with industry are not yet finalised. R Prince also noted that there has been no direction on how to submit new projects. There will be considerable impact on the pool of funds available due to the removal of matched VC funding from pool 1 projects.

H Mitchell suggested that we need to focus on the industry direction and how we can achieve this and not worry about what could happen with regards to funding. If there is opportunity to do this with commonwealth funds then how do take advantage of this and how do we do this? R Prince agreed noting that we need to focus on where we need to go, what resources we need and how to achieve this.

R Prince advised that there are two current relevant senate reviews. The first focused on the future of the levy which was initiated by Senator Leyonhjelm. A central element to this review was the drive to have levies reviewed every 3 years. A submission was tabled to the review.

The second senate submission was on the environment and controls to protect it in regards to biosecurity. R Prince noted that there are controls in place to protect this through Plant Health Australia and Animal Health Australia and that another body (Environment Health Australia) would not be necessary and would contribute more red tape to government. R Prince noted that some of the other bodies present which were lobbying hard for the establishment of Environment Health Australia were also quite damming of the Nursery Industry and its perceived contribution to weed problems. R Prince noted that he has sent information to the relevant parties on the programs the Industry has under taken in relation to weed education and mitigation in the industry. R Prince also noted that there is no control process/ barriers to entry for anyone to plant up some pots and sell these on. R Prince also noted that he advised the senators that we have petitioned for registration of growers in order to control this and industry would be very supportive of this.

C O'Connor noted a recent inquiry from a WA weeds researcher questioning the methodology of the weed risk assessment website the industry has. H Mitchell suggested there are opportunities to work with these groups to become allied to our cause.

C O'Connor noted the work being done in relation to water treatment and waste streams as part of NY13003 was coming to fruition.

C O'Connor noted that the waste stream work was of interest especially with materials which were traditionally non-recyclable such as plastics from poly tunnels or shade cloth. C O'Connor also noted that he had recently done some work in this area in conjunction with Terracycle and a scheme they have for recycling nespresso coffee pods. The scheme is operated out of florists and now garden centres and provides for a drop off facility to be used for consumers to recycle their used pods.

R Prince noted that milestone reports were submitted to HAL prior to the 4th of Nov to ensure that we received payment for these prior to the rollover of HAL into HIA and funding is frozen. At this stage now no funds are being released from HIA.

R Prince noted that there is currently a 202020 Vision roadshow taking place. The list of councils registered to attend has been circulated to the state associations. The NSW meeting is being held on the 6th of Nov where 30 councils will be presented to. The format of the day relates to 5 key topics and 4 key objectives under each topic. Participants will work shop these objectives and identify the barriers to achieving these objectives. The expectation is that the involved parties are able to identify the problems and the solutions can be provided or targeted for priority and research. R Prince noted that in South Australia some participants were not aware that green space appreciates in value. By highlighting this it enables justifying funds for maintenance at the local council level.

H Mitchell reiterated the importance of 202020 Vision and suggested that there is opportunity to utilise the industry more.

R Prince agreed in relation to exposure or understanding the issues but noted that the program had the industry as the beneficiary rather than actually undertaking the engagement. Likewise some of the skillsets being utilised in the engagement of the influencers are not held within the industry.

P Douglas observed that if industry was to get value out of it (202020 Vision) there needed to be some clear links established/ actions for industry to play.

R Prince noted that a question moving forward will be that without an IAC how are these projects to be managed? With no clear HIA direction this will be a watching brief.

Tree Standards - R Prince provided an update on the AS2303 Australian Standard - Tree stock for landscape use, noting that there will be an upcoming Standards committee meeting. R Prince also noted that he would be attending an upcoming LGTRA conference. LGTRA have had issues with the draft standard and have requested changes to the draft, with new tables proposed for discussion. Feedback received has been mixed with both positive and negative responses.

R Prince suggested that in regards to industry standards a harmonisation of container sizes would be of immense benefit to industry. H Mitchell noted that one thing which needs to be done is that each pot should have the volume of the container printed on the container. C O'Connor noted that he had issues in relation to this in previous roles. H Mitchell noted that this may be an issue in regards to the ACCC. R Prince observed the impact of this in relation to product quality and consistency for the consumer. Likewise the impact that standard container size harmonisation would have on supply chain and production efficiencies would be considerable.

General discussion on this point followed.

R Prince suggested that LED lighting would be an area to view for research in the coming years as well as focus on biosecurity especially in regards to BioSecure *HACCP* and an independent auditing ability.

R Prince departs the meeting 12:40pm

C O'Connor provided a brief update on the BioSecure HACCP trial and its successful completion in QLD/VIC and extension to the other states. C O'Connor noted to the committee that the FMS manuals are being updated to incorporate a greater degree of consistency of terminology as well as cosmetic updates.

H Mitchell asked what will happen to the IAC. C O'Connor replied that at this stage the IAC will be dissolved and that HAL/HIA do not have a process in place for a replacement mechanism. The HIA board will be meeting 08 December and hopefully some more clarity will flow on from here.

C O'Connor noted that there may be opportunities to lobby for the industry biosecurity program to fund a cross horticulture project through the tier 2 investment pool.

C O'Connor provided a brief on PEPICC and quarantine covering the ICON upgrade to BICON and noted the government focus on cost recover for quarantine operations.

C O'Connor covered the environmental risk matrix, noting that little had changed in the status of the threats/issues identified.

C O'Connor noted that at this stage the research project proposals which had been identified through the industry research pre-call and discussed at the previous meeting, have been placed on hold until clarification arrives from HAL/HIA on the processes for submitting research proposals.

P Douglas asked the question who is responsible for ensuring the pipeline for research remains open noting that there are still priorities for research. C O'Connor noted that the research still needs to be done and that the current unstable climate will settle. The industry levy is still in place and funding for research will be available however the process by which this happens may differ. It would be prudent to consider other avenues for funding from other sources, perhaps looking at some targeted research. C O'Connor noted that existing VC contribution funds although now not matched may be perhaps be used in joint partnerships with overseas entities. C O'Connor went further to note that many countries are experience similar issues to ourselves citing the Californian drought and their response to water management and the link this has to our 202020 Vision as one such example which we could leverage.

P Douglas question in light of the changes to research mechanisms did this committee have a role? C O'Connor responded saying that as an industry we still need research to be conducted and that internally we still have the need to identify areas of concern to target and a mechanism to do so. C O'Connor went further to note that in part this committee was an industry think tank to focus on our environmental and technical issues.

S Burdette noted that in this time of change would it not be an ideal time to consider what we as an industry want and the direction we need to take. C O'Connor agreed noting that the upcoming consultation to discuss this issue has been postponed until January to allow more time for us to determine the lie of land moving forward with HIA and to critically review our industry makeup and what we can do to improve it.

S Burdette noted that this needs to have a time line. H Mitchell responded, the focus of the board and consultation meeting will be on this and that there has been significant discussion on this. C O'Connor noted that our objectives/goals remain the same such as broadening the market increasing the quality of product etc. The methodology on how we achieve those goals may differ but not the goals themselves.

Both S Burdette and H Mitchell noted that we cannot afford to wait on HAL/HIA and that we need to continue to work towards our industry goals.

General discussion followed.

S Burdette liked the concept of more regular phone meetings which was agreed to by the rest of the committee with a yearly face to face meeting.

MEETING CLOSE 1pm

Next Meeting TBA



Environment & Technical Committee Meeting

Date:	20 October 2015
Time:	12:00 pm – 1:45 pm
Location:	Teleconference
Attendees	Hamish Mitchell (Chair), Steve Burdette, Chris O'Connor, John Bunker
Apologies	Peter Douglas

ITEM TOPIC

1 Welcome and Apologies

H Mitchell opened the meeting at 12pm and welcomed the attendees. P Douglas was noted as an apology.

2 Confirmations of Minutes Jun 2014

Minutes of the last meeting were proposed by H Mitchell and confirmed by S Burdette.

3 Matters arising from last meeting

C O'Connor reviewed the current action item list.

4 Matters Arising

C O'Connor asked the committee if there were any matters arising for this meeting.

5 HIA Update

C O'Connor provided an update on HIA, noting that he had sent all attendees a copy of the presentation delivery by Anthony Kachenko during the NGI CEO meeting held on 22-23 Sep 2015. C O'Connor noted that there had been one industry advisory meeting to date and that the key focus of the meeting was the investment opportunities for levy funds with discussion held on 202020 and the IDO project. From this meeting HIA advised NGIA that the IDO project NY12006 would cease 17 Nov 2015 and that a new biosecurity project would be in place moving forward. The communication project is intended to finish mid Dec 2015 based upon the outcomes of a newly contracted project which has gone to tender. C O'Connor noted that based on this HIA projects managed by NGIA would be decreased.

C O'Connor provided background on the Industry biosecurity project. J Bunker noted that he had been on the review panel for this project tender. C O'Connor noted that there would be changes to

the method of operation of FMS and the role of the states. C O'Connor noted that a working group was in place and was working towards developing the new operating model in the absence of levy funded support. C O'Connor noted that NIASA and EcoHort would still need to be retained as NIASA is the bedrock for the BioSecure HACCP program.

C O'Connor noted that the industry communications project was up for tender and that NY12011 and NY12012 had recently been independently reviewed by RM Consulting Group. C O'Connor noted that review included an online survey as well as phone interviews. C O'Connor reported that the review was generally favourable with opportunities in establishing a more rigorous monitoring and evaluation mechanism and covered additional outcomes out of the review.

C O'Connor noted that the outcomes of the review have informed the development of the new industry communications tender. C O'Connor reported that the new program would not have a policy development aspect despite industry indicating that this was valuable and important. C O'Connor noted that Policy in the future would need to be funded out of member funds moving forward.

H Mitchell noted that challenge going forward is that areas which are no longer funded via levy projects will still need to be funded, but managing those funds will be the real challenge. C O'Connor noted that this will be part of the transition moving forward and that it could be an opportune time to review the role of NGIA and how NGIA works in collaboration with state associations and what the value proposition is to members.

H Mitchell enquired as to the timing of the communications project and biosecurity projects, C O'Connor noted that the tenders for communication close on 15 Nov and it is anticipated that the project should be awarded and running by mid Dec 2015. The industry biosecurity project would need to be approved by the HIA board in November.

C O'Connor advised that the industry advisory mechanism would be known as Industry Advisory Panels and noted that the presentation had some details on this.

C O'Connor noted that there were a limited number of nursery industry projects being conducted through HIA as old projects com the other end of their life. Moving forward identified projects include the biosecurity project, communications project and the treestock balance project with other projects conducted through the auspices of 202020.

H Mitchell asked if 202020 would move into pool 2 funding. C O'Connor noted that 202020 remains the industry marketing program; with pool 2 green cities funding being stand alone with perhaps collaboration through CAUL and CSIRO green cities programs to match funding around green cities research which will support 202020 Vision messages through R&D.

J Bunker questioned if the young leaders and conferences would be supported through levy funds. C O'Connor noted that conferences would not be supported through levy funds moving forward, but that there was a standalone pool 2 to support leadership development opportunities. Existing projects in these areas for industry would finish after the national conference in Feb 2016. C O'Connor noted the announced pool 2 funding pools which have been confirmed by HIA. C O'Connor noted that the industry has a new industry relationship manager and that Craig Perring has moved to marketing, managing 202020.

C O'Connor noted that HIA was looking at establishing a mechanism for seeking broader exposure for R&D proposals through an online submission mechanism. H Mitchell noted that this was good idea as long as industry still had an opportunity to review submissions. C O'Connor noted that there was significant opportunity to leverage the R&D from other industries as well.

6 NGIA Project Updates

C O'Connor noted that as the end of year approaches a number of projects will be coming to an end and that NGIA would be writing project final reports and covered which projects would be finishing. Once new projects have been tendered information would be sent out to the network. With regards to the biosecurity project the intent was to have a transitionary period from the existing FMS operation for the first 6 months.

H Mitchell noted that it is important that as an industry we stay positive during the transitionary period and that HIA will be useful to industry and that continuing R&D is critical for our industry. H Mitchell noted that one of the big challenges for industry will be the vote on the levy in 2017 and ensuring that the levy continues past 2019. C O'Connor agreed noting that the amount of R&D generated as a result of the levy over the last 20 years is amazing. C O'Connor noted that the opportunities around pool 2 are quite exciting and given the current focus on agricultural investment the ability to leverage pool 2 is considerable.

7 Environmental Issues

C O'Connor noted that he had updated the NGI environmental risk matrix with annotations based upon NGIA management of the risks.

C O'Connor noted that he had also included an element around the social aspects for industry as well now. For example there has been some focus on 457 visas and foreign workers in industry and for that reason and the close alignment to environment risk; he had included the social aspects. C O'Connor noted that ethical sourcing is an issue citing that the Dumen group had highlighted their ethical sourcing program with respect to their propagation material being produced in third world countries. C O'Connor noted that this had been an issue with other industries but is something relatively new to the nursery industry and suggested keeping watching brief on.

H Mitchell noted issues around PBR and the ethics surrounding protection of naturally occurring products and this could be considered in light of ethical sourcing. General discussion on this topic followed.

H Mitchell noted that having the ethical sourcing of materials is a good addition and may be worthwhile investigating for policy options for the future.

J Bunker noted that possible additional items would be the relationship industry has with AQIS and the Subcommittee on domestic quarantine and market access regarding plant movement. C O'Connor noted that he sat on the Post-Entry Plant Industry Consultative Committee and that John MacDonald had significant involvement with the Subcommittee on domestic quarantine and market access through the Biosecurity project and work with the biosecurity national management group.

C O'Connor suggested that the key environmental issue on the horizon is water, in light of the return of el Niño, and noted that he had updated the water policy in preparedness for this as well as updating the policy from its previous stance.

C O'Connor noted that he was working on updating the industry weeds policy and provided a background to this. C O'Connor noted that the industry had done quite a lot since the last weeds policy was introduced and cited examples such as the plant labelling policy, the weeds risk assessment tool and the grow me instead campaign.

C O'Connor highlighted the difficulties in getting access to weed declarations across the country noting from a business perspective trying to manage this can be hard especially considering the cross border trade of plant stock.

C O'Connor noted that the ease of access of this information can be used to help enforce controls across the non-professionals as well.

C O'Connor noted the need for a more consistent weed risk assessment across states, noting that although based from the same handbook (HB294:2006) there are significant differences.

A mechanism for consultation and contestability is also required considering that weed species are not identified to cultivar level and noting that sterile cultivars may be classed as weeds. C O'Connor commented on the high level of emotion involved in discussion around weeds and the drive of issue motivated groups. The opportunity for consultation and a seat at the table to bring business cases forward would be good for industry.

H Mitchell noted that the issue of weeds needs to be balanced with their performance in the environment and that whilst being a weed else where a specific plant may be considered an important amenity plant locally. C O'Connor highlighted the approach of WA noting that weeds listed in the country are effectively banned in WA. C O'Connor also noted the issues around climate change and the potential for the industry to be charged with the sins of the father, noting the potential for spread of plants. H Mitchell noted that perhaps in this circumstance it may be about how do we manage the" new" natural environment.

C O'Connor asked the committee for their thoughts and noted that the draft would be sent to the committee and state associations for comment prior to NGIA board sign off.

8 General Business

C O'Connor provided background on the NGIA environment committee history and noted that HIA would not fund association meetings moving forward leaving the question what do we do with the committee in the future? NGIA would need to fund the committee moving forward. C O'Connor noted that from his perspective the committee has been quite valuable as an industry think tank noted its evolution from purely environmental aspects to one covering technical aspects as well.

C O'Connor asked the committee their thoughts on the role of the environment committee moving forward.

J Bunker responded noting that he saw it important as being able to provide support and feedback and to generate ideas. J Bunker noted that he saw there was a role still moving forward.

S Burdette noted it was difficult to provide direction at this point given the amount of unknowns regarding HIA and the role NGIA has in relation to R&D priority setting. C O'Connor noted that the changes HIA were undergoing have still left a lot of questions unanswered. C O'Connor noted that NGIA still relies on the feedback from its members. C O'Connor noted that the role of the association has perhaps in the past focused on the service delivery side based upon the amount of staff members who were funded out of project funding. This could require a change in the focus of NGIA to more of an advocacy based approach.

H Mitchell noted the importance of the committee is that the NGIA board has another group of industry persons which can be called on for advice/guidance and to provide recommendation.

Without the funding through HIA it could free up this committee to look at other things such as advocacy issues with government.

H Mitchell noted that his vote would be to keep the committee going with quarterly meetings with a fairly loose agenda to discuss issues of importance to industry. C O'Connor noted that he considered the think tank aspect of the committee was important.

C O'Connor noted that the lack of HIA funding could certainly free up resources for agripolitical lobbying and that the committee could help to support this.

H Mitchell suggested that this could be discussed at the next board meeting with and would have further discussion with C O'Connor. C O'Connor responded noting that this committee and the NACC committee are the only two board subcommittees operating at present and both are affected by funding changes. This could be an opportune time for the board to assess what subcommittees it will require as well as what advice sources it will need both internal and external to industry.

H Mitchell thanked the committee for the time and input and closed the meeting at 1:45pm

ACTION ITEM: H Mitchell and C O'Connor to discuss board subcommittee requirements and the function of the Environment and Technical Committee moving forward.

ACTION ITEM: C O'Connor to forward draft of Weeds Policy to committee once completed for comment.

Appendix 2

Minutes of the National Accreditation and Certification Committee (NACC)



National Accreditation and Certification Committee (NACC) Meeting – Day 1

Date:	Wednesday 26 th June 2013
Time:	8:30 am – 5:30 pm
Location:	Meeting
	Burswood on Swan (in half of River Room)
	1 Camfield Drive
	Burswood WA 6100
	Ph: (08) 9472 0255
	www.burswoodonswan.com.au
	Accommodation
	Crown Promenade (previously Holiday Inn)
	Great Eastern Highway
	Perth WA 6100
	Ph: (08) 9362 7777
	www.crownpromenadeperth.com.au
Attendees:	Colin Groom (WA; Chair), Anthony Kachenko (NGIA), Chris O'Connor (NGIA), John Marshall (VIC), Scott McDonald (NT), Tim Phillips (TAS), David Eaton (SA), Gary Eyles (NSW), Michael Danelon (NSW), John McDonald (QLD), Trevor Winter (WA), Katrina Hill (WA), David Reid (VIC); Esther Ngang (NGIWA CEO).
Apologies:	Terry Spink (QLD), Grant Dalwood (SA), Megan Connelly (NT)

Ітем Торіс

¹ Welcome and Apologies

C Groom formally declared the National NIASA Advisory Committee (NNAC) Meeting open at 8:35 am and extended a warm welcome to all Committee Members. A Kachenko noted that T Spink, G Dalwood and M Connelly were apologies. C Groom introduced K Hill to Committee Members. A Kachenko indicated that the meeting would be split across the two days with operational matters on Day 1 and growth opportunities on Day 2. He advised that Esther Ngang, NGIWA CEO, would sit in on the meeting in order for her to get a better understanding of the operation of the Committee.

² Confirmation of Minutes

2.1 NNAC Committee Meeting Minutes December 2013

C Groom advised that the Minutes from the Meeting held on 5 December 2012 were provided in the Meeting papers and Committee Members were asked to raise any concerns regarding the accuracy of these minutes.

MOTION: The NACC accept the minutes from the 5 December 2012 NACC meeting as a

true and accurate record.

Moved: J Marshall

Seconded: G Eyles

2.2 Technical Officers Group (TOG) Telelink March 2013

C Groom advised that the Minutes from the Meeting held on 12 March 2013 were provided in the Meeting papers and Committee Members were asked to raise any concerns regarding the accuracy of these minutes. It was noted that the date was incorrect. C Groom asked if program certificates had been sent to State Associations. A Kachenko replied by saying that a Dropbox folder had been developed with artwork for certificates placed into the Dropbox folders. He noted that NGIA would not print certificates due to high costs as the print run was too small owing to the multiple variations of the certificates. No further changes were noted.

³ Matters Arising From Last Meeting

3.1 Review of Action List

A Kachenko provided an overview of the Action Items. He provided an update on the following outstanding/in progress items.

- 1. A Kachenko to draft an 'appendix' or modify Section 2.7 of NIASA regarding root health for consideration at the next NNAC. He noted that this would occur after the release of the proposed Australian Tree Standard that will release in July 2014.
- 2. NGIA to forward the NGI communication strategy to NNAC. A Kachenko indicated that C O'Connor was drafting this. This would be tabled at the next NACC meeting.
- 3. M Danelon and G Eyles to seek feedback from Auscitrus to see what areas they are interested to incorporate into a NIASA Appendix. G Eyles indicated that there had been minimal progress in this area as Auscitrus has been through a recent period of tough trading and restructuring. Despite this, they are keen to maintain interest in working towards drafting a NIASA appendix. This item will remain on the Action Items as a watching brief.
- 4. T Winter to discuss Phytophthora baiting with the Department of Environment and Conservation (DEC) to clarify double testing and why as well as demonstrated comparison between the *Eucalyptus sieberi* cotyledon baiting and existing NZ lupin baiting methods. T Winter discussed the need for a review of the Phytophthora baiting technique with a double testing and *Eucalyptus sieberi* cotyledon baiting method. He reaffirmed that the Department of Environment and Conservation (DEC) were driving these changes. The Committee indicated that A Kachenko should qualify why the DEC were driving these changes in terms of what constituted double testing (based on a peer reviewed scientific methodology) and why as well as demonstrated comparison between the *Eucalyptus sieberi* cotyledon baiting and existing NZ lupin baiting methods.

Action: A Kachenko to contact the DEC to verify the science behind the *Eucalyptus sieberi* cotyledon baiting technique.

- 6. Members of the NACC to forward A Kachenko activities and/or costings for activities that are currently omitted or should be reviewed in future versions of the NY12006 Annual Operating Plan or State Quarterly Report Templates. A Kachenko indicated that he hadn't received any feedback. Committee Members discussed the need for greater weighting of costs to outputs arising from BioSecure *HACCP* to reflect the time allocated to each business seeking BioSecure *HACCP* certification. A Kachenko clarified that the NY12006 Annual Operating Plan or State Quarterly Report would be revised for the 2013-2014 financial year and reflect this discussion.
- 7. A Kachenko and J McDonald to identify auditor training opportunities in 2013 for the IDO network. A Kachenko indicated that the IDO network had been trained in Interstate

Certification Assurance (ICA) training. This was a requirement under the new governance requirements for BioSecure *HACCP* for market access will require all IDOS to have ICA training. T Winter and K Hill will need to become ICA trained in the near future in order to meet this requirement. General discussion followed regarding procedure in BioSecure *HACCP* in relation to certain activities such as 'vehicle inspection.' It was made clear that records and procedures must be documented and in place as specified in the guidelines against activities such as inspection and sign off of vehicles entering a production site, crop monitoring, consignment inspections, etc and where an appropriate risk has been identified.

- State Association to forward A Kachenko a list of how many NIASA, EcoHort and BioSecure manuals have been sold for A Kachenko to generate 'access codes' to ensure all existing guideline holders have access to electronic manuals.
- 9. State Association to forward A Kachenko a list of how many NIASA, EcoHort and BioSecure manuals have been sold for A Kachenko to generate 'access codes' to ensure all existing guideline holders have access to electronic manuals. A Kachenko indicated that codes had been circulated. He noted that codes had a 180 day expiry date. A Kachenko indicated that many of the codes hadn't been used and had lapsed. J McDonald indicated that NGIQ had forwarded every NIASA business in Queensland their codes at the beginning of 2013 and only a small number actually activated their accounts. J McDonald advised he would sit down with Queensland growers to make sure they have access to the manuals during the next audit round. It was decided that this approach was the most logical in moving forward.

Action: IDOs to ensure all existing guidelines holders have access to the online manuals.

10. A Kachenko to update the NIASA Appendix 2. He noted that Committee Members could still provide input before signing off on the update on July 2013.

⁴ State Reports and National Projects

4.1 State Reports (5 minute Update)/ Fees and Charges Discussion

The NSW, QLD and WA Technical Officers Six Monthly Reports were tabled and taken as read. Other reports were tabled during the meeting and discussed.

J McDonald noted changes to NGIQs SACC with the appointment of Tony Mullan from Greenfingers Potting Mix and Chris Healy from Nursery traders resigning. He also noted that NIASA numbers had changed to 75 and EcoHort numbers to 58.

C Groom noted that Amanda Shade from Kings Park Botanic Gardens was a new member on the SACC with Roger Evans from Richgro retiring.

D Reid discussed his report and noted that NGIV had applied for the Carbon Futures Fund through DAFF to calculate current carbon expenditure in 50 nurseries in order to determine if there are any gains to be made, offset excess emissions and have it recognised by the government agency. The noted that this will be communicated in fact sheets, field days and a brochure at the end of the 2 year study. A Kachenko indicated that NGIA with HAL and other industries had submitted a national grant through the same funding mechanism. Both D Reid and A Kachenko noted that the rushed nature of their applications had meant that both parties weren't aware of each other's intent. He explained that in future, both NGIA and State Associations should be more open in discussing projects of national interest for the benefit of industry.

D Reid discussed Victoria DPI moves to see property registration (Property Identification Codes). General discussion covered how property registration should be administered based

on historical schemes. J McDonald and A Kachenko noted that NGIQ and NGIA had a consistent policy on property registration based on biosecurity. He indicated that he would circulate both the NGIQ and NGIA positions as well as an earlier across horticulture scoping study for grower registration.

Action: AK to circulate NGIQ, NGIA and scoping study for grower property registration.

4.2 2013/14 Environment and Technical Project Update (NY13003)

A detailed overview of project NY13003 was tabled. A Kachenko mentioned that the 2013/14 Environment and Technical Project will be contracted in July 2013 for completion in August 2014 with a valued of \$300,000.

The following sub projects were briefly discussed. A Kachenko mentioned that project 1- 6 were continuations of the current NY12001 2012/13 Environment and Technical Project.

- 1. Operational resources for NGIA National Environment Committee
- 2. Update of NGI policies
- 3. Meeting industry's EPPRD and broader industry biosecurity obligations
- 4. Regional Representation
- 5. Minor use pesticide program for NGI
- 6. NGI affiliate and research linkage program
- 7. Water disinfestations treatment comparison trials to validate Nursery Production Farm Management System. A Kachenko noted that this sub-project would engage a researcher to design an appropriate trial to fill knowledge gaps on the efficacy of chlorine, chlorobromine, chlorine dioxide, ozone and ultraviolet light water treatments against a range of pathogens including *Alternaria*, *Cylindrocladium*, *Phytophthora*, *Pythium*, *Rhizoctonia* and *Fusarium* and their propagules at various lifecycle stages (e.g. mycelium, spores, etc.). He commented that a more detailed research project is required to determine efficacy levels/scope/residuals that the currently approved irrigation water treatments have against key plant pathogens.
- 8. Develop nursery industry crop monitoring & surveillance methodologies. A Kachenko indicated that this project would engage a researcher to investigate international work undertaken in nursery production monitoring and surveillance methodologies and assess the statistical validity of these systems plus identify knowledge gaps and provide statistically valid methodologies for cropping systems including: Plugs/tubes/seedlings (closely spaced cropping), Potted colour (closely spaced cropping), House plants (protected cropping), Trees, palms & shrubs (hardy outdoor cropping) and Advanced stock (open spaced cropping). He noted that Australian Standard AS 1199.1 Sampling procedures for inspection by attributes Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection would be a useful document to refer to for this project.
- 9. Waste audit and gap analysis of Australian production nurseries. A Kachenko noted that this project would review all conceivable waste streams including media, paper, plant, chemical, nutrient, textiles and packaging. The project would provide an economic case study generated through this study will be crucial in terms of quantifying savings from appropriate waste handling and waste minimisation strategies.

A Kachenko indicated that his presentation at the NGIWA conference on 25 June had provided a detailed overview of the NGI urban Forest Research Program and sought feedback from Committee Members. He briefly discussed the 202020 Vision as part of the next phase of nursery industry marketing.

4.4 Australian Standard for Specifying Trees

A Kachenko provided a brief overview of the proposed Australian Standard for Specifying Trees. He noted that the original NATSPEC Specifying Trees Guidelines written by Ross Clark had been misunderstood, misapplied, missed the mark between supplier and customer requirements and had not factored in new science since it was last publicised in 2003. He provided an overview of the process behind the National Australian Standard committee and the industry steering committee. He then gave a detailed overview of the current draft covering definitions, aboveground and belowground characteristics and the balance between these characteristics referred to as a 'size index'. He detailed the sampling methodology and the checklist that would be used to assess against. Committee Members asked if they could provide comment on the current version of the draft.

Action: A Kachenko to circulate a copy of the draft Australian Standard for Specifying Trees to the NACC for input prior to the next Australian Standards Committee meeting.

⁵ Operational

5.1 EcoHort Guidelines Update

A Kachenko indicated that the changes agreed to from the last NACC were incorporated into a version 2 update. A Kachenko asked if there were any further changes. No further changes were raised.

5.2 NIASA Growing Media Checklist Update

A Kachenko tabled a copy of the updated Appendix 2 and new Growing Media Checklist. General discussion covered the frequency of audits. It was decided that two NIASA audits were required per annum. It was decided that Under Section A 1.8 External Audits: The current step two and three would be removed and the following inserted:

2. A six monthly NIASA accreditation audit against the guidelines utilising the NIASA Best Management Practice Guidelines Growing Media Checklist. NIASA requires independent six monthly testing for Phytophthora spp. and other soil borne pathogens and pests.

Under A1.11 Flow Chart, in the second column, the last three points to be omitted and changed as follows:

- 1. External audits annually apply the analytical parameters as described in Section A.1.8 External Audits under point 1.
- 2. External audits six monthly NIASA accreditation assessment, independent evaluation to meet NIASA Best Management Practice Guidelines.
- 3. External audits six monthly random sampling, independent testing for plant pathogens.

M Danelon questioned the concentration of calcium detailed in A 1.16 and A1.19 and suggested it should remain at 4 grams per litre.

Action: A Kachenko to update NIASA based on the feedback of the NACC and circulate the revised version by 31 July 2013.

5.3 BioSecure HACCP Trial Update

J McDonald provided an update on the BioSecure *HACCP* trial. The trail is scheduled for 1 July 2013, however will likely be delayed while agreement between jurisdictions is sought. A Project Control Board has been established with Rod Turner (PHA and Chair), Gary Darcy (VIC), Mike Ashton (QLD), Chris Anderson (NSW), Geoff Raven (SA) and John McDonald (NGIA) as Members. Governance and administration documents have been finalised and are with the PCB for comment. Terms and conditions for businesses have been drafted. The BioSecure *HACCP* guidelines will also be updated in the next 12 months with updated procedures and record sheets. Entry Condition Certification Procedures have been established for key pests of Victoria and Queensland. The trial will be undertaken between two businesses in QLD (Birdwood and Pohlmans) and VIC (Mansfield's and Proteaflora) who are BioSecure *HACCP* certified. J McDonald advised that he will be representing industry on the DMAWG on issues relating to BioSecure *HACCP* as an ex-officio member. J McDonald advised that the Audit Management System (AMS) was operational; however there would be a few changes likely to arise following this trial. Indeed, this would likely be the case for all resources arising from this project.

A Kachenko noted that he was looking to explore the opportunities with this system for export market opportunities and would be meeting with bureaucrats in Canberra in mid-July to discuss opportunities.

Discussion covered the cost associated with the fees and charges for the Audit Management System (AMS). It was noted that the most equitable way would be a cost per certificate. A Kachenko noted that a summary of current costs per business would be useful in setting the fees and then work backwards to determine the average cost per certificate growers are currently paying.

J McDonald informed the NACC that both Queensland and Victorian biosecurity regulators had raised the issue of the potential for NGIA to allow other horticultural producer's access to the AMS for interstate electronic certification. J McDonald suggested that this may well be an opportunity for state NGI's to capitalise on and draw extra income into the program. A Kachenko agreed, however indicated that this would be a licencing arrangement of the tool in order to benefit market access requirements for these industries.

5.4 Freight Issues Outline Draft

In G Dalwood's absence, he prepared a document that was tabled to discuss. The document detailed attributes designed to highlight best practices and procedures with regard to the movement of greenlife material in the important phase of the cycle from grower to retail outlet. The Committee agreed that G Dalwood had developed a sound document; however it was unclear if the document was for accreditation of third party freighters or for best practice in managing nursery vehicles. The outline was tabled during the meeting and discussed in detail. It was decided that two documents should be drafted. The first was an appendix to NIASA best practice guidelines for existing NIASA businesses to assist in managing logistics. The second was a general guideline for logistics that should be considered in a similar vein to the National Plant Labelling Guidelines.

Action: G Dalwood to work with A Kachenko in refining the document to focus on best practice guidelines for existing NIASA businesses and a more detailed general guidelines for logistics.

5.5 Progress from AUSCITRUS on Budwood Scheme

There was no further discussion on this Agenda item.

5.6 DAFWA & requirements for Phytophthora Testing

There was no further discussion on this Agenda item.

5.7 Nursery Paper Schedule

C O'Connor tabled the 2013 Nursery Paper timeline. He noted that it was important to ensure the Nursery Papers were submitted on time and in accordance with the Guidelines. A Kachenko noted that all words and images should comply with copyright requirements with due recognition provided for all sources of information. He noted that the August position would be undertaken by Bob Wynyard.

Action: C O'Connor to circulate a copy of the updated 2013 Nursery Paper schedule to the IDO network.

5.8 DAFF Approved Officers (AO) Update

A Kachenko tabled a document which outlined the role of AOs. AOs are specially trained individuals who are accredited to perform specific export inspection functions in accordance with Australian export legislation. AOs must have the right skills, and pass a competency assessment to be able to inspect plants and plant products, empty containers and vessels' holds to meet the requirements of overseas trading partners and comply with all legal requirements. An AO must also have no unresolved conflict of interest that would affect their ability to carry out their job function. A Kachenko asked if the IDOs were interested in going through the process of AOs. The general consensus was that this should be a watching brief, due to the reality that businesses exporting product could become an AO in their own right. No further action was proposed at this time.

⁶ Administration

6.1 National Audit Portal Update

A Kachenko provided an overview of the updated National Audit Portal. He provided Committee Members with an overview of the changes on the projector with many changes relating to cosmetic and backend updated. He noted that the system also provided users with greater ability to track data through enhanced capacity to search and filter records. He noted that the National Audit Portal would go live by 31 July 2013.

6.2 NY12006 IDO Project Update – Quarterly Report Template Update - Feedback on Activities

A Kachenko tabled the 12006 IDO Project Update – Quarterly Report Template for feedback. There was no further discussion on this Agenda item.

6.3 New Zealand Licence Agreement Update

A copy of the New Zealand Non-Exclusive Licence Agreement was tabled. A Kachenko advised that all feedback from the previous meeting had been incorporated in to this agreement. No further comments were made during the meeting. A Kachenko provided a verbal update on the developments between Australia and New Zealand regarding FMS. He indicated that he had recently returned from New Zealand where he had carried out 10 NIASA and EcoHort audits. Of these, four were of a level commensurate for NIASA accreditation and EcoHort certification. He noted that he would revisit New Zealand in November 2013 to undertake a further round of audits as well as engage with new businesses. There would also be the opportunity for some training through third party facilitators to address key production issues observed during the audits. He noted that the licence agreement would be signed by mid-August between the NGIA Board and the NGINZ Board.

EM	Торіс
7	Marketing
	7.1 FMS Marketing Materials
A Kachenko tabled a document that de marketing the program to date. He ask requests for more materials.	A Kachenko tabled a document that detailed all FMS promotional stock developed for marketing the program to date. He asked for all Committee members to advise him of requests for more materials.
	He noted that requests for material should be made prior to Tuesday 2 July 2013 in order to ensure that they were costed in to the current project budget (NY12002). D Reid and M Danelon indicated that they would provide A Kachenko with a list of resources required.
	Action: D Reid and M Danelon to request marketing collateral from A Kachenko by 2 July 2013.
	7.2 Autumn Winter Advertising Campaign Update
	C Groom indicated that this item would be carried over to Day 2 owing to shortness in time.
	7.3 Opportunities for Conversion
	C Groom indicated that this item would be carried over to Day 2 owing to shortness in time.

Meeting Closed 4:45 pm



National Accreditation and Certification Committee (NACC) Meeting – Day 2

Date:	Thursday 27 th June 2013
Time:	8:30 am – 3:00 pm
Location:	Meeting
	Burswood on Swan (in half of River Room)
	1 Camfield Drive
	Burswood WA 6100
	Ph: (08) 9472 0255
	www.burswoodonswan.com.au
	Accommodation
	Crown Promenade (previously Holiday Inn)
	Great Eastern Highway
	Perth WA 6100
	Ph: (08) 9362 7777
	www.crownpromenadeperth.com.au
Attendees:	Colin Groom (WA; Chair), Anthony Kachenko (NGIA), Chris O'Connor (NGIA), John Marshall (VIC), Scott McDonald (NT), Tim Phillips (TAS), David Eaton (SA), Gary Eyles (NSW), Michael Danelon (NSW), John McDonald (QLD), Trevor Winter (WA), Katrina Hill (WA), David Reid (VIC)
Apologies:	Terry Spink (QLD), Grant Dalwood (SA), Megan Connelly (NT)

Ітем Торіс

¹ Welcome and Meeting Outline

C Groom welcomed Committee Members to Day 2 of the meeting. He commented that the purpose of the day was to deal with key changes to the Nursery production Farm Management System to ensure it would meet stakeholder needs in going forward.

7.2 Autumn Winter Advertising Campaign Update (from Day 1)

A Kachenko tabled a document detailing the businesses who had engaged with the Autumn Winter Advertising Campaign. A total of 69 businesses nationally registered as part of this campaign. The Committee walked through each contact received and discussed opportunities in engagement into the program. The bulk of these registrations (45%) were through Facebook and Twitter with a further 13% from the Your Levy at Work (www.yourlevyatwork.com.au)industry blog. Each of these businesses had been sent the induction kit and would require a follow up by the State Association in the near future. A Kachenko indicated that there were approximately 20 businesses that had not received their kits as he had run out of Pocket Diagnostic Test Kits. He indicated that this would mean a four week delay in circulating the final list; however he indicated that he would send the list of businesses who had already received an induction kit to ensure that they could be contacted by State Associations.

² a) FMS Annual Operating Plan 2013-2015

A Kachenko tabled the NY13001 Annual Operating Plan (AOP) for the years 2013/14 and 2014/15. He noted that the project has been allocated \$120,000 for the two years with the project commencing on 1 July 2013. He indicated that the funds were 100% R&D with no marketing levy. He suggests that it would be worthwhile to discuss and plan for 2013/2014. The sub projects detailed within the AOP as follows:

- The NACC supported funds (\$20,000) to be allocated to facilitate two meetings as per the Nursery Production Farm Management System.
- The maintenance of the Nations Audit Portal (NAP) was agreed to with up to \$10,000 allocated to this item to accommodate hosting fees and updates.
- Payment of the Smart Approved WaterMark (SAWM) licence fee to ensure both the NIASA and EcoHort programs maintained their SAWM recognition (\$2,000). Discussion covered the need to market the program to existing NIASA and EcoHort businesses to ensure they knew how to market SAWM (e.g. on websites, product catalogues, availability lists, stationary etc.).
- Exhibit at national conferences, including the 2014 NGIA National Conference and relevant trade events (\$5,000).
- Facilitate the Winter/Autumn campaign similar to the once just executed to engage with non-NIASA businesses. The campaign would be advertised in national media including Outdoor Design Source, HortJournal and Landscape Contractor Magazine and other relevant publications (\$7,500).
- Maintain the HortJournal partnership where ads are place in HortJournal that linked to the articles written about accredited/certified businesses in each edition. C O'Connor Kachenko indicated that he would update the production schedule and advise the states immediately (\$7,500). The Committee indicated that it would commit to 12 months and revisit the continuation of this program in year 2 of the project.

In 2014/2015, it was discussed that funds should be allocated to exhibit at the International Horticulture Congress and World Green Infrastructure Congress, both in September 2014.

Committee Members indicated that discussion on the AOP should be defined pending conclusion of the day's discussions.

Action: A Kachenko to update the 13/14 AOP incorporating the aforementioned changes and circulate to the NNAC.

Action: A Kachenko to circulate the SAWM logo and explanatory brochure to State Associations.

Action: C O'Conner to update the Nursery Production Farm Management System and HortJournal Partnership agreement production schedule and circulate to the NACC.

b) Renew HortJournal Schedule - for consideration

The Committee indicated that it would commit to 12 months and revisit the continuation of this program in year 2 of the project.

³ Advancing the FMS program forward – Strategy session

Proposed name change for Nursery Industry Accreditation Scheme Australia to Nursery Industry Accreditation Scheme Australasia

A Kachenko indicated that there was growing interest in the program from several countries across the region regarding the program (e.g. Singapore, Chile and New Zealand). He indicated that it was a small change that would elevate the program internationally. Few changes to marketing collateral would be needed pending the change.

MOTION: The NACC support to change Nursery Industry Accreditation Scheme Australia to Nursery Industry Accreditation Scheme Australasia.

Moved: G Eyles

Seconded: J Marshall

International developments and opportunities

A Kachenko indicated that there had been minimal conversation with Chile since his visit late 2012. Similarly, he noted that there had been minimal interest from Singapore since discussions in 2011 and earlier. He added that Singapore had developed their own accreditation program and to his knowledge, was being implemented across the world.

General discussion covered international accreditation programs and their equivalence to the Nursery Production Farm Management System, specifically NIASA. Programs covered GlobalGAP and industry BMP's. A Kachenko indicated that this Agenda item would be discussed in the next Agenda item.

Third party review of NIASA and EcoHort programs

A Kachenko indicated that a gap analysis of NIASA and EcoHort against international guidelines should be undertaken to ensure their currency in terms of information and content. Local and international programs should cover:

- Enviroveg
- Cotton BMP
- EuroGAP
- Best Management Practices: Guide for Producing Nursery Crops (Southern Nursery Association)
- Best Management Practices for Climate Friendly Nurseries
- The Canadian *P. ramorum* Certification program
- Massachusetts Nursery Industry Best Management Practices Guide
- Singapore Nursery Industry Accreditation Program

A Kachenko indicated that this would need to be a consultancy owing to the scale of work required. J McDonald indicated that he had some consultants in mind that would be worth pursuing for this task. The output would be a summary of gaps rather than a detailed report. The Committee suggested that \$15,000 would be warranted for this project. A Kachenko

indicated that he would incorporate this into the 13/14 AOP.

Developing a solution to water disinfestation for in-ground production

A Kachenko provided a brief background of the issues. This included the size and scale of the operation (i.e. 200 hectare sites on multiple sites) and their concern in managing overland water flow entering and leaving the property and the necessity of water disinfestation based on feasibility (owing to multiple water sources) and costs. General discussion covered the need to better understand the barriers from in-ground growers. J McDonald provided an example of cost for chlorination for a protected cropping and inground grower to demonstrate that the water demand in an inground production nursery used less water and thus lower costs for disinfestation water for container growers made sense based on the closed nature of the system and the size and scale of the operation, however suggested that these issues were different for inground growers. J McDonald indicated that EcoHort addressed this and that any change to the guidelines required science to provide evidence to support the relaxing of water disinfestation for inground growers. J McDonald also advised the committee to be prepared for container growers to challenge their requirement to disinfest irrigation water if the standard changes for inground growers.

It was decided that IDOs with growers requiring interest in accreditation should provide their barriers and the following data:

- Number of water sources
- Number of sites
- Total area irrigated
- Flow rate
- Water use per hectare
- History of pathogen testing (Genus species if available)

Action: IDOs to collate data on inground growers to table at the next NACC meeting.

Identifying market drivers

General discussion covered the lack of market drivers, however noted that there was a move being forced through the 'value chain' driven by customer demand. A Kachenko noted AusVeg recently launched Enviroveg Platinum which builds on the EnviroVeg Program. Growers seeking additional recognition (aside from Enviroveg) for their practices are now able to have their practices verified by an independent party and can access exciting new rewards under the Scheme. For example, Coles are will deliver enhanced promotional recognition for the Program in its regular customer communications. General discussion indicated that a similar approach should be exercised by Bunning's, considering they are part of the Wesfarmers group. General discussion focussed on other market drivers including local government specifying NIASA in tender documents. Other program discounts include Phosyn Analytical, Farm Minder, Pocket Diagnostic Test Kits and Pathogen Testing through DAFF, QLD. General discussion covered the need for advice on the content required in sales kits for circulation to existing businesses engaged in the program, or businesses wishing to find out more about the program.

Action: Targeted communication on these benefits should be reinforced to all growers
through state magazines.

Action: A Kachenko to forward a detailed summary of a sales kit for an existing or new business wishing to engage in the program using DropBox.

J McDonald left the meeting due to a scheduled Consultative Committee on Emergency Plant Pest teleconference.

Inclusion of transport and tissue culture laboratories

C Groom indicated that transport had been previously covered. A Kachenko noted that tissue culture facilities were not technically covered by NIASA. He noted that tissue culture facilities were already part of the program through association with the nursery they were associated with (e.g. Ramm Botanicals, Brockland's and Alcoa). A Kachenko indicated that a guide in NIASA should be developed to accommodate these businesses and provide criteria for standalone tissue culture facilities. Guidelines already cover 'propagule/propagation' areas; however there is additional information specific to tissue culture facilities that should be considered. A Kachenko indicated that J McDonald had considered this previously. A Kachenko will liaise with J McDonald to determine the best way forward to address this prior to the next NACC meeting.

Action: A Kachenko to approach J McDonald to investigate the options available for tissue culture to be incorporated in NIASA.

Business coaching

J McDonald re-joined the meeting. A Kachenko outlined a proposal put forward by Russell Cummings from Strategic Business Development. Russell facilitated the Horticulture Next Generation Workshop in 2012 for current and emerging leaders in horticulture. The Workshop was levy funded through the across industry program by HAL. A Kachenko indicated that he attended the Workshop and found it useful.

A Kachenko discussed a proposal Russell had provided him which covered

- Training Needs Analysis of participants
- 1 x NGIA Business Fast Track Workshop of 2 days duration
- Additional 3 x Workshops for up to 20 Members each workshop of 0.5 to 1.0 day duration Limited coaching support via phone, email and internet for up to 20 Members – 1 or 2 calls between workshops
- 24/7 Access to the Mindshop On-line Resource Centre and on-line Training Courses for up to 20 Members
- 100 x on-line Training Courses for other NGIA members, stakeholders and staff
- Unlimited access to on-line Fast Problem Solving course for all NGIA members, management and staff
- Tailored NGIA Academy newsletters and webinars

The total cost would be \$83,800 per annum or \$4,190 per person per annum. The idea of

the workshop was to target NIASA business owners. General discussion covered the fact that there is minimal market failure with other providers offering business coaching and indeed, qualifications under the Australian Qualifications Framework (AQF).

A Kachenko indicated that the Horticulture Next Generation Workshop was being run again in 2013, with the deadline for application 15 July 2013.

C O'Connor provided an overview of the online training portal (Talent LMS) based on cloud computing he has been working on. The software access is approximately \$200 per month. He provided Committee Members with a demonstration on a test growing media workshop he has developed. A Kachenko indicated that the portal could be used to meet training requirements for BioSecure *HACCP* market access. It would also be used to transfer existing industry workshops into an online resource. Workshops could be purchased through PayPal. The test workshop would be circulated to Committee Members by 30 September 2013. General discussion covered the alignment of existing industry workshops against AQF. A Kachenko indicated that NGIA did not have the resources to undertake this. S McDonald indicated that he would be willing to assist in this process. C O'Connor indicated that he would follow up with S McDonald with regards to this prior to the next meeting.

Action: C O'Connor to circulate the test growing media workshop by 30 September 2013.

Action: C O'Connor and S McDonald to discuss mapping of industry workshops against the AQF.

Survey of NIASA business needs

A Kachenko said that he would be undertaking a NIASA business survey at the halfway or end point of the current project. He noted that this was required for two reasons. The first, to better understand and plan future activities relating to NIASA and the second, to provide methods to evaluate and track progress of the project for reporting requirements.

4 General Business

A Kachenko advised that the Biosecurity Farmer of the Year award was open with Birdwood Nurseries taking out the award in 2011. The closing date for applications was 26 July 2014.

A Kachenko asked M Danelon if he had followed up the business in NSW who was displaying NIASA accreditation despite the fact that they were not NIASA Accredited. M Danelon indicated that he had sent a letter to the business and was awaiting a reply.

General discussion covered skill development for the IDOs to 'sell' the program. A Kachenko indicated that he would set some time aside at the next meeting to cover sales skills through the use of role playing and other professional development activities. Committee Members agreed that this would be a worthwhile exercise.

J McDonald indicated that the December NACC meeting would be a good opportunity to cover off on specific training for the Audit Management System as the trail between Queensland and Victoria should be well underway.

Action: A Kachenko to consider sales and Audit Management System training for the December 2013 meeting or following the 2014 NGIA National Conference in Sydney.

⁵ Next NACC Meeting: 11 December 2013 Sydney

Ітем	Торіс	
	5.1	Technical Officers Group (TOG) Telelink 2 pm 19 September 2013
	5.2	NACC Meeting in 2014, 11-12 June 2014

Meeting Closed 3 pm



National Accreditation and Certification Committee (NACC) Meeting

Date:	Wednesday 11 December 2013
Time:	9:30 am – 4:00 pm
Location: Stamford Plaza Sydney Airport Hotel	
	Corner of Robey & O'Riordan Streets
	Mascot NSW 2000
	(02) 9317 2200
Attendees:	Colin Groom (WA; Chair), Anthony Kachenko (NGIA), Chris O'Connor (NGIA), John Marshall (VIC), Scott McDonald (NT), Tim Phillips (TAS), David Eaton (SA), Terry Spink (QLD), Gary Eyles (NSW), Michael Danelon (NSW), John McDonald (QLD), Katrina Hill (WA), David Reid (VIC), Grant Dalwood (SA), Des Boorman (NSW)
Apologies:	Megan Connelly (NT)

Ітем Торіс

¹ Welcome and Apologies

C Groom formally declared the National NIASA Advisory Committee (NNAC) Meeting open at 9:35 am and extended a warm welcome to all Committee Members. S McDonald noted that M Connelly was an apology. C Groom introduced D Boorman to Committee Members who is a new part time Industry Development Officer (IDO) for NSW. D Boorman provided an overview of his career in horticulture which included plant breeding, lecturing at TAFE and various roles in production nurseries.

² Confirmation of Minutes

2.1 NACC Committee Meeting Minutes June 2013

C Groom advised that the Minutes from the Meeting held on 26^t& 27 June 2013 were provided in the Meeting papers and Committee Members were asked to raise any concerns regarding the accuracy of these minutes. Minor editorial comments were noted by several NACC members. A Kachenko noted that these minutes would be amended.

MOTION: The NACC accept the minutes from 26 & 27 June 2013 NACC meeting as a true and accurate record.

Moved: T Phillips

Seconded: J Marshall

³ Matters Arising From Last Meeting

3.1 Review of Action List

A Kachenko provided an overview of the Action Items. He provided an update on the following outstanding items.

- A Kachenko provided an overview and status update on the Australian Standard for Trees. Public comment closed on 17 November with 181 comments received. Each comment has been evaluated, and where appropriate included into a revised draft. The Standards Australia committee (EV18) managing this project met on 5 December to review all comments. Key changes in the revised draft include a 'should' rather than a 'shall' criteria for size index, self supporting and included bark. Additional text referring to an independent audit process was also included into the revised draft. This audit process is yet to be drafted, however will be a bolt on to NIASA or a stand along audit process. The revised draft will be made available in February 2014 for public comment which will last for six weeks. It is important that all IDOs communicate this as widely as possible.
- NGI communication strategy documents would be forwarded to the NACC once completed. A Kachenko indicated that C O'Connor was in the process of drafting this. The draft will be circulated to the NGIA Board first.
- 3. A Kachenko & J McDonald briefed the committee on the *E. sieberi* baiting technique and provided further background on Murdoch University and their involvement with Phytophthora strain identification. A Kachenko indicated that he will travel to Perth to discuss this further with key researchers, regulators and industry in February 2014.
- 4. FMS online manual access had not been taken up by all growers. J McDonald noted that he sat down with growers during audits to assist in the download process and indicated this delivered maximum success.

ACTION – All IDOs to provide login details to FMS online manuals during next round of FMS audits.

ACTION – A Kachenko to provide a list of which growers have not downloaded the FMS manuals.

- 5. Tissue Culture A Kachenko & J McDonald to pursue this in 2014.
- 6. Proposed meeting for IDOs prior to national conference on 10 March 2014 from 2 pm. NGIA will fund conference attendance, flights and accommodation the value of 50%.

⁴ State Reports and National Projects

4.1 State Reports (5 minute Update)/ Fees and Charges Discussion

A Kachenko noted his disappointed with the state report submissions with only Queensland and New Zealand reports having been submitted on time for inclusion in the meeting papers. Other reports were tabled at the meeting.

ACTION – IDOs are to ensure that state reports are to be submitted on time as per specified timelines prior to future NACC meetings.

The Queensland and New Zealand reports were taken as read.

J McDonald noted in the Queensland report that both the Australian Banana Growers Council QBAN and Avocados Australia ANVAS are looking likely to be replaced by NIASA adoption. He advised that he would keep the NACC updated at future meetings with progress.

D Reid discussed his report and noted that he had initial discussions with Australian Rubus Growers Association in relation to extension of FMS to rubrus growers. T Phillips indicated that he had a relationship with Alison Brinson, Rubus Industry Development Manager and would follow this up with A Kachenko and D Reid.

ITEM TOPIC

ACTION – T Phillips to contact Alison of Australian Rubus Growers Association in conjunction with A Kachenko and D Reid to continue discussions with regards to FMS adoption by rubrus growers.

D Reid raised the issue of auditing across multiple sites and the issue of stock pathways from a non NIASA site through to a NIASA site. Questions on misleading stock purchasers arose. General discussion on stock quarantine requirements followed as per the NIASA guidelines. D Reid indicated that he would work with the business to manage stock pathways and quarantine requirements in future. D Boorman indicated that a declaration could be a useful addition to the NIASA program. J McDonald indicaed that he would need this prior to February 2014 for incorporation in the NIASA Review (Agenda item 7.3).

ACTION – D Boorman to draft a declaration sample for non NIASA grown stock to be noted or declared to the customer. This needs to be sent to J McDonald prior to 1 February 2014.

K Hill provided and overview of Western Australia, observing that she is increasing her hours to cover the slack following Trevor Winter's recent departure. Phytophthora issues and hysteria were noted as previously raised in the Action Items, with information on Phytophthora being communicated to industry without the support of science. K Hill remarked that she wishes to facilitate training for growers but has been focusing on audits. A Kachenko noted that the IDO role is more than just audits which account for 40% of the project.

Discrepancies in the fees charged for FMS components were noted amongst NACC members. A Kachenko confirmed that the Heads of Agreement signed in April 2013 specified that EcoHort and BioSecure *HACCP* fees should be set at a minimum of \$250.

G Dalwood covered the South Australian report. No increase in business numbers. Grant noted the work he has been undertaking with the National Vine Biosecurity Council, with potential that they adopt FMS for aligned nurseries. These discussions will be ongoing in 2014.

G Dalwood noted that he had a business which is no longer NIASA certified still displaying NIASA logo signage This has now been removed. General discussed followed on the actions to take in this situation, which included letters from the State Accreditation and Certification Committee (SACC), followed by escalation to the NACC.

M Danelon and G Eyles briefed the committee on the NSW report. With the closure of Avondale Nursery they note that Val will remain on the NSW SACC for 6 months. Succession planning for the committee has been aided by the inclusion of Greg Scott and Mark Engel. One new business has been accredited with NIASA & EcoHort.

J Marshall asked M Danelon how NSW were able to afford a second IDO (D Boorman). Discussion followed on the IDO project funding. A Kachenko provided an overview of how the funding was allocated per jurisdiction based on outcomes.

A Kachenko noted to the committee the increasing importance of measuring productivity gains in industry as a result of the project. Also noted was that this project is the biggest single project managed through HAL's portfolio.

J Marshall asked that we include on the next meeting agenda discussion on how we measure productivity gains.

ACTION – A Kachenko to include on the next meeting agenda discussion point on measuring productivity gains for project NY12006.

T Phillips noted that this would be his last meeting as he will be stepping down from the committee to take a more active role in his business. C Groom thanked Tim for his service on the committee. No SACC committee members were listed for NGIT.

4.2 New Zealand Report

A Kachenko discussed the New Zealand report, noting that a degree of marketing has been undertaken and that 4 business were certified NIASA / EcoHort following his first visit in May 2013. A Kachenko reported that in 2014 he would look to contracting the auditing work to a suitably skilled Auditor in 2014 due to work priorities and had been provided a contact by NGISA to pursue.

A Kachenko advised the committee that (Kiwi Vine Health KVH) New Zealand were looking at a high health program for the kiwifruit industry. Possible options suggested by KVH included BioSecure *HACCP*. A Kachenko advised that due to the costs associated with BioSecure *HACCP* it is highly unlikely that KVH will consider this as an option. Despite the cost barriers, he advised that NGINZ were keen to pursue this dialogue.

General discussion followed on pros and cons of this scenario including the likely hood of BioSecure *HACCP* being used for international market access into Australia. The general feeling was negative as this would be detrimental to the Australian industry.

MOTION: The NACC recommend that BioSecure *HACCP* not be licenced to New Zealand or Internationally.

Moved: T Spinks

Seconded: T Phillips

C Groom voted against the motion.

4.3 2013/14 Environment and Technical Project Update

A Kachenko tabled the AOP for the Environment and Technical project 2013/2014. Noted was that under section 2 \$20,000 of funds allocated for IDO communications and skill development will be removed in future as these funds will be incorporated under the IDO project NY12006.

Also noted was the water disinfestation project under section 3 of which is yet to be contracted. The South Australian Research and Development Institute (SARDI) was noted as a potential provider but has not agreed. The QLD Government's Department of Agriculture, Fisheries and Forestry (DAFFQ) is also a potential provider for this research.

Anthony noted that in future a more robust tendering process will likely take place to determine suitable providers. A Kachenko noted that HAL is currently undergoing a review in terms of processes and how they do business. It is likely that this will result in significant change to the way funding is administered in the near future.

4.4 Projects submitted to HAL for possible funding 2014/15

A Kachenko provided a brief overview of the projects submitted to HAL for possible funding in 2014/15. These included:

Description	HAL Component
Operational resources for NGIA National Environment and Technical Committee	\$10,000.00
Update of NGI policies	\$10,000.00
Minor use pesticide program for NGI	\$10,000.00
NGI affiliate and research linkage program	\$60,000.00

Ітем	Торіс	
	Future Success of Landscape Trees guidelines and Certification Program	\$60,000.00
	Meeting industry's EPPRD and broader industry biosecurity obligations program	\$30,000.00
		\$180,000.00

4.5 Student Project Update

A Kachenko tabled a summary of the university student levy funded projects to date. This will be incorporated into a more detailed list including links to the project outputs (i.e. reports, nursery papers etc.).

ACTION – A Kachenko to update and recirculate the summary of university student levy funded project prior to the next NACC.

⁵ Administration

5.1 Nursery Paper Schedule

The Nursery Paper Schedule for 2014 was tabled and populated. C O'Connor stressed the importance of due dates for the articles.

ACTION – C O'Connor to forward completed copy of the 2014 nursery paper schedule to the IDO network prior to 1 January 2014.

5.2 2015/16 Future R&D Project Proposal Timeline

A Kachenko presented the 2015/2016 project proposal timeline and advised the committee on the ranking process noting that limited feedback was received this year. A Kachenko also advised the committee on the submission process and stressed that 13/8/2014 is the deadline to receive project from the states.

A Kachenko also noted the expression of interest call NGIA conducted earlier in the year via newspaper advertising and noted that NGIA will undertake a similar process in 2014 to gauge wider with possible research providers.

General discussion followed on the development of research proposals and who could apply as a service provider. A Kachenko noting that projects must be aligned to the Industry Strategic Investment Plan, must address market failure and must represent whole of industry.

5.3 Hort Journal and FMS Partnership arrangement

The Hort Journal partnership was tabled. IDOs have the schedule to follow until November 2014. Articles on FMS businesses shall be forwarded to Karen Smith at Hort Journal by the deadline.

6 Operational

6.1 2013/14 Annual Operating Plan update

A Kachenko tables the 2013/14 Annual Operating Plan. Noted was the exhibit space arranged at the NGIA National conference and the IHC Conference in 2014.

ACTION – C O'Connor to forward the IDOs a schedule for manning the FMS trade booth at the NGIA National Conference in 2014.

6.2 NY12006 (IDO Project) Annual Operating Plan Update

A Kachenko tabled the NY12006 (IDO Project) Annual Operating Plan. Brief discussion followed on the allocation of outcomes and funding. A Kachenko advised that the project was nearing its midway point and a full review would be required.

6.3 2014 Auditor Training

A Kachenko advised the NACC that Lead Auditor training will be conducted for the IDOs during 10-13 Feb 2014 at the NGIA Office in Sydney. Costs will be covered for the training, accommodation and flights for the IDOs. The training will be of benefit to the professional development of the IDO network and will put the IDO network in good stead for future opportunities arising from the Australian Tree Standard, market access opportunities via BioSecure *HACCP*, international program exposure and FMS program auditing in general.

All IDOs present were asked and committed to attend the training. NGIA to arrange travel and accommodation details prior to 15 January 2014.

6.4 National Audit Portal Update

A Kachenko tabled a summary of audits that had been completed 2012-2014. He noted that not all audits are being completed on a financial or calendar year basis. There may be some administrative issues with the entry of this data into the audit portal however all audits **must** be completed on a yearly basis.

6.5 Transport and Logistics Appendix

G Dalwood briefed the committee on the proposed appendix on transport and logistics for the NIASA manual. The NACC agreed that this appendix should be informative only and not referenced via the checklist.

Changes to the provided document include:

- A15.3 include holed stretch wrapping.
- A15.6 Unloading must comply with current requirements for unloading i.e. applicable Australian Standards and pertinent State Road Regulations.
- A15.7 Vehicle maintenance including roll stops on tailgate loaders must be functional and in good order.

ACTION – G Dalwood to supply appropriate photographs for possible inclusion in the Transport and Logistics Appendix by 31 January 2014.

ACTION – A Kachenko to supply copy of the Transport and Logistics Appendix in a word format to John McDonald prior to February update.

6.6 BioSecure *HACCP* trial update

J McDonald and D Reid briefed the committee on the BioSecure *HACCP* market access trial. Feedback so far has been good from the trial participants and government bodies.

In a legislative framework, J McDonald noted that the best option moving forward is for the relevant biosecurity agency to appoint/approve appropriate people employed by the NGI's as approved auditors under BioSecure *HACCP* who can make a recommendation to the "Chief Executive Officer" or similar departmental officer to "accredit" (government accrediting not our programs) a business to issue BioSecure *HACCP* Biosecurity Certificates (BHBC). This option supports the government bureaucracy and would be easier to achieve in the short term.

J McDonald noted that the trial will be completed by March 2014 and recommends that all IDOs begin the process of talking with specific business who are likely to embark on the BioSecure *HACCP* certification process immediately.

A Kachenko indicated that there would be a BioSecure *HACCP* update pending changes arising from this program to be completed by February 2014.

ACTION – J McDonald to send to all IDOs the BioSecure *HACCP* Legislative Options paper to discuss with pertinent government representatives.

ACTION – All IDOs to identify and start talks with suitable businesses re BioSecure *HACCP* certification and legislative barriers and report back at the next NACC.

6.7 NIASA Review Update

J McDonald provided an update to the committee on the NIASA review. The review scope includes undertaking a desktop audit and comparison to international BMP programs, a review of terminology use and consistency, updates to checklists and other content and an update of images.

Any issues with terminology are to be discussed with J McDonald prior to 31 January 2014.

ACTION – IDOs are to provide replacement images where required to J McDonald prior to the 31 January 2014 for possible inclusion in NIASA and EcoHort.

ACTION – J McDonald to remove business names and jurisdictions from photograph captions in NIASA and EcoHort to limit issues with closure of businesses or revocation of NIASA certification.

6.8 NIASA/ EcoHort Water Management Changes

J McDonald presented proposed clarification of terminology for consistency regarding definition of waste water, runoff, release and recycled water for consideration. M Danelon discussed 'what is a watercourse' and whether these should be included in key definitions. A Kachenko indicated that a decision needed to be made by 25 December 2013 to progress this matter forward.

ACTION – IDOs to contact J McDonald prior to 25 December 2013 if there are issues with the proposed terminology changes regarding water as tabled during the meeting.

6.9 In Ground Growers

D Reid Reported that he had no data on this issues at present but was approaching an in ground grower to look at this further.

ACTION – D Reid to report back to the next NACC on progress of discussions regarding in ground water usage.

6.10 Water Research – Disinfestation

A Kachenko reported to the committee that he and C O'Connor will be meeting with a supplier (Greenworks) on 16th Dec 2013 to discuss copper systems for disinfestation of pathogens. A Kachenko will be seeking further evidence on the efficacy of the system and will circulate to the IDO network prior to discussion on the inclusion of the system as an acceptable method of water disinfestation.

ACTION – A Kachenko to circulate information on copper disinfestation systems to the IDO network prior to the next NACC.

1500 J McDonald & D Reid depart meeting

7 Marketing

7.1 Marketing Collateral

ITEM TOPIC

A Kachenko briefed the committee on the available marketing collateral for the FMS program. A Kachenko noted that the Canadian Industry had developed a DVD for growers embarking on nursery certification programs which detailed and provided an overview of 'how to get started'. He noted that this would be a useful tool to add to existing resources in the near future.

G Eyles noted that the NGINA may have the capacity to refresh some of the marketing collateral design.

ACTION – A Kachenko to discuss marketing collateral refresh with the NGINA.

7.2 Program Engagement

A Kachenko provided the IDOs the book "Sales Cats" by Mike Boyle noting that this is an area where our IDO network needs to focus on to convert growers into the program. Also noted was the webinar series by Russel Cummings that detailed key business improvement webinars, with many useful to production nursery staff and owners.

1530 J Marshal D Eaton and G Dalwood depart meeting.

8 General Business

8.1 Accreditation across two sites

C Groom raised the issue and sought clarification on accreditation across multiple sites of a single business. General discussion followed but it was determined that each site should be accredited separately. A Kachenko noted that this was specified in the Terms and Conditions.

8.2 Further General Business

D Boorman raised issues regarding the National Audit Portal (NAP) noting that it was not particularly user friendly noting functionality in other systems he has used. A Kachenko indicated that he was willing to look at options for updating the software.

ACTION – D Boorman to explore other system options for the NAP prior to the next NACC meeting.

C O'Connor briefed the remaining committee members on e-learning. General response from the IDOs remaining was that the system was user friendly and has potential applications. A Kachenko noted that the full platform will be launched at the 2014 National Conference in Sydney.

A Kachenko asked if NACC members were using Dropbox. The majority indicated that they were. He advised that he would set up a Dropbox folder to house future meeting papers.

8.3 Next Meeting

Next NACC meeting is scheduled for 11 &12 June 2014 location TBA

Next IDO meeting will be 2pm 10 March 2014 prior to National Conference.

Meeting Closed 4:05 pm



National Accreditation and Certification Committee (NACC) Meeting – Day 1

Date:	Wednesday 11 th June 2013	
Time:	9:30 am – 5:30 pm	
Location:	Meeting	
	NGIV Offices (TBC) www.ngiv.com.au	
	3/307 Wattletree Road, Malvern East VIC 3145	
	Accommodation	
	Quest East St Kilda	
	441 Inkerman Street	
	EAST ST KILDA VIC 3183	
	Phone: 03 9526 3888	
Attendees:	Colin Groom (WA; Chair), Anthony Kachenko (NGIA), Chris O'Connor (NGIA), Scott McDonald (NT), Gary Eyles (NSW), Michael Danelon (NSW), John McDonald (QLD), Katrina Hill (WA), David Reid (VIC), Terry Spink (QLD), Grant Dalwood (SA), Peter Douglas (VIC)	
Apologies:	David Eaton (SA), John Marshall (VIC), Megan Connelly (NT)	

ITEM TOPIC

1 Welcome and Apologies

C Groom opened the meeting and welcomed the committee members. Apologies were received from D Eaton, M Connelly and J Marshall. P Douglas was present as a proxy representing J Marshall and the VIC State Accreditation and Certification Committee (SACC).

2 **Confirmation of Minutes**

2.1 NACC Committee Meeting Minutes December 2013

C Groom advised that the Minutes from the NACC Meeting held on Wednesday 11 December 2013 were provided in the Meeting papers and Committee Members were asked to raise any concerns regarding the accuracy of these minutes.

MOTION: The NACC accept the minutes from the Wednesday 11 December 2013 NACC meeting as a true and accurate record.

Moved: T Spinks

Seconded: G Eyles

Technical Officers Group (TOG) Telelink March 2014 2.2

Matters arising from Last Meeting 3

3.1 Review of Action Item List

ACTION ITEM - G Eyles is to follow up with D Boorman is relation to item 13 from the previous meetings action item list - D Boorman to draft a declaration sample for non NIASA grown stock to be noted or declared to the customer. This needs to be sent to J McDonald prior to 1 February 2014.

ACTION ITEM - G Eyles is to follow up with D Boorman is relation to item 27 from the previous meetings action item list - D Boorman to explore other system options for the NAP prior to the next NACC meeting.

4 State Reports and National Projects

J McDonald briefed the committee on the QLD report. Marlborough Nursery conducted a field day which was well attended by 63 growers. T Spink advised that it was well received.

J McDonald also noted the work being conducted with the Avocado Nursery Voluntary Accreditation Scheme (ANVAS) module for FMS and provided a brief commentary on the BioSecure HACCP program.

D Reid briefed the committee on the VIC report. D Reid noted that he had been approached by the Victorian Seed Potato Association (SPA) to investigate the use of FMS to meet SPA needs.

A Kachenko provided an update on NZ. He noted that NZ was looking to appoint an IDO/FMS auditor. Gale Bath has been suggested as a possible candidate. Further discussion to occur at the NGINZ conference.

K Hill briefed the committee on the WA report. K Hill advised that there were multiple issues surrounding various groups in WA agitating for increased Phytophthora testing at nursery sites.

ACTION ITEM – K Hill and E Ngang to open dialogue with WA Dept. of Agriculture and Food to confirm Phytophthora testing requirements and accepted methodologies.

G Dalwood and M Danelon provided updates on SA and NSW respectively.

5 Operational

5.1 FMS Annual Operating Plan 2013-2015

A Kachenko briefed the committee on the current operating plan. A Kachenko was questioned about the fee for Smart Approved Water Mark and its uptake. The committee decided that to retain access to SAWM for FMS businesses.

5.2 FMS Manual Codes

A Kachenko noted that manual codes were available from him if needed. All FMS businesses must have access to their manuals online, especially given the forthcoming updates.

5.3 NIASA and EcoHort Review

J McDonald provided update on the 3rd party review process that was taking place on NIASA and EcoHort. Key areas undertaken in the review were a gap analysis of other environmental certification programs (e.g. Global Gap) and a terminology review to ensure consistency amongst the manuals. A summary report will be made available to the NACC before 31 July.

5.4 BioSecure HACCP trial update

Material was covered by J McDonald in section 6.

5.5 Freight Issues outline draft

G Dalwood presented his work on a draft appendix to NIASA on best practice freight for nursery stock. Minor changes to the draft were discussed. A Kachenko indicated that this would form part of the NIASA review.

5.6 Nursery Paper Schedule

C O'Connor updated the IDOs on the Nursery paper schedule. An update for 2015 will be discussed in the December meeting.

5.7 FMS Partnership with Hort Journal

C O'Connor advised that the FMS partnership with Hort-journal is approaching review. The committee agreed that it is a worthwhile endeavour to provide exposure for FMS businesses and also to provide and insight into the program for non FMS businesses. It was agreed that the schedule for 2014 would be replicated as we move to 2015.

M Danelon noted that he was having trouble with finding FMS businesses and that he used Engalls Nursery which although not FMS accredited were progressing down that path.

5.8 Update on water disinfestation

D Reid provided an update on a desk top audit of in ground growers and their water uses. The volumes were large (1.5ML / Ha) however not beyond the means of disinfestation.

ACTION ITEM - D Reid will continue to work on solutions to engage with in ground growers in disinfesting water to meet FMS requirements.

M Danelon & G Eyles questioned some of the water disinfestation methodologies in the FMS manuals. A Kachenko advised that these were being investigated under current levy research. He added that additional technologies may be investigated in future levy projects if prioritised by industry and linked to the NGI Strategic Investment Plan. J McDonald further added that inconsistencies noted in the NIASA and EcoHort manuals will be corrected during the current update. He advised that Managing Water in Plant Nurseries will be the base reference for data where there are inconsistencies.

G Eyles asked the question on when the last time this publication was updated. J McDonald noted that it was 2002 and that A Kachenko had approached NSW DPI to relinquish the IP in relation to this. NSW DPI has advised they are chasing this up from their end.

NOTE: Post NACC it was confirmed that NSW DPI are in the process of updating "Managing Water in Plant Nurseries".

General discussion on the resources for water management followed. A Kachenko noted that in relation to updates to manuals this can be easily facilitated through electronic updates in the future.

M Danelon questioned the process on approving new inclusions of water disinfestation technologies. J McDonald noted the current project on water disinfestation and that this pathogen testing matrix can set the bench-mark protocol for testing of new technologies and become the template for future reference. This water testing benchmark could be included in the HoA. Discussion of this point can follow post project delivery at a future NACC meeting.

General discussion on water disinfestation followed

6 Administration

6.1 – 6.2 AMS and BioSecure HACCP Resourcing

J McDonald provided an in-depth update on the BioSecure *HACCP* Trial between QLD and VIC. All reports so far have indicated it to be a success. During the trial 49 BioSecure *HACCP*

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Biosecurity Certificates (BHBC) were issued. The trial now needs to be independently assessed by a third party auditor and a report provided to the Sub-committee on Domestic Quarantine & Market Access.

Once this report is accepted it provides an opportunity to lobby state government to incorporate BioSecure *HACCP* into legislation. General discussion on this point followed.

ACTION ITEM - J McDonald asked the committee to provide costs of plant health certificates for their respective states to assist with developing a costing strategy.

J McDonald explained and demonstrated the Audit Management System (AMS) to the committee. Once the updates to the system are completed access details will be sent to the IDO's.

John McDonald advised that terms and conditions for BioSecure *HACCP* have been updated to reflect the new requirements for businesses to utilise the AMS for market access. This draft update will need to be approved by legal before being circulated.

J McDonald discussed with and questioned the committee on their preference for the penalties for non-conformances of the program highlighting the importance of maintaining the integrity of the program. General sentiment from the committee was that they were comfortable with the non-conformance levels and penalties.

ACTION ITEM – J McDonald is seeking further feedback from the committee on the penalty preferences for non-conformance in the BioSecure *HACCP* program by 31st August 2014.

John McDonald and Chris O'Connor covered briefly the elearning elements associated with the BioSecure *HACCP* program noting the flexibility and ease of use for growers.

6.3 NZ Licence Agreement update

A Kachenko provided background information on Kiwi Vine Health and the NZ interest to move to a high health scheme. NZ is interested in BioSecure *HACCP*. NZ licence options for BioSecure *HACCP* were discussed including trade/exportation exclusion clauses with note that it would be an appropriate expansion of the FMS program in NZ. Committee feedback was sought. Strong opposition to the NZ expansion of BioSecure *HACCP* was voiced from the committee. The main focus of objection was from the view point of possible NZ export of nursery stock into Australia and the possible further expansion of the program.

T Spinks noted examples of potted *Phalaenopsis* orchids into Australia from Taiwan and the risk potential of other countries accessing Australian markets.

MOTION – The committee recommends that licensing of BioSecure *HACCP* to NZ is not supported.

Discussion was had in relation to NZ using a bolt on program to NIASA such as what Queensland is considering with QBAN (Quality Banana Approved Nurseries).

J McDonald noted the opportunities for export and BioSecure *HACCP* to be recognised as a systems approach for high health status.

7 Marketing

7.1 FMS Marketing Materials & 7.2 Autumn/Winter Hort Journal Campaign

A Kachenko briefed the committee on the availability of marketing materials. Note was made that the Intro to FMS course was available on elearning.

A Kachenko asked if there was anything else the IDO's need to market the program. The listing of FMS businesses in the NGIQ and NGIV state publications was noted positively.

The Autumn – Winter Hort Journal campaign was discussed and leads obtained discussed with the IDO's. It was questioned if in its 3rd year of being run the campaign is approaching its use by date, having saturated the existing leads. The fees from this campaign may be better spent in other means. But was agreed to keep this campaigned for another year.

8 Project Mid Term Review

8.1 Outline of Review Process (NY12006 and NY12016)

A Kachenko briefed the committee on the requirements for a mid-term review of the FMS project and IDO projects.

A Kachenko suggested that surveys need to be conducted with engaged businesses in the program.

Also noted was that given the recent HAL review there will be changes required.

General discussion followed in relation to the HAL review.

8.2 Discussion on Measurement and Evaluation (Productivity)

A Kachenko briefed the committee on the background to the increased focus on productivity gain demonstration as an outcome of extension delivery. Highlighted were the concerns of larger levy payers in supporting small players within the industry and the focus on R&D outcomes. A Kachenko also noted that there are opportunities in the light of the HAL review to focus on the synergies that different Horticultural Industries have through collaborative projects.

C Groom asked the committee for their input on ways to increase our reporting/recognition of the gains developed through extension in the industry.

J McDonald discussed the gains table as used by NGIQ to validate gains through extension for the nursery industry with focus on water.

A Kachenko noted that there is potential to use a similar format in future IDO projects to highlight productivity gains delivered through extension.

M Danelon observed that although the IDO network comes together at meetings such as this there was an opportunity to increase communication and collaboration amongst the group. General discussion on the demands on the IDO followed i.e. requirements of the role versus the demands by State CEO's.

A Kachenko asked if there was an opportunity to reinvent the IDO project how would it be achieved. Is there a better way? Was there potential for the IDO project to be managed via the National office to free up resources for the State bodies and streamline reporting?

Consistency in performance reviews, reporting, staff development and attracting new staff were viewed as difficult in the current model.

General discussion followed on these points.

J McDonald asked the group who works regularly with their EO and is assessed against their KPI's. A Kachenko noted that these reviews should also include career aspirations and development needs.

A Kachenko observed the demands on associations (resource restraints etc.) are putting pressures on the IDOs to perform duties outside of their extension deliverables.

Discussion regressed to general discussion on BioSecure HACCP pricing.

Meeting close 5:30pm



National Accreditation and Certification Committee (NACC) Meeting – Day 2

Date:	Thursday 12 th June 2014	
Time:	8:30 am – 3:00 pm	
Location:	Meeting	
	NGIV Offices (TBC) www.ngiv.com.au	
	3/307 Wattletree Road, Malvern East VIC 3145	
	Accommodation	
	Quest East St Kilda	
	441 Inkerman Street	
	EAST ST KILDA VIC 3183	
	Phone: 03 9526 3888	
Attendees:	Colin Groom (WA; Chair), Anthony Kachenko (NGIA), Chris O'Connor (NGIA), Scott McDonald (NT), Tim Phillips (TAS), Gary Eyles (NSW), Michael Danelon (NSW), John McDonald (QLD), Trevor Winter (WA), Katrina Hill (WA), David Reid (VIC) Grant Dalwood (SA) Terry Spink (QLD) Peter Douglas (VIC)	
Apologies:	Megan Connelly (NT), John Marshall (VIC), David Eaton (SA)	

Ітем Торіс

1 Nursery Visit – Proteaflora

The committee visited the Proteaflora site to see the practical application of the BioSecure *HACCP* program.

The committee thanked David Rob and Ian for their openness with the committee on their experiences with the program.

Meeting Recommenced 1pm NGIV Office

2 Review of Nursery Visit – BioSecure HACCP Discussion

C Groom asked D Reid to provide some background on his involvement with Proteaflora in the journey to BioSecure *HACCP*.

General discussion followed on the operation procedure that Proteaflora use.

G Dalwood noted that in his experience once the owner has decided to engage with the BioSecure *HACCP* program you need to identify and work with a key staff member who will champion and drive the process. It also worked to go through the program requirements in detail and link sections to pictures on site to customise the presentation/discussion.

Grant stated that it takes at least a year and numerous visits to get business across the line followed up by 6 monthly visits.

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General discussion on the electronic systems that Proteaflora used to manage records followed. S McDonald observed that the key aspect was in the establishment of the record keeping system, following this maintaining the process was easy. J McDonald noted that other businesses use a paper based system, whereas others use a hybrid system where written records are scanned for auditing J McDonald provided a background on the recording requirements i.e. AMS is required if the grower wishes to use BioSecure *HACCP* for market access.

Discussion followed on the software requirements and the lack of one system that could be used. C O'Connor provided an overview of GS1's involvement with Proteaflora and the use of barcodes to speed up the record capture and accuracy rates.

J McDonald repeated Rob Furnisse's observation that the people and their buy in was essential, J McDonald then observed that without this buy in the role of the IDO in guiding the business through BioSecure HACCP is all the much harder. One of the key aspects is to ensure the processes are out on the nursery floor not just sitting on the shelf - have the work instruction at the point of work.

Project management training may be of use at an introductory level for nursery businesses engaged in the program. S McDonald observed that change management training may also be of benefit.

G Dalwood suggested that perhaps templates of appropriate wording for signage be developed for specific activities/processes. General discussion in relation to cultural change and the drivers to adoption of FMS programs followed.

P Douglas observed that one of the drivers is the wastage, and Proteaflora is focused on managing its stock to reduce wastage.

G Eyles noted the additional on farm benefits that are presented with BioSecure *HACCP*. A Kachenko expanded upon this observing that we need to communicate the benefits of recording data to facilitate measurement.

J McDonald asked the committee members what they would like to see in relation to the program, what do they need what will get them to adopt the programs. What information we need to package up to present to growers.

M Danelon suggested an ABC approach – Awareness, Benefits, Commitment – suggesting that industry is not aware of the benefits and this needs to be sold. J McDonald replied that this should be done by the IDO identifying what growers are doing already (i.e. recording because it makes sense or it's just good practice) and how it fits into BioSecure *HACCP* system. – Ask the grower - Are you interested? Yes, then let's work together.

A Kachenko asked the IDOs what they need to sell the program. A specific resource, etc. noting in Canada that they use a DVD.

J McDonald suggested open days to bring in interested parties to work with them and demonstrate that they are doing a lot of things required under the program anyway.

J McDonald challenged the IDO network to work with their respective SACC presidents and get them across the line in relation to EcoHort and BioSecure *HACCP*

ACTION ITEM – IDO's are to work with their respective committee members as a test case to achieve EcoHort and BioSecure *HACCP*. A trial report is required before December 2014.

G Dalwood asked for a dot point template for the process on explaining the program to

growers. J McDonald noted he would be happy to put some notes on his experiences down.

A Kachenko noted that for each record there needs to be some explanation (i.e. 1 liner) as to why the grower needs to record it – what the benefit/value is. Because people don't like to keep records for the sake of keeping records and revert to the "I can't be bothered" approach.

G Eyles noted that the structures/process increase the value of the business.

General discussion on the requirements for record keeping followed including WHS, stock management,

A Kachenko asked who amongst the group had seen the BioSecure *HACCP* videos developed to explain each stage of the program and noted that they are great to include in presentations and to use as an opener for discussions with growers. J McDonald noted that Pohlmans use the videos in their induction process.

3 General Business

S McDonald asked how a non-member can be a NIASA accredited nursery. S McDonald was advised that because the program is a HAL funded program all levy payers are entitled to access to the program.

G Eyles asked if there was a possibility for the committee to attend the Aus Citrus facilities for the next meeting. A Kachenko noted that it could be a possibility but is dependent upon funds available.

D Reid asked A Kachenko how the meeting went at Speciality Trees. A Kachenko noted that it was a great initiative to invite your clients to the nursery to demonstrate how you do things, foster openness and transparency and build relationships. A Kachenko spoke about the tree standard and FMS with the clients who were predominately form the local council sector.

S McDonald advised the committee that this would be his last meeting for at least the next two years as he will be moving to the UK.

4	Next Meeting		
	Technical Officer Group (TOG)	Tele meeting	2pm - 3pm Tue 23 rd Sep 2014
	NACC Meeting	Sydney	9am – 3pm Wed 10 th Dec 2014

Meeting Closed 3 pm



National Accreditation & Certification Committee (NACC)

Date:	Wednesday 10 th December 2014
Time:	9:30 am – 3:30 pm
Location:	Stamford Plaza Sydney Airport
	O'Riordan St Mascot NSW 2020
Attendees:	Colin Groom (WA; Chair), Robert Prince (NGIA) (Until 10:30), Chris O'Connor (NGIA), Gary Eyles (NSW), Michael Danelon (NSW), Des Boorman (NSW), Terry Spink (QLD), John McDonald (QLD), John Marshall (VIC), David Reid (VIC), David Eaton (SA), Grant Dalwood (SA), Samuel Kandiah (NT)

Ітем Торіс

¹ Welcome and Apologies (0930 – 0935)

C Groom opened the meeting at 0930. M Connelly and K Hill were noted as apologies. C Groom welcomed S Kandiah to the committee who is replacing Scott McDonald for NT.

2 Confirmation of Minutes

C Groom If there were any issues with the previous minutes and if they could be accepted. T Spink moved to approve the minutes which was seconded by D Eaton.

6 Operational

Given that R Prince was only available for the first part of the meeting C Groom asked that item 6 operational aspects move forward to enable R Prince to discuss recent changes with HAL/ HIA and their implications to the FMS and IDO projects.

R Prince noted that he was meeting with Australian Organic Recycling Association (AORA) to discuss issues common to both groups such as legionella and look at opportunities to work more closely.

R Prince noted that HAL has transitioned to HIA and that the HIA board is presently meeting and will be looking at how HIA will operate within the confines of the Statutory Funding Agreement with the Federal Government. Peak Industry Bodies are particularly affected under this new arrangement.

R Prince advised that there will be changes to the funding model in particular the Voluntary Contribution funding (VC). Two pools A & B will be established. Pool A will be industry levies for industry specific needs. Pool B will be for co-contribution funds for strategic issues across the horticultural sector.

For example the IDO project is 50% funded through matched levy funds and 50% through matched VC funds. Under the new arrangements VC funding (now co-contribution) will only be matched if it goes into a second pool of cross industry funding.

This will have a significant impact upon future IDO projects as essentially 25% of the

previously available funding (i.e. matched VC funds) is now removed.

Another impact will be that HIA has until Dec 2015 to align all of its projects to requirements under the SFA. Whilst the IDO project runs until Aug 2016 this will likely need to be changed through a variance to comply with requirements under the SFA by Dec 2015 **.

J McDonald asked what the drivers were for setting the investment priorities for Pool B and indeed for the industry levy funds. R Prince noted that at this stage it is not known what mechanisms would be used until after the first HIA board meeting. Likewise R Prince noted that NGIA is seeking to have Green Cities included as a pool B theme however mechanisms to do this have not been clarified.

R Prince noted that IAC's have been disbanded but HIA will be looking to introduce a new advisory committee.

J Marshall asked how the advisory members will be selected, how research priorities will be selected and how the information will be disseminated. R Prince noted that it has yet to be confirmed by HIA but growers will nominate and vote on the advisory members. HIA is intending to establish a database of all levy payers in Australia to facilitate this by asking growers to register.

G Eyles asked how voting mechanisms would work. R Prince noted that each levy payer would receive one initial vote with additional votes per levy payer being allocated based on the amount of levy paid up to a maximum of 100 votes.

J Marshall noted that the industry needs to be aware of the changes which are happening. R Prince agreed and noted that as information is confirmed from HIA it will be sent out to industry and more discussion will follow the industry consultation meeting in January 2015.

R Prince advised that the IDO project underwent a midterm review and that the NGIA Board had decided to implement the recommendations of the review and how the project can be modified well before the Dec 2015 deadline previously noted.

G Eyles expressed concerns on how the industry body will proceed given A Kachenko's recent departure and R Princes imminent departure. R Prince noted that the plan forward will be determined after the next consultation meeting noting that the industry must change. Likewise projects must be adapted to work within the confines of new constraints.

R Prince also advised that NGIA was investigating the potential of looking at a new levy collection mechanism through media volumes.

R Prince also briefly discussed the implications of new Biosecurity legislation. J McDonald noted that PIBs are signatories to the Deed not the levy payers and reduced funding will have impacts upon the ability for PIBs to meet requirements under the Deed.

R Prince noted that as further information comes to light the NACC as well as state associations will be informed.

R Prince departed meeting 1030am

** Subsequent to this NACC meeting NGIA have been advised that projects will be required to meet the new SFA by 30 June 2015

3 Matters from Last Meeting

3.1 Review of Action Item List

C O'Connor went through the outstanding items on the action item list.

Item 9 - IDO's are to ensure state reports are submitted on time was completed.

Item 10 – Replaced by new action item

ACTION ITEM D Reid to contact Australian Rubus Growers Association regarding FMS adoption by rubus growers.

Item 11 - D Boorman to draft a declaration sample for non NIASA grown stock to be noted or declared to the customer. This needs to be sent to J McDonald prior to 1 February 2014.

D Boorman provided to the committee a proforma declaration for use by NIASA nurseries for non NIASA grown stock. J McDonald noted that prior to it being accepted it would need to be presented to State Accreditation & Certification Committees.

General discussion followed on regarding the definition of what "grow" means and at what stage is a plant considered to have been "grown" in a NIASA nursery.

The committee agreed that this declaration be included into NIASA as a "should" requirement rather than a mandatory requirement depending upon feedback from state committees.

ACTION ITEM D Boorman to confirm wording on declaration for non NIASA stock and send to NACC by 31 Dec 14. Response required from NACC on its Acceptance by 31 Jan 15.

ACTION ITEM – NGINA SACC will review the T&C with relation to the use of a declaration for Non NIASA grown stock.

C O'Connor then reviewed the In Progress Action items for a current status update.

Item 1 – Refers to an appendix relating to root health be included in NIASA.

ACTION ITEM – C O'CONNOR to review the minute from Jul 2011 and liaise with the chair on this action item.

Item 2 - NGIA Communication policy sent to NACC - Removed

Item 3 – G Eyles reported that Auscitrus are still looking at options but have limited capability at the moment. G Eyles will advise the NACC once Auscitrus are available/have the capacity to address - Removed and placed upon a future opportunity list

Items 4, 7 & 8 – Online manual access for growers. Requires IDO's to ensure that growers have accessed the manual online. Removed

Item 5 – A Kachenko to approach J McDonald to investigate options for tissue culture to be incorporated into NIASA.

J McDonald noted that it has been discussed and will bring to the committee at a later date. J McDonald requested for information on SOP's regarding tissue culture.

ACTION ITEM – D Reid to provide J McDonald information SOP's etc. from propagation businesses on tissue culture for possible inclusion into NIASA.

Item 6 – Sales and Audit training – Completed no request now for sales training from IDO's.

C O'Connor asked the IDO's what training they are seeking as a group.

D Boorman noted the lack of a centre of excellence for production nursery training as the impacts that will have for the industry future.

ACTION ITEM – C O'Connor to investigate training opportunities for the IDO network for;

- 1. Tissue Culture
- 2. Water disinfestation
- 3. Propagation D Boorman noted that he may be able to look at options for propagation training for the network.

Item 12 – IDO's to initiate talks with suitable businesses re BioSecure HACCP certification and legislative barriers – REMOVE

ACTION ITEM – J McDonald to contact M Danelon in order to meet with NSW Govt representatives on BioSecure HACCP and market access.

Item 13 – Completed

Item 14 - Completed

Item 15 - Completed

Item 18 – D Boorman submitted information on new portal software developers. Given the changes with the funding model this will need to be placed on hold.

Item 19 - K Hill & E Ngang to open dialogue with WA Dept. of Agriculture & Food to confirm Phytophthora testing requirements and accepted methodologies. – C Groom reported the E Ngang has contacted the dept. however has no answer as yet – Item remains in progress.

Item 20 – D Reid to continue working on solutions to engage with in ground growers to disinfest their water to meet FMS requirements. D Reid reported that he is working with a new in ground grower who is keen to meet the FMS requirements.

Item 21 – Replaced by NEW ACTION ITEM – IDO's to send J McDonald ICA and inspection costs for each state by 30 Jan 2015

Item 22 - Completed

Item 23 – IDO's are to work with their respective committee members as a test case to achieve EcoHort and BioSecure HACCP.- Removed

4 State Reports and Project Updates

4.1 State Reports

State reports were taken as read however a few queries/issues were raised. C O'Connor reviewed these.

The WA state report noted that they had issues with the FMS portal.

ACTION ITEM – C O'Connor to discuss with E Ngang issues WA has experienced with acing the portal.

C O'Connor noted that VIC reported a query in relation to the FMS requirement to retain 5L of potting media. D Reid stated that he has a business in VIC which has questioned the need

to do this. J McDonald noted that the requirement for 5L sample of media was due to the potential number of tests required if there was an issue with the media.

4.2 Outstanding Audit review

C O'Connor conducted a review of outstanding audits on 08 Dec 2014, details of which were presented at the meeting. A number of businesses in the portal were showing more than 12 months lapsed since the completion of their last audit.

Active NIASA businesses without a recorded 2014 Audit were as follows:

QLD	1
NSW	4
SA	7
VIC	19
WA	28

TAS FMS businesses had lapsed, however G Dalwood noted that he was undertaking a trip to conduct audits in TAS following the completion of the NACC. It was also noted that the Qld business had resigned from NIASA recently and not been marked accordingly in the NAP.

D Reid observed that a number of businesses in VIC had expressed concern over being audited during a busy time. C O'Connor reaffirmed that the business must be audited within 12 months or they risk losing their certification. If need be audits should be scheduled to be completed before the 12 month period to better suit operational requirements. D Boorman observed that auditing during the busy period is probably the best time to audit.

C O'Connor also noted that the administration of records, such as contact details of growers or business trading status must be kept up to date. This is especially important given the work being conducted with BioSecure *HACCP*.

C Groom noted he would speak with E Ngang in relation to audits not being completed.

ACTION ITEM – C Groom requested that FMS fees and charges for each of the programs be clarified again with State Associations.

4.3 Environment and Tech project update

C O'Connor provided a brief update on the current Environment and Technical project.

5 Administration

5.1 2014 Nursery Paper Schedule

C O'Connor reviewed the Nursery Paper schedule with the IDO's nominating preferred months and topics.

ACTION ITEM – C O'Connor to circulate Nursery Paper schedule to IDO's and finalise topics

5.2 Hort Journal and FMS Partnership Arrangement

C O'Connor briefed the committee on the continuing partnership with Hort Journal regarding articles on FMS businesses.

ACTION ITEM – C O'Connor to send IDO's an updated schedule of articles.

ACTION ITEM – C O'Connor to resend the link to all completed FMS business articles to the IDO network

7 Operational (Continued)

7.1 BioSecure HACCP Trial

J McDonald provided the committee an update on the BioSecure *HACCP* market access trial. J McDonald noted that the trial was successful and an independent auditor audited the program (NGIQ & NGIV) and growers on farm both in Queensland and Victoria. J McDonald discussed the penalties for non-conformances within the program.

On October 3rd 2015 the Sub-committee on Domestic Quarantine & Market Access (SDQMA) met to consider the BioSecure *HACCP* trial results and review the audit report. With John McDonald attending the SDQMA meeting to provide further updates and clarify issues within the audit report the committee went onto agree to a national 3 year trial of BioSecure *HACCP* as a market access instrument.

J McDonald noted that he will be working with other states moving forward with work still to be completed on the following before implementation:

- BioSecure HACCP governance and administration documents
- BioSecure HACCP manual
- Development of a document management system (underway)
- Development of a MoU and agreement by Plant Health Committee
- Continuing development of the Audit Management System (AMS)

General discussion on the implementation of BioSecure HACCP followed.

7.2 NIASA Review Update

J McDonald provided an update on the work to date on the NIASA and EcoHort manual updates. The BioSecure *HACCP* manual update is still in progress as a result of information from the trial audit.

Key focus was on editing issues, image updates and aligning terminology this was especially prevalent with NIASA due to the number of updates and author changes it has had. The checklist was reviewed to ensure alignment throughout the checklist. Noted was that references to individual businesses would be removed from images. This will help to ensure longevity of the document.

Water disinfestation methods were further explained in the NIASA manual. The reference document for water treatment used was the 2nd Edition of *Managing Water in Plant Nurseries.* Once all programs are completed the texts will be sent through to each IDO for comment.

J McDonald also noted that the committee would be sent a document resulting from the review of international best practice programs pertaining to the nursery industry. The document will detail highlighted gaps, i.e. areas which appear in other programs but not in the Nursery Production FMS. J McDonald noted that some of these may not be necessarily applicable but will be included for consideration. For example workplace health and safety is not in the FMS guidelines but is found in other international best practice/environmental management programs. Comment will be sought on the update.

8 Marketing

C O'Connor asked the IDO's if they required any existing marketing material, or if they required any new marketing material developed. No additional marketing material was requested.

9 General Business

No new general business was raised.

General discussion on the benefits of FMS followed.

D Boorman raised issues of extension and agronomy within the industry, general discussion followed.

10 Next meeting

The next meeting date will be confirmed after the consultation meeting to be held 20/21 Jan 2015.

Meeting Closed 3:30 pm



National Accreditation & Certification Committee (NACC)

Date:	Wednesday 05 Julie 2015
Time:	10:00 am – 3:30 pm
Location:	Stamford Plaza Sydney Airport
	O'Riordan St Mascot NSW 2020
Attendees:	Colin Groom (WA; Chair), Peter Vaughn (NGIA; CEO) Robert Prince (NGIA), Chris O'Connor (NGIA), Gary Eyles (NSW), Michael Danelon (NSW), Des Boorman (NSW), Wayne Parr (QLD), John McDonald (QLD), John Marshall (VIC), David Reid (VIC), Tony Van der Staay (TAS), David Eaton (SA), Grant Dalwood (SA), Teena Sanford (NT), Megan Connelly (NT)
Apologies:	K Hill (WA)

Ітем Торіс

¹ Welcome and Apologies

C Groom opened the meeting at 10:00. C Groom noted that K Hill was as an apology and explained to the committee that K Hill would be finishing her contract with NGIWA at the end of June 2015.

Given the amount of new attendees at this meeting each committee member introduced themselves. C Groom welcomed W Parr, T Van der Staay and T Sanford to the committee. C Groom also introduced P Vaughn to the committee as the new NGIA CEO.

C Groom noted that this may be the last NACC meeting to occur due to the changes happening with the structure of the program due to the HIA transition. C groom noted that changes are still not confirmed but that state executive officer had been kept abreast of the developments.

C Groom also noted that agenda item 7 will be of importance for the program moving forward.

2 Confirmation of Minutes

C Groom If there were any issues with the previous minutes and if they could be accepted.

T Sanford questioned the incorporation of TC in the FMS program. C Groom responded noting it would be covered in the action items from the previous meeting and asked if the minutes could be approved.

G Eyles moved to approve the minutes.

3 Matters from Last Meeting

3.1 Review of Action Item List

1) C O'Connor to review 2011 minutes and liaise with chair on action item from 2011 regarding an 'appendix' or modifying Section 2.7 of NIASA regarding root health.

Given that the Australian Standard for trees has been introduced C O'Connor suggested that a reference to this standard be incorporated into NIASA. C Groom asked for the committee thoughts M Danelon noted that he had no issue with the reference to the standard in NIASA as a reference and that industry had been consulted in its drafting. G Eyles noted his support for this from NSW. J Marshall agreed with G Eyles and general support was noted around the table.

ACTION ITEM - AS 2303:2015 Treestock for landscape use is incorporated into section 2.7 of NIASA as a reference for root health.

2) D Reid to provide J McDonald with information/ SOP's etc from propagation businesses on tissue culture for possible inclusion into NIASA

D Reid had spoken with Tissue Culture Australia and they will supply a copy of their SOP's once completed. J McDonald noted that he has some information and will amalgamate with information from D Reid

ACTION ITEM - remains a work in progress

3) C O'Connor to investigate training opportunities for the IDO network for; Tissue Culture, Water Disinfestation & Propagation

C O'Connor noted some online courses available and the potential to undertake a residential course through Melbourne Polytechnic. D Reid noted that Tissue Culture Australia may provide opportunity for some training or that there is a capability within Holmesglen.

D Boorman noted that he was able to run a training day for the IDO network. C O'Connor suggested that D Boorman discuss this at a later time. D Boorman noted the lack of opportunity for undertaking professional development. C O'Connor noted that the IDO network underwent Lead Auditor training last year. C Groom suggested that as employees of state associations it is up to the employer to provide ongoing professional development and that in light of funding changes there would likely be no opportunities for IDO training through NGIA in the future. D Boorman noted that this should be included in any programs moving forward.

4) D Reid to contact Australian Rubus Growers Association regarding FMS adoption by Rubus growers

D Reid reported that he had been in contact with Phillip Rowe of Australian Rubus Growers Association (ARGA) and had already undertaken an audit on a key supplier. D Reid noted that he regularly promotes the scheme with the Victorian Horticultural Industry Network (HIN)

C Groom asked if any further action was required on this item. D Reid noted that there was not. C O'Connor suggested that perhaps we should be looking at pushing into the other horticultural industries to promote FMS and asked for suggestions. J McDonald suggested an increased marketing budget for the program. G Dalwood noted his work with the Grape vine industry. J McDonald highlighted the citrus industry attitude during the recent biosecurity exercise yellow dragon. J McDonald noted that growers in this industry were still sourcing stock from non-accredited nurseries so some of the issues were being perpetuated by this action (i.e. Keeping non accredited nurseries in the market). J McDonald suggested that we need a dedicated person/project to talk at the higher (board) level with these industries on the benefits of the scheme to further market demand. D Reid noted that his approaches have

just gone through the ARGA without marketing direct to growers. J McDonald noted that in the past marketing was in other industry publications Ausveg / Growcom etc. but should focus on the other PIB's (Board Level) in order to drive industry uptake. General discussion on this issue followed. J McDonald also noted the difficulty in engaging other industries but noted the increased interest in the programs based upon biosecurity issues.

G Eyles provided a brief update on the status of citrus Australia and their aim to progress FMS certification

R Prince discussed the differences between certifying production systems or certifying end products and the implications this will have for any certifying body moving forward.

ACTION ITEM - Include other horticultural PIB organisations into the future opportunities list for FMS promotion.

5) D Boorman to confirm wording on declaration for non NIASA stock and send to NACC by 31 Dec 14. Response required from NACC on its acceptance by 31 Jan 15.

C Groom noted the responses received on this issue;

- D Reid noted that the VIC SACC supports a declaration
- J McDonald responded nothing that the QLD SACC was not in support of a mandatory declaration given the levels of paperwork required however would be supportive of a voluntary declaration.
- G Dalwood comments noted that with SA Govt FMS accredited businesses are preferred in their purchasing, but not aware of this issue.

C Groom reiterated that the intent with this declaration was not for FMS businesses to declare stock they had grown but only for stock which they have sourced elsewhere. C Groom clarified this intent with the committee which agreed.

G Eyles recommended that this is voluntary with a view to becoming mandatory in the future depending upon the future of the scheme.

J McDonald noted that he needed to clarify wording with the QLD SACC prior to accepting.

R Prince highlighted his opinion which is that moving forward there will be a lot more brokerage companies and this will become more of an issue, and that this could have ramifications with BioSecure *HACCP*.

C Groom suggested that this was a loophole and D Boorman suggested that this was fraud misrepresenting stock as having been grown in a NIASA accredited nursery.

Suggested title was the Non NIASA Source stock declaration.

C Groom asked for a response from the committee if they agree to the concept of such a declaration and that it should be initially voluntary with a move to mandatory at a later date as it is an important loophole. The committee agreed to this.

ACTION ITEM - C O'Connor to send wording out to the IDO network for confirmation.

6) NGINA SACC will review the T&C with relation to the use of a declaration for Non NIASA grown Stock

C Groom noted that at a later stage i.e. when mandatory this could be reviewed

7) J McDonald to contact M Danelon in order to meet with NSW Government Representatives on BioSecure HACCP and market access

Further dialogue continuing.

8) K Hill and E Ngang to open dialogue with WA Dept. of Agriculture and Food to confirm Phytophthora testing requirements and accepted methodologies.

C Groom reported that E Ngang had undertaken dialogue with WA DAF without clear clarification yet.

9) D Reid will continue to work on solutions to engage with in ground growers in disinfesting water to meet FMS requirements.

D Reid noted that this is still continuing but could be removed from action item list.

10) IDO's to send J McDonald ICA and inspection costs for each state by 30 Jan 2015

J McDonald reported that he was still missing information from TAS, NSW and NT. M Danelon to follow up for NSW, M Connelly will follow up for NT and T Van der Staay will submit on behalf of TAS

ACTION ITEM – M Danelon, M Connelly and T Van der Staay to send J McDonald costs/schedule of fees for ICA's

11) C O'Connor to discuss with E Ngang issues WA has experienced with the portal

Completed

12) C O'Connor to resend link to all completed FMS business articles to the IDO network

Completed

4 State Reports and Project Updates

4.1 State Reports

J McDonald reported for QLD - Taken as read

G Dalwood reported for SA - Taken as read however wanted to confirm fees. J McDonald confirmed these as per the HOA for FMS. C Groom noted that G Dalwood had requested further research in water disinfestation/ training for IDO's and sought clarification. G Dalwood suggested that ongoing work was needed to verify other water disinfestation methods beyond what was recommended through NIASA. C Groom inquired if any work had been done in this area recently and C O'Connor noted the work by NSW DPI in reviewing UV, Chlorine and Chlorine Dioxide treatments.

G Dalwood reported for TAS - Taken as read.

D Reid reported for VIC - D Reid note the report as taken as read apart from his discussion with Victorian Seed Potato Authority. VICSPA are keen for their Labs to be audited by the IDO network. M Connelly queried why they are not being audited by NATA D Reid noted that this is not suitable for their needs. J McDonald noted that there are standardised practices for labs and that he was not aware of any TC labs which were NATA accredited or any end users requiring NATA certification for TC.

C Groom confirmed that at present FMS does not contain any information for auditing TC

ITEM TOPIC

labs and that D Reid is waiting upon the auditable aspects required by VicSPA .J McDonald noted that this is further to the work in including TC labs in NIASA.

C O'Connor suggested that prior to embarking on this work would it be feasible to seek out EOI's from other labs who are keen to do this prior to investing the time and money.

M Danelon questioned if this was the role of an IDO. J McDonald suggested that with the 8 VicSPA labs and the QBAN labs this could be a good captive market

J McDonald noted that Ross Bourne (ex University of Queensland) could be a good consultant to assist in writing the TC inclusion in NIASA. D Boorman noted that he had worked with him the past and may be able to contact him.

D Eaton noted that Ball was writing a quality document in relation to the quality of TC being received and would share this with J McDonald.

General discussion on TC followed.

C Groom recommended that TC should be included under future opportunities and consideration should be given to funding this inclusion into NIASA. P Vaughan agreed with this.

M Danelon reported for NSW - taken as read. C Groom asked for clarification of the fees noted. Discussion followed on the numbers of NIASA businesses and their increase or decline in states.

G Dalwood noted that Bunnings had put pressure on two businesses to obtain FMS accreditation. General discussion on the drivers for businesses to take up FMS followed.

M Connelly reported for NT - Report taken as read. C Groom questioned the reported fees of NT. M Connelly noted that the fees reported were correct. M Connelly stressed that as a continuous improvement program it was important to keep growers engaged. C Groom replied that given funding constraints we will need to be charging commercially viable fees to keep the scheme running. C Groom noted that in relation to fees NGINT is breaching the HOA signed previously in 2013 (NIASA \$440, EcoHort \$250).

4.2 Outstanding Audit Review

C O'Connor provided the IDO's and state representatives a listing of businesses which were past their 12 month audit date. C O'Connor noted that some of these businesses were still listed as active but had not had their status updated in the National Audit Portal.

C Groom noted that the objective of this were to ensure oversight of audits and that businesses were being audited.

5 Administration

5.1 Nursery Paper Schedule

C O'Connor covered the schedule and noted that it is still on track. Project NY12011 which funds the Nursery papers has had an extension submitted to HIA in order to cover it until the end of the year, as this project was due to end in August 2015.

Depending upon funding it will be uncertain if the Nursery Papers will continue next year.

R Prince reported to the committee that an EOI had been released from HIA looking for an independent consultant to review communications in the Nursery sector. R Prince noted that

the scope of this review in relation to communications is quite limited.

Further discussion followed on the Nursery Papers and extension. M Danelon observed that the papers and extension through the IDO network was without the bias demonstrated by extension provided through agronomists working for agrochemical companies. J Marshal noted that a number of the papers may not have direct relevance at the time but provide a resource to refer to or provide tangential guidance to improve businesses.

General discussion about the consistency of HIA communication followed - some committee members received emails others did not despite having registered.

D Boorman noted that in relation to communications the industry has many different production systems & product ranges in comparison to other horticultural industries and this diversity compounds the issues around communication as we need to apply broad brush strokes.

5.2 Marketing Collateral (Attachment)

C O'Connor noted that if IDO's required any marketing collateral from the list provided to contact C O'Connor.

6 Operational

6.1 BioSecure HACCP trial update

J McDonald provided an update on the BioSecure *HACCP* trial. The trial was audited last year and 21 recommendations came out of the audit, which have been addressed. The biggest recommendation was that there was no document management system. This has been addressed and the program underwent a further close-out audit in early April 2015. The audit was closed and a positive report provided to the subcommittee for domestic quarantine and market access (SDQMA).

On the 28th of April the SDQMA fully accepted the audit report noting that all recommendations had been addressed and that we were free to begin operating (3 year national trial) with BioSecure *HACCP* once the states enacted their respective regulatory processes.

At present none of the states/territories have a complete and clear regulatory authority to allow BioSecure *HACCP* to operate however they are able to introduce bridging mechanisms e.g. inspector's approvals (QLD) or biosecurity orders (VIC). This will be key moving forward.

J McDonald noted that he will be following up resolutions from the subcommittee for domestic quarantine and market access through the Chair (Rod Turner PHA).

R Prince questioned if there is a one page document for the states identifying who is on the subcommittee and an example of what is required. J McDonald noted that he was working with the QLD and VIC states and once the bridging mechanisms for these states are reenacted he will provide detail to the other states using these as an example.

C Groom questioned where the ongoing improvement to BioSecure *HACCP* was being paid from. R Prince noted that it was coming from the industry R&D project which will be finishing soon hence the need to progress this.

T Sanford asked for more details on the BioSecure HACCP process and how this would work for a nursery which J McDonald provided. Further discussion continued on ICAs and

their future and the opportunities for improved outcomes for industry with the use of ECCP's.

C Groom noted that at present in terms of his own business he did not see the market access of BioSecure HACCP as a driver as he was not moving large quantities of stock interstate.

M Danelon questioned if smaller growers would take up BioSecure HACCP given that the market driver appears only to benefit the larger businesses. J McDonald replied noting that he had both small and large businesses interested and that the market access is a flow on result. The real driver for the program was about getting growers to drive their pest and disease management holistically on farm. J McDonald noted that from his experiences it was more difficult to implement in a larger business than in a small business. J McDonald also noted the increased benefits around traceability and the improvements in pest and disease management. J McDonald suggested that in future elements of the supply chain will be demanding evidence of high health and that we should be there before we are dictated to.

D Reid noted three businesses who were keen to take up BioSecure HACCP and saw benefits to their ability to recommence operations quickly after an incursion.

J McDonald noted that industry will have more control through the ECCP process and that we will see more incursions in the country. R Prince responded to M Danelon and noted that as the larger players adopt BioSecure HACCP the smaller players will be driven to do so as well as less use of government schemes and hence cost increases as government moves to full cost recovery. Hence the industry scheme will see some good cost savings.

M Danelon asked about succession planning for the writing of ECCP's. J McDonald noted that the system is being established with templates, guidelines etc. to facilitate the easy writing of ECCP's.

ACTION ITEM - P Vaughan to seek NGIA Board approval to continue undertaking the BioSecure *HACCP* market access trial.

6.2 FMS Review update

J McDonald provided an update of the FMS review noting that the review was completed.

Subject to funding this will be incorporated. R Prince noted that this will be integral moving forward depending upon the future of the program.

C Groom confirmed that there were two aspects, the first to ensure consistency of terminology across the 3 manuals and the second to undertake a gap analysis of the program compared to international programs.

J McDonald noted that a number of gaps were identified and these will need to be discussed by the committee. J McDonald will consider recent research in water disinfestation for inclusion into FMS.

C Groom noted that the FMS project will be reviewed by the NGIA board. M Danelon challenged this questioning the technical expertise of the board. M Danelon supported by G Eyles, requested that the review be conducted by the IDO network. J McDonald noted that this depends upon whether the FMS recommendations need to change in light of the research i.e. chlorine with a specific contact time and residual.

T Sanford question updates and how this would work for growers in receiving the update. J McDonald noted that the new manual will be uploaded into the FMS manual portal, noting that businesses should be logged into this portal.

C Groom clarified that J McDonald will seek clarification on water from the IDO network and will provide the full reviewed FMS manuals to NGIA by the end of June. J McDonald agreed noting that he would provide the information and a time frame to the IDO network and if did not receive feedback he would progress and send through to NGIA.

C Groom clarified with M Danelon if this was suitable to which M Danelon agreed.

ACTION ITEM - J McDonald to send reviewed FMS water disinfestation requirements to IDO network for comment.

ACTION ITEM J McDonald to send revised files through to NGIA by the end of June 2015

6.3 Australian Standard - AS2303 Tree stock for landscape use

C O'Connor noted that the standard was available through the standards website. D Boorman noted some anomalies with the standard in content.

C O'Connor asked D Boorman for this information to be sent through. R Prince interjected and advised D Boorman that information sent through was after the review period for public comment. R Prince noted that Standards were strict with time frames in relation to this. R Prince also noted that the standard will be up for review in two years to incorporate new research data.

C O'Connor noted that there was a supporting guide in progress to provide further information and guidance to the standard. R Prince noted the recent release of the Expression of Interest from HIA Evaluation of Nursery Tree Stock Balance Parameters which will examine tree stock growth around the country.

R Prince also noted that there had been some inquiries around standards associated with containers i.e. volumetric. T Sanford noted that there is discrepancy in the industry with actual and advertised volumes. C O'Connor noted that this was an ACCC issue. J Marshall noted that currently in the market bags are measured in litres and pots in diameter. C O'Connor noted that there were fluctuations in pot diameter i.e. what is marketed as a 140mm pot may be a 132mm pot or there are differences in height squat vs standard.

7 Operational (Cont.)

7.1 Future of the IDO project & FMS

C O'Connor provided a brief overview of the recent information from the HIA led grower meeting held in Melbourne (22-23 April 2015). Noting that in the room T Sanford, T Van der Staay R Prince and P Vaughn were present at this meeting. Discussed were the needs of the industry and the key areas for industry investment.

Feedback from this meeting were

- 1. Strong focus on biosecurity in the areas of market access, on farm hygiene and training.
- 2. IDO program should focus on market development and support the 202020 Vision.
- 3. Accreditation should be fee for service.

C O'Connor noted that as the IDO project stands at the moment it will be finishing at the end of the year in order to comply with the Statutory Funding Agreement (SFA) HIA has with the

Federal Government. The question is how we move forward.

R Prince presented. The FMS project NY12016 which included the governance of the NACC committee, marketing materials etc. which was approximately \$120 000 across the life of the project (LOP) and this concluded in 30 May 2015. Complimentary to this is the IDO project which is approximately \$3.2 million (LOP) which is divided according to state sizes. This project was due to run until August 2016. On the basis of the size and value of the project it was identified that it would be unlikely to continue in its current format.

A key element of the IDO project was the running /auditing of the FMS program. Given this feedback from the HIA workshop was that considerable levy expense was being focused upon subsidising the approximately 230 FMS businesses and the IDO network. Feedback provided was that businesses already have the technical information they need and that the technical role should be fee for service. Likewise audits if they are of value should be on a commercial fee for service.

W Parr suggested that this response was on the basis of a small sample of people with alternate reasons for their comments and did not want the industry to improve and progress. T Van der Staay and T Sanford disagreed with this comment.

R Prince noted that in this HIA meeting there would be close to 60% of the levy represented. W Parr question who was being supported; the large businesses or the industry? R Prince noted that this was a sensitive issue and that people are angry because they do not understand it. R Prince noted we need address today how do we deliver the program moving forward due to its overall benefit to the industry.

T Van der Staay stated that in the HIA meeting the overall consensus which was felt was that the IDO program had come to a peak. T Sanford agreed noting that in the meeting there were some non-accredited businesses which were good business but questioned the amount of levy funds being spent to support FMS.

Biosecurity and market access were seen as critical for the industry as was market growth.

R Prince noted that in regards to the IDO project funding of \$3.2 million it was split approximately;

\$800k levy \$800k matched govt. funds

\$900K voluntary contributions \$700k matched govt. funds

Under the new rules the matched govt. funds for the voluntary contribution component is not accessible for industry projects. R prince noted that in essence the IDO project which did have \$800k per year now has \$400k per year, unless the industry decides to dedicate full levy funds to the project.

R Prince provided further background including an explanation of the two HIA pools of investment. R Prince also advised that HIA are assessing elements of industry projects against compliance with the SFA, this includes PIB management, sub-contracting of projects and the use of voluntary contributions. Each of these aspects are seen in the current IDO project.

R Prince advised that he and NGIA President M Mehigan met with A Kachenko and C Perring of HIA and were advised that the project had to change by end of June 2015. However HIA needed grower consultation. Out of this consultation (22/23 April) the growers advised that they want a different program.
J McDonald noted that he had heard that industry levy funds could be used in pool 2. R Prince noted that this was correct however it had to be a HIA directed horticulture wide project signed off by the HIA Board i.e. not for specific industry. R Prince went further to note that this is why we submitted concepts (green cities, & biosecurity) to the HIA white paper for pool two.

General discussion followed. J Marshall asked R Prince based upon his knowledge and experience what we should look at. R Prince detailed a separate business operation focusing on auditing, owned by NGIA and hence able to access the IP associated with FMS. The operation would be independent and at arm's length from NGIA. The auditors could also be employed in a consulting capacity. The organisations services would be fee for service. Based upon the current level of audits this would need to initially be supported by / underwritten with a levy project until it is self-sustaining.

R Prince noted that another option was that FMS was free to the industry BUT to be accredited it needs to be audited.

R Prince also noted that a separate Biosecurity position would be established completely 100% levy funded. The driver for becoming accredited will be through government and private sector demanding suppliers demonstrate biosecurity commitments. R Prince noted that this organisation will be seen as being more independent from an auditing perspective.

J Marshall agreed with R Prince noting that in his opinion this is coming rapidly citing Bunnings and issues with Biosecurity and the changes that are being driven in the vegetable sector by the supermarkets. G Dalwood observed some of the same changes happening in SA.

D Eaton asked where the growers thought they would get their technical information. T Sanford suggested that at the meeting the growers thought there was more benefit in the market development.

R Prince noted that the company would be focused on biosecurity with FMS as just a tool to achieving biosecurity outcomes.

G Eyles noted that if the focus needed to transition more to biosecurity to maintain a level of continuance of the IDO network then this is what is needed to be done. J Marshall concurred with this observation.

W Parr asked how the organisation will be at arm's length from NGIA. R Prince noted that the new company will have a board and constitution with grower levy payer representation and technical expertise.

C Groom asked the committee if NGIA moved to setting up an accreditation only body, were there other services which could provide technical advice? D Boorman noted issues surrounding payment for advice. G Dalwood suggested that there were not specialised services. R Prince suggested that it may be possible for Garden City Plastics to apply for a HIA EOI for technical advice for the nursery industry. The issues of bias and conflict of interest surrounding this were discussed.

The importance of extension was also discussed in driving change in the industry. R Prince noted that the loss of the IDO role will impact upon the regional capacity of the industry, in that IDO's are involved in many areas beyond purely on farm technical advice. General discussion in this area followed.

In regard to biosecurity obligations, J McDonald noted the importance of NGIA being the

signatory of the EPPRD

C Groom questioned the industry attitude to paying for extension services which was highlighted in the Moko report and was rejected by the industry. G Dalwood noted that a number of years had passed since then. J Marshall observed that if market forces dictate that you need to be accredited then the costs does not matter as it becomes part of doing business. J Marshall noted that each year there are more requirements from Bunnings and that they are leveraging other growers to get them up to speed.

General discussion on Bunnings drivers in the marketplace followed.

R Prince asked the committee if they see the model as being where we need to go. J Marshall and G Eyles agreed with the model. T Sanford suggested exploring two options one with levy and one without levy support. W Parr noted that the shareholders/board would be key to getting support form industry. G Dalwood suggested that the State committee representatives could be involved as board members. T Van der Staay noted that the board/owners should be levy payers only so that there was no influence for other sectors.

R Prince noted that from the HIA point of view they are looking for outcomes, how it will it be delivered and how it will be measured. T Sanford suggested that isn't the issue that there are only 230 FMS businesses still the issue regarding investment of levy funds? J McDonald noted that although there may only be 230 formally accredited nurseries other nurseries have adopted / are applying best practice methods as well e.g. growing on gravel beds etc. and this was the aim of FMS as the vehicle to bring about R&D change. G Eyles suggested that perhaps the number of FMS businesses should not be used but another measurable instead. R Prince notes that at present we report on engagements/ communications etc., however further requirements are being required from HIA.

Discussion followed on costs for auditing with G Dalwood noting costs he charges for audits for ICA's.

W Parr departed the meeting at 3:00pm

P Vaughan addressed the committee noting that from his perspective the discussion was very good. P Vaughn noted that at the HIA meeting it would have been of benefit to have had a presentation from an IDO to better highlight aspects of their role and work which they undertake which is not readily seen by industry. P Vaughan asked what we as an NGIA board should take to HIA noting that from his perspective the Biosecurity role should be underpinned by levy funds as it benefits the whole of industry but with additional fee for service for those who want to progress this area further. P Vaughan also noted the opportunities that were discussed around other auditing services.

P Vaughan noted that his take away message for the board was that the key area for levy funds is through biosecurity. T Sandford suggested calling the program Biosecurity compliance. P Vaughan noted that after the board meeting he would like to initiate a phone conference so that all in the committee are aware of the process moving forward.

C Groom commented that from his perspective one of the issues was that the IDO project was not nationally consistent in terms of outcomes noting that IDO's have multiple bosses. D Boorman noted that the success of the Queensland IDO network has been through leveraging state funds to employ more IDO's and hence free J McDonald up to concentrate of longer term strategic outcomes. J McDonald noted that this was achieved through the support of NGIQ.

D Boorman questioned the remuneration of IDO's. R Prince noted that remuneration for IDO's is set by the state NGI's. D Boorman responded noting that moving forward consideration needs to be given in this area.

ТЕМ TOPIC J Marshall asked what we are recommending to the national board. C Groom observed that he saw broad support for the model presented, noting in his opinion he was not driven by the biosecurity aspect noting other elements which drive his business but that in the future such a body would be auditing perhaps other areas such as turf, rubus etc. This was perhaps the only option moving forward i.e. setting up a standalone auditing body. J Marshall replied noting that it comes down to what's in a name. P Vaughan observed that this is perhaps a reflection of the transition in the market. R Prince noted the key drivers for HIA being market access, efficiency and productivity, also noting the risk profile of the industry, being a potential threat to all other industries due to our movement of live germ plasm. 8 **General Business** No general business. C Groom thanked all for attending the meeting. Both J Marshall and G Eyles thanked everyone for their commitment to the NACC and the time commitment. Both also expressed their disappointment at what my well be the last NACC meeting. G Eyles noted that he is leaving feeling supportive of the proposed way forward.

9 Next Meeting

N/A

Meeting Closed 3:30 pm

Appendix 3

GS1 Australia HGAG GreenLife Work Group Meeting Minutes



Meeting Minutes	HGAG GreenLife Work Group Meeting			Meeting	16/06/2015
Venue	GS1 Mt Waverley	Date	16/06/15		Start time:
	GS1 Botany	Next Meeting	25/08/15	Time	10.30am Finish time: 12:00pm
Chair	Chris O'Connor	Minutes to be Ta	aken By	Joseph Taylo	r – GS1

Company	Attendee	Title
Oasis Horticulture	Andrew White	General Manager
NGINA	David Foster	CEO
NGIA	Chris O'Connor	Policy & Technical Officer
Nursery Management Systems	Andy Cameron	Managing Director
ProteaFlora	Rob Furniss	Operations Manager
GS1 Australia	Joseph Taylor	Senior Advisor – Consumer Goods
GS1 Australia	Sean Sloan	Industry Manager – Consumer Goods
Company	Apologies	Title
NGIV	David Reid	Nursery Industry Development Officer
Masters	Jayson deForrest-Haddleton	Vendor Supply Chain Manager
Bunnings	Robert Chin	Compliance Coordinator Bio- Security & Nursery Standards
Home Timber & Hardware	Errol Kennedy	Inventory & Procurement Manager
Home Timber & Hardware	Myra Grinter	Buyer - Greenlife
Benara Nurseries	Carole Fudge	Sales & Marketing Manager
GS1 NZ	Eddie Guinness	Professional Service Analyst



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Meeting N	linutes	
ltem #	Description/Action Item	Action Items/Responsibility
1.	 Welcome, Apologies & Anti-Trust Joseph Taylor (GS1) welcomed attendees, read apologies and full anti- trust statement and handed across to the Work Group Chair Chris O'Connor. 	
2.	 Review previous meeting minutes and action items Chris O'Connor tabled the previous minutes and confirmed the following: Standardized template for sharing basic product data – (Confirmed as WIP) Woolworths requiring BCV reports for all products in respect of Benara - Still to be actioned, Errol Kennedy (HTH) agreed to follow-up for next meeting. (Carry over) Numbering & Bar coding guide for production nurseries – To be sent by NGIA and NGINA to it's members – (Completed) Investigate the potential to package membership, printer and scanner for nurseries (This Meeting) GS1 to present on GS1-128 v Databar and GS1 Consulting – (This meeting) 	ACTION – GS1 to arrange meetings with GreenLife retailers to discuss further the idea of having a standardised template for sharing basic product data. ACTION - Errol Kennedy to discuss internally with WW's the issue of them requiring BCV reports for all products in respect of Benara.
3.	 GS1 Consulting Presentation John Szabo (Manager GS1 Consulting), gave a comprehensive overview of GS1 consulting offerings including indicative costs (See slides) 	
4.	 GreenLife Package Essentially 2 options were discussed, the first being a basic option of being able to print and apply barcode labels to have plants ranged with a retailer, predominantly for smaller nurseries and the second being a more advanced option to facilitate accurate inventory management and scanning to locations within the nursery, mainly for larger nurseries. Details of 2 basic solutions, both hardware, software & costings from Matthews and Gamma Solutions, were presented to the group, and it was confirmed that another quote would be available shortly from Peacock Bros. It was also confirmed that quotes for the advanced option would require further input and time from the solution partners and that perhaps an extraordinary work group meeting could be held to discuss this further? GS1 confirmed that it would be discounting the membership joining fee to facilitate these new GreenLife members. Discussions also took place around the integration of technology ie into inventory and on the cloud, including associated costs, which need to be factored into the overall package. It was suggested that perhaps the advanced solutions could be tied-in 	ACTION – GS1 to follow- up solution partners and re-present full suite of solutions, both basic and advanced, including costings, at either an extraordinary or next work group meeting.



	 with a GS1 Consulting Discovery Project. GS1 confirmed that that the winning solution partner would be invited to present at the next work group meeting, and also to co-present their solution with GS1 at the NGINA expo day in Sydney on 1st September 2015. They will also be asked to participate in a proof of concept within a nursery later this year. 	
E	GS1-128 v Databar Presentation	
5.	• GS1 gave a comprehensive overview of GS1-128 bar code and attribute data that it captures, and also GS1 Databar.	
	• GS1 recommended using an EAN-13 within a retail environment and a GS1-128 to be used within a production environment.	
	• The group agreed that GS1-128 for internal use should be the next focus, given the ability to track not only GTIN, but also attributes such as production date, quantity and batch number. It was felt that this is where nurseries could start getting immediate benefits by using GS1- 128 internally within their respective businesses as they are currently only looking at the retail side of things from a numbering & barcoding perspective.	
6	Other Business/Agenda Items/ Next Meeting	ACTION – Chris
0.	 It was confirmed that the GreenLife work group and collateral is being actively promoted on the respective industry associations websites ie NGIA, NGINA and NGIV, however is was unsure what the position was for NGIQ and also South Australia and Western Australia. It was confirmed that the NGINA event on 1st September in Sydney will be a Marquee Expo event featuring landscapers, designers etc with 120 stands and is being advertised in the Horticultural Journal. GS1 confirmed as having a speaking slot on the day. 	O'Connor to provide CEO contact details for all industry associations nationally. ACTION – Joseph to liaise with David Foster re GS1 speaking
		opportunities and
	Mosting Closed at 12:00mm	
7.	Next Meeting Tuesday 25 th August 2015	



Meeting Minutes	HGAG GreenLife Work Group Meeting			Meeting	24/02/2015
Venue	GS1 Mt Waverley	Date	24/02/15		Start time:
	GS1 Botany	Next Meeting	28/04/15	Time	10.30am
				Time	Finish time: 12:00pm
Chair	Chris O'Connor	Minutes to be Ta	aken By	Joseph Taylo	r – GS1

Company	Attendee	Title
		Compliance Coordinator Bio-
Bunnings	Robert Chin	Security & Nursery Standards
Masters	Jayson deForrest-Haddleton	Vendor Supply Chain Manager
NGINA	David Foster	CEO
NGIA	Chris O'Connor	Policy & Technical Officer
Nursery Management Systems	Andy Cameron	Managing Director
ProteaFlora	Rob Furniss	Operations Manager
Benara Nurseries	Carole Fudge	Sales & Marketing Manager
GS1 Australia	Joseph Taylor	Senior Advisor – Consumer Goods
		Industry Manager – Consumer
GS1 Australia	Sean Sloan	Goods
Company	Apologies	Title
		Nursery Industry Development
NGIV	David Reid	Officer
		Inventory & Procurement
Home Timber & Hardware	Errol Kennedy	Manager
Home Timber & Hardware	Myra Grinter	Buyer - Greenlife
Oasis Horticulture	Andrew White	General Manager
GS1 NZ	Eddie Guinness	Professional Service Analyst



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Meeting N	<i>linutes</i>	
ltem #	Description/Action Item	Action Items/Responsibility
1.	 Welcome, Apologies & Anti-Trust Joseph Taylor (GS1) welcomed attendees, read apologies and full anti- trust statement and handed across to the Work Group Chair Chris O'Connor. 	
2.	 Review previous meeting minutes and action items Chris O'Connor tabled the previous minutes and confirmed the following: Standardized template for sharing basic product data – Perhaps a simplified version of GS1net? Should be added as a new objective for the group for 2015.? Woolworths requiring BCV reports for all products in respect of Benara - Still to be actioned, Errol Kennedy (HTH) agreed to follow-up for next meeting. Numbering & Bar coding guide for production nurseries – To be sent by NGIA and NGINA to it's members Investigate the potential to package membership, printer and scanner for nurseries. All other action items were complete, see slides for full discussion. 	ACTION – GS1 to arrange meetings with GreenLife retailers to discuss further the idea of having a standardised template for sharing basic product data. ACTION - Errol Kennedy to discuss internally with WW's the issue of them requiring BCV reports for all products in respect of Benara ACTION – Chris O'Connor and David Foster to send numbering & bar coding guidelines for production nurseries to NGIA and NGINA respectively. ACTION – GS1 to discuss basic entry level costs to bundle a bar code printer, software etc.
3.	 Review Discussion took place around what had been achieved by the group as follows: GTIN allocation rules document has been completed. Numbering & Bar coding guidelines for Nurseries document now complete. Are these documents being promoted via websites etc? How are they being used? Any feedback 	ACTION – GS1 to send link to GS1 GreenLife page on website.
4.	 Review of Objectives for 2015 Work Group objectives for 2015 were reviewed individually as follows: Hardware Numbering & Bar Coding guidelines for GreenLife - Chair to review / seek to remove objective 	ACTION – Chair and GS1 to review Hardware N&BC Guidelines for GreenLife.

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	 Online Training – Group would like to look at videos prior to or at next meeting Biosecurity – the group agreed that DAFF would play a big role in this and that this should be removed as an objective. Review advanced barcode education elements such as barcode re-use & how Code 128 could help (a nursery) internally – Group agreed that a session on what a GS1-128 can do should be presented in next meeting. How can GS1 Consulting support the industry – Group would like a presentation from GS1 Consulting Manager at next work group meeting. 	ACTION – GS1 to send videos for online training to group prior to next meeting. ACTION – GS1 to remove objective around Biosecurity. ACTION – GS1 to present a session on GS1-128 in next meeting. ACTION – GS1 to present on Consulting options at next meeting. ACTION – Joseph to update Work Group objectives and re-send to the group
5.	 GreenLife Value Proposition It was confirmed that the workflow is now in design phase and being worked on by GS1 Marketing. 	to the group.
6.	 Other Business/Agenda Items/ Next Meeting Savings Calculator – This was discussed with the group and a request for feedback was made. The group was interested in seeing survey questions on base data assumptions and an example of the calculator. 	ACTION – GS1 to send group link to GS1 Savings calculator
7.	Meeting Closed at 12:00pm	



Meeting Minutes	HGAG GreenLife Work Group Meeting			Meeting	27/11/2014
Venue	GS1 Mt Waverley	Date	27/11/14	Time	Start time: 1.00pm
	GS1 Botany	Next Meeting	24/02/15	Time	Finish time: 2:30pm
Chair	Chris O'Connor	Minutes to be Taken By		Joseph Taylo	r – GS1

Company	Attendee	Title
		Inventory & Procurement
Home Timber & Hardware	Errol Kennedy	Manager
Home Timber & Hardware	Myra Grinter	Buyer - Greenlife
		Compliance Coordinator Bio-
Bunnings	Robert Chin	Security & Nursery Standards
NGINA	David Foster	CEO
NGIA	Chris O'Connor	Policy & Technical Officer
Nursery Management Systems	Andy Cameron	Managing Director
GS1 Australia	Joseph Taylor	Senior Advisor – Consumer Goods
GS1 NZ	Eddie Guinness	Professional Service Analyst
		Industry Manager – Consumer
GS1 Australia	Sean Sloan	Goods
Company	Apologies	Title
		Nursery Industry Development
NGIV	David Reid	Officer
Nursery Traders	Tim Bunker	Managing Director
Masters	Jayson deForrest-Haddleton	Vendor Supply Chain Manager
Elegant Outdoors	Mike Mehigan	Managing Director
ProteaFlora	Rob Furniss	Operations Manager
Benara Nurseries	Carole Fudge	Sales & Marketing Manager
Oasis Horticulture	Andrew White	General Manager



Meeting N	linutes	
ltem #	Description/Action Item	Action Items/Responsibility
1.	 Welcome, Apologies & Anti-Trust Joseph Taylor (GS1) welcomed attendees, read apologies and full anti- trust statement and handed across to the Work Group Chair Chris O'Connor. 	
2.	 Review previous meeting minutes and action items Chris O'Connor tabled the previous minutes and confirmed the following: GPC codes for horticulture – Was confirmed as a watch & brief scenario and an aspirational goal at this stage. Woolworths requiring BCV reports for all products in respect of Benara - Still to be actioned, Errol Kennedy (HTH) agreed to follow-up for next meeting. Standardized template for sharing basic product data – Perhaps a simplified version of GS1net? Should be added as a new objective for the group for 2015. 	ACTION – GS1 to keep a watching brief on GPC codes for Greenlife. ACTION - Errol Kennedy to discuss internally with WW's the issue of them requiring BCV reports for all products in respect of Benara ACTION – GS1 to add standardized template for sharing basic product data as a new work group objective.
3.	 Presentation of final Numbering & Barcoding Guidelines for Dummies one pager It was confirmed that the document had been produced and submitted for design phase and would be available next week. Main discussion was around how to promote the document and it was generally agreed that it should be sent to growers and independents, used at industry events, mailed and used in industry body publications. 	ACTION – GS1 to send link to finished Numbering & Bar Coding Guidelines for Dummies document to Chris O'Connor and David Foster, who will then send to NGIA and NGINA members respectively.
4.	 GreenLife Value Proposition - Update It was confirmed that the objective is to map the Greenlife supply chain from plant production right through to retailer. Task group formed and first meeting completed with a view to having a flow diagram completed early 2015. 	
5.	 Plantmark Meeting - Overview Sean Sloan (GS1) provided an overview of recent meeting confirming that both standardized data and potential work group participation were of immediate interest. Discussions then took place around GS1 membership benefits and concessions for growers and it was asked if there was potential to package GS1 membership, printer and scapper for purseries. Group is 	ACTION – Send meeting invites to Plantmark for 2015. ACTION – GS1 to investigate the potential to package membership



	looking at having a one pager outlining this including indicative costs.	printer and scanner for nurseries.
6.	Other Business and Next Steps	
	 Savings Calculator – This was discussed with the group and a request for feedback was made. 	
	• Meeting Dates – Were tabled for 2015 and it was suggested that the August meeting be capped at 1 hour due to busy time of year for the sector.	
	• Ideas for 2015 – Looking at 128 barcode and standard set of attributes for bio-security component. However, need to focus on stock management first-up. Reviewing EDI standards was suggested as the	
	industry is not using full EDI.	
7.	Meeting Closed at 2:15pm	



Meeting Minutes	HGAG GreenLife Work Group Meeting			Meeting	23/10/2014
Venue	GS1 Mt Waverley	Date	23/10/14	Time	Start time: 1.00pm
	GS1 Botany	Next Meeting	27/11/14	Time	Finish time: 2:30pm
Chair	Joseph Taylor	Minutes to be Taken By		Joseph Taylo	r – GS1

Company	Attendee	Title
		Inventory & Procurement
Home Timber & Hardware	Errol Kennedy	Manager
		Compliance Coordinator Bio-
Bunnings	Robert Chin	Security & Nursery Standards
		Nursery Industry Development
NGIV	David Reid	Officer
Benara Nurseries	Carole Fudge	Sales & Marketing Manager
NGINA	David Foster	CEO
NGIA	Chris O'Connor	Policy & Technical Officer
Elegant Outdoors	Mike Mehigan	Managing Director
Oasis Horticulture	Andrew White	General Manager
ProteaFlora	Rob Furniss	Operations Manager
Nursery Management Systems	Andy Cameron	Managing Director
		Senior Advisor – Industry
GS1 Australia	Joseph Taylor	Engagement
GS1 NZ	Eddie Guinness	Professional Service Analyst
Company	Apologies	Title
Home Timber & Hardware	Myra Grinter	Buyer - Greenlife
Nursery Traders	Tim Bunker	Managing Director
Masters	Jayson deForrest-Haddleton	Vendor Supply Chain Manager
		Industry Manager – Consumer
GS1 Australia	Sean Sloan	Goods



Meeting N	linutes	
ltem #	Description/Action Item	Action Items/Responsibility
1.	 Welcome, Apologies & Anti-Trust Joseph Taylor (GS1) welcomed attendees, read apologies and full anti- trust statement and handed across to the Work Group Chair Chris O'Connor. 	
2.	 Review previous meeting minutes and action items Chris O'Connor tabled the previous minutes as read and confirmed previous action items as complete. (See slides) 	
3.	 Review Numbering & Bar Coding Guidelines for Dummies one pager It was confirmed that the document has been produced and the group was invited to review. It was commented that reference should be made to noting the importance of recording specific barcode to businesses internal product/item code (if used) and to the plant specifications (Genus/species/cultivar/pot size) and other attributes as required. Other comments were made regarding the integration of the barcode/s into your existing business management/m.y.o.b/invoicing/database system. The group agreed to send any additional comments or input to Joseph Taylor for consideration and consolidation. 	ACTION – Group to send additional comments for inclusion in the N&BC guidelines for dummies one pager to Joseph Taylor – Completed.
4.	 GreenLife Value Proposition Confirmed objective is to map the GreenLife supply chain from plant production right through to retailer Final nursery/grower to participate in the production of this document was confirmed as Sonja Cameron (Cameron Nurseries) First Task Group meeting to take place within 2 weeks. 	•
5.	 GPC Codes Expanded to Horticulture Sector - Update Overview of GPC codes was presented (See slides) It was confirmed that a new work effort had commenced overseas to develop GPC horticultural standards in new classes, families and brick to more accurately classification of horticultural products (plant and flowers) The group agreed that Genus, Species, and Cultivar are key. Major effort on this is being spearheaded by GS1 Netherlands (See slides) 	 ACTION – GS1 to contact Michael Mowad at GS1 global for further information on GPC expansion into the horticultural sector. – In Progress



6	Ot	her Business and Next Steps	•	ACTION - Errol
0.	٠	Bar code Verification Reports – Carole Fudge (Benara) raised the issue		Kennedy to discuss
		of Woolworths requesting BCV's for all products and that printing		internally with WW's
		correct bar code size on labels is a challenge, potentially rejected by		the issue of them
		WWS and that new labels to facilitate such would cost more.		requiring BCV
	٠	Education & Training – Brief discussion took place around Databar with		reports for all
		key concern being the capability of retailer back end systems to scan		products in respect
		and accommodate data.		of Benara
	٠	Communications – Recent publication in Horticultural Journal was	٠	ACTION – Group to
		referenced and it was agreed to keep pushing articles in this		discuss further the
		publication. It was agreed that the Value Proposition document would		feasibility of working
		flesh out and promote the advantages of bar codes.		on a standardized
	٠	Data Template – it was suggested that the document that the grower		template for sharing
		is putting in their system is not too dissimilar to what is supplied to the		basic product data.
		supplier. The group briefly discussed a standardized industry template		
		for this basic product information and it was suggested that this could		
		potentially become a new body of work or objective for the group.		
8		Meeting Closed at 2:15pm		
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Meeting Minutes	HGAG GreenLife Work Group Meeting			Meeting	28/08/2014
Venue	GS1 Mt Waverley	Date	28/08/14	Time	Start time: 1.00pm
	GS1 Botany	Next Meeting	25/09/14	Time	Finish time: 2:30pm
Chair	Joseph Taylor	Minutes to be Taken By		Joseph Taylo	r – GS1

Company	Attendee	Title
		Inventory & Procurement
Home Timber & Hardware	Errol Kennedy	Manager
		Compliance Coordinator Bio-
Bunnings	Robert Chin	Security & Nursery Standards
Masters	Jayson deForrest-Haddleton	Vendor Supply Chain Manager
Masters	Patrick Duggan	Senior Vendor Quality Analyst
Masters	James Dowson	Vendor Supply Chain Specialist
NGINA	David Foster	CEO
NGIA	Chris O'Connor	Policy & Technical Officer
Elegant Outdoors	Mike Mehigan	Managing Director
Oasis Horticulture	Andrew White	General Manager
ProteaFlora	Rob Furniss	Operations Manager
Nursery Management Systems	Andy Cameron	Managing Director
		Senior Advisor – Industry
GS1 Australia	Joseph Taylor	Engagement
GS1 Australia	Sean Sloan	Industry Manager – Consumer Goods
GS1 NZ	Eddie Guinness	Professional Service Analyst
Company	Apologies	Title
Benara Nurseries	Carole Fudge	Sales & Marketing Manager
Home Timber & Hardware	Myra Grinter	Buyer - Greenlife
Nursery Traders	Tim Bunker	Managing Director
NGIV	David Reid	Nursery Industry Development Officer



Meeting Minutes				
ltem #	Description/Action Item	Action Items/Responsibility		
1.	 Welcome, Apologies & Anti-Trust Joseph Taylor (GS1) welcomed attendees, read apologies and full anti- trust statement and handed across to the Work Group Chair Chris O'Connor. 			
2.	 Review previous meeting minutes and action items Chris O'Connor tabled the previous minutes as read and confirmed previous action items as complete. (See slides) 			
3.	 Review Prioritisation of Work Group Objectives Numbering & bar coding for dummies 1 pager - Was discussed and a commitment was made to have this completed by the 18th September. Value Proposition Document – It was confirmed that 2 retailers have been confirmed namely Home Timber & Hardware and Elegant Outdoors, and 1 nursery/grower, namely ProteaFlora. It was asked if another nursery grower would volunteer to assist in the production of this document. Bio-Security – It was confirmed that a bio-security document already exists outlining what to do in the event of bio-security and that essentially this objective is complete. DataBar – It was suggested that the industry needs to look at Databar but that this would be a more long term objective over the next 4-5 years for 2018/19. The main concern was the retailer's current ability to scan Databar. RFID – This was again confirmed as a low objective, potentially 2016 and beyond. Master Data – Was confirmed as a puzzle that needs to be solved, so that there is a standardized way of sharing information from grower to retailer. 	 GS1 to complete 1 page numbering & Bar coding for dummies by 18th September and send to WG Chair. Andy Cameron to confirm another nursery/grower to participate in the production of the Value Proposition document. Chris O'Connor to send link to Bio- security document to the group. See below 		
4.	 Retailer issues with GreenLife The floor was opened to the retailers to comment on some of the typical issues handling GreenLife product. It was confirmed that legibility, seasonality, physical and mechanical were the issues with GreenLife and that number alignment was largely ok. It was confirmed that the smaller specialist entry level suppliers were 	 GS1 to look at GS1 US videos re: supply chain and share with the group. See below 		



	 Getting numbers and applying them were confirmed as the main issues for growers/nurseries. It was asked if there was an opportunity for "bundling" ie: label printer & GS1 membership? The group agreed however that an instructional video for Numbering & Bar Coding, showing the whole process in 30 minutes, who to speak to, what you need for bar code printing specific for GreenLife, would be of real benefit. It was confirmed that this could be hosted on the NGIA website as a Youtube video. The group also discussed the option of a survey to identify what are the current problems and that this could be added to the NGIA website post the Value Proposition document, which could be used as a reference. 	
5.	 GPC Codes It was asked if the schema would be of benefit ie: as basic information on an invoice and it was agreed that yes this would be beneficial. It was also commented that this would be useful when setting up a product in the retailers system and would be very powerful from a bio-security perspective. It was confirmed that GPC is just attribute values ensuring correct product identification. It was suggested that the schema could be listed on the NGIA website and that the schema could be built to accommodate Australian species. 	 Send more information on GPC codes to the group.
6.	 ProteaFlora Update Rob Furniss (Operations Manager) gave an overview of the recent GS1 engagement with ProteaFlora, confirming that having all internal processes bar coded and managing data efficiently were the main priorities. ProteaFlora is also looking at internal improvement & efficiencies in relation to total supply chain. 	 GS1 to work with the NGIA on customizing a GS1 consulting package for a cluster of NGIA members.
7.	 Other Business and Next Steps Groundswell Magazine – September publication on Numbering & Bar coding was shared with the group. GS1 Speaking Slots – Opportunities for speaking were discussed and it was suggested that the Tree & Shrub grower's forum was a good opportunity for future presentations. Next meeting Thursday 25th September 2014 Venue: GS1 Melbourne and Sydney Time: 1.00pm – 2.30pm 	Send September Groundswell article to Chris O'Connor
8.	Meeting Closed at 2:30pm	

You Tube video options:

<u>https://www.youtube.com/watch?v=3DMzfNmrR6g</u> or a bit shorter <u>https://www.youtube.com/watch?v=Aft2kdhrq5E</u>

Biosecurity Link The manual is here <u>http://www.ngia.com.au/Category?Action=View&Category_id=543</u>



And the policy document is here <u>http://www.ngia.com.au/Category?Action=View&Category_id=503</u>





Meeting Minutes	HGAG Advisory Council Meeting			Meeting	2/2014
Venue	GS1 Mt Waverley	Date	31/7/2014	Time	Start time: 10.30am
		Next Meeting	30/10/2014	Time	Finish time: 11:45am
Chair	Errol Kennedy	Minutes to be Taken By		Joseph Taylor	– GS1

Company	Attendee	Title
Dulux Group	Patrice Chan-Yam	Supply Chain Development Manager
John Danks	Errol Kennedy (Chair)	Inventory & Procurement Manager
Metcash	Michael Haire	GM eData Adminstration
Saint Gobain	Graham Loosely	Projects Manager- Supply Chain
Super Retail Group	John Hill	Implementation Manager
3M	Paul McNicholas	Business Services Manager ANZ
Mitre 10 (AU)	Sally Thompson	BA Team Leader
Marley (NZ)	Tanya Waddell	Chief Information Officer
Methven (NZ)	Kerry Lord	GM Operations
Placemakers (NZ)	David Pollard (Co-Chair)	GM Technology
Valspar Paint (NZ)	Nigel Sayers	Systems Manager
GS1 Australia	Maria Palazzolo	CEO
GS1 Australia	Sean Sloan	Industry Manager – Consumer Goods
GS1 Australia	Joseph Taylor	Senior Advisor – Industry Engagement
GS1 NZ	Shaun Bosson	Chief Operating Officer
GS1 NZ	Eddie Guinness	Professional Service Analyst
GS1 NZ	Vijay Todkar	Business Development Manager
Company	Apologies	Title
Repco	Jamie Walton	General Manager
Bunnings	Craig Joyner	Supplier Support Manager
Masters	Jayson deForrest-Haddleton	Vendor Supply Chain Manager
ED Oates	Simon Carroll	IT & Customer Service Manager
ITM (NZ)	Andrew Ryan-Kidd*	GM Finance & IT



Meeting I	Minutes	
ltem #	Description/Action Item	Action Items/Responsibility
1.	 Introduction Errol Kennedy (Chair) opened the meeting Maria Palazzolo provided a welcome 	Info only
2.	 Welcome, Apologies & Anti-Trust Sean Sloan (GS1) welcomed attendees, read apologies and full anti-trust statement. Resignation received from John Eccleton @ Winstone Wallboards. GS1 NZ seeking confirmation if replacement to be forthcoming Sally Thompson from Mitre 10 Australia joined the group Lynelle Small from 3M stood in as Delegate for Paul McNicholas Observers from Reece Plumbing in attendance (Clayton Newell & Marc Mosbauer) Attendee Register attached HGAG Advisory Council Attendance Li 	Info only
3.	 Review previous meeting minutes and action items Chair reviewed previous action items which were complete (See slides) HGAG Benchmarking Survey is being updated and a revised version will be sent to group for signoff Week Commencing 4th August along with a letter from the Chair / Co-Chair seeking respondents to complete the survey. Group is still seeking to obtain contacts within the Construction sector. Anyone with contacts at relevant organisations to send details to GS1 for following up. Product Image Specification discussion included with Master Data WG update by Michael Haire 	 Send final copy of survey to group for approval with letter from Chair / Co- Chair Group to send through contact details relating to Construction industry Eg Metricon / Porter Davis etc
4.	 What makes the Group successful and how do we report this? Measure success : Number of Retailers actively promoting GS1net / barcoding / EDI . Number of Suppliers working on different GS1 initiatives via active WGs. Relative success of each Work Group as defined by their Work Plans. Measure the effectiveness of implementing N&B at all levels of packaging i.e. Audits Number of Attendees at events i.e. Roadshow, Forum, Supply Chain Week etc. Guide and instruct active Work Groups to ensure Industry objectives are met. Work Group Updates 	 GS1 to provide sample reporting updates for approval at next meeting (Following Chair / Co-Chair review)
5.	All Workgroups have now met and completed a review of Objectives including Priority and Responsibilities. From a reporting perspective, the following contains an update from each Chairperson that has the highest priority item, any issues or roadblocks	



 Top priority – Review GSInet data set Issues / Roadblocks - Nil Notes – Product Images should be discussed and handled within the WG activities and no additional work group is needed to complete a review. OZC (Order to Cash) WG (John Hill – Super Retail Group) Top priority – Complete review of EDI MIGS v HIWG MIGS Issues / Roadblocks – Group needs to expand with more retailers and NZ participation (Danks / Masters) Notes – NZ to follow up possible interested parties Greenlife WG (Chris O'Connor – NGIA) Top priority – Finalise all Numbering & Barcoding related activities Issues / Roadblocks - Industry uptake; need to find leverage to make change Notes – NZ to follow up possible interested parties Greenlife WG (Chris O'Connor – NGIA) Top priority – Finalise all Numbering & Barcoding related activities Issues / Roadblocks - Industry uptake; need to find leverage to make change Notes – NZ to follow up possible interested parties Gotte / GDSN Release 3 Update If anyone would like more details about current Work Group activities, please feel free to contact Sean from GS1 or any of the Chairs noted above Detailed update on Project Zodiac and GDSN Release 3 was postponed indefinitely however updates are already being fed through the Master Data WG for now. All GSI the users will be individual communications regarding these projects. In nearly all cases, both time and resources will be needed to ensure business continuity when these projects go live in 2015 / 2016, though GS1 will be actively working with many companies individually to manage / mitigate as much as possible. Anyone interested in reading or reviewing the Timber section of the current Hardware Numbering & Barcoding Guidelines don to meet industry requirements. GS1 ca nupdate them followin		Master Data WG (Michael Haire – Metcash)		
 Issues / Noadblocks - Nil Notes - Product Images should be discussed and handled within the WG activities and no additional work group is needed to complete a review. O2C (Order to Cash) WG (John Hill – Super Retail Group) Top priority - Complete review of EDI MIGs v HIWG MIGs Issues / Roadblocks - Group needs to expand with more retailers and NZ participation (Danks / Masters) Notes - NZ to follow up possible interested parties Greenlife WG (Chris O'Connor – NGIA) Top priority – Finalise all Numbering & Barcoding related activities Issues / Roadblocks - Industry uptake; need to find leverage to make change Notes – H DataBar were a potential solution to including Batch Number on the pot, how many retailers could currently scan and decode this at POS? If anyone would like more details about current Work Group activities, please feel free to contact Sean from GS1 or any of the Chairs noted above Detailed update on Project Zodiac and GDSN Release 3 was postponed indefinitely however updates are already being fed through the Master Data WG for now. All GS1net users will be individual communications regarding these projects. In nearly all Cases, both time and resources will be neaded to ensure business continuity when these projects go live in 2015 / 2016, though GS1 will be actively working with many companies individually to manage / mitigate as much as possible. Cother Business Following the previous HGAG AC meeting, a query was raised to seek clarity on how certain timber products were managed / barcoded In summary, if the current Numbering & Barcoding Guidelines do not meet industry requirements, GS1 can update them following feedback from industry. Substantial effort was put into a review of these some years ago, so it is important to ensure these remain relevant. http://www.gs.au		Top priority – Review GS1net data set		
 Notes – Product Images should be discussed and handled within the WG activities and no additional work group is needed to complete a review. O2C (Order to Cash) WG (John Hill – Super Retail Group) Top priority – Complete review of EDI MIGs v HIWG MIGs Issues / Roadblocks – Group needs to expand with more retailers and NZ participation (Danks / Masters) Notes – NZ to follow up possible interested parties Greenlife WG (Chris O'Connor – NGIA) Top priority – Finalise all Numbering & Barcoding related activities Issues / Roadblocks – Industry uptake; need to find leverage to make change Notes – If DataBar were a potential solution to including Batch Number on the pot, how many retailers could current Work Group activities, please feel free to contact Sean from GS1 or any of the Chairs noted above 6. Zodiac / GDSN Release 3 Update Detailed update on Project Zodiac and GDSN Release 3 was postponed indefinitely however updates are already being fed through the Master Data WG for now. All GS1 the users will be impacted by these projects, so please be aware that in many cases there will be individual communications regarding these projects. In nearly all cases, both time and resources will be needed to ensure business continuity when these projects go live in 2015 / 2016, though GS1 will be actively working with many companies individually to manage / mitigate as much as possible. 7. Other Business Following the previous HGAG AC meeting, a query was raised to seek clarity on how certain timber products were managed / barcoded In summary, if the current Numbering & Barcoding Gidelines do not meet industry requirements, GS1 can update them following feed		 Issues / Roadblocks - Nil 		
 and no additional work group is needed to complete a review. OZC (Order to Cash) WG (John Hill – Super Retail Group) Top priority – Complete review of EDI MIGs v HIWG MIGs Issues / Roadblocks – Group needs to expand with more retailers and NZ participation (Danks / Masters) Notes – NZ to follow up possible interested parties Greenlife WG (Chris O'Connor – NGIA) Top priority – Finalise all Numbering & Barcoding related activities Issues / Roadblocks – Industry uptake; need to find leverage to make change Notes – If DataBar were a potential solution to including Batch Number on the pot, how many retailers could current work Group activities, please feel free to contact Sean from GS1 or any of the Chairs noted above 6. Zodiac / GDSN Release 3 Update Detailed update on Project Zodiac and GDSN Release 3 was postponed indefinitely however updates are already being fed through the Master Data WG for now. All GS1net users will be impacted by these projects, so please be aware that in many cases there will be individual communications regarding these projects. In nearly all cases, both time and resources will be needed to ensure business continuity when these projects go live in 2015 / 2016, though GS1 will be actively working with many companies individually to manage / mitigate as much as possible. 7. Ther and how this is managed in today's environment Following the previous HGAG AC meeting, a query was raised to seek clarity on how certain timber products were managed / barcoding Guidelines do not meet industry requirements, GS1 can update them following feedback from industry. Substantial effort was put into a review of these some years ago, so it is important to ensu		 Notes – Product Images should be discussed and handled within the WG activities 		
02C (Order to Cash) WG (John Hill – Super Retail Group) • Top priority – Complete review of EDI MIGS v HIWQ MIGS • Issues / Roadblocks – Group needs to expand with more retailers and NZ participation (Danks / Masters) • • Notes – NZ to follow up possible interested parties • Greenlife WG (Chris O'Connor – NGIA) • • • Top priority – Finalise all Numbering & Barcoding related activities • • Issues / Roadblocks – Industry uptake; need to find leverage to make change • • Notes – If DataBar were a potential solution to including Batch Number on the pot, how many retailers could currently scan and decode this at POS? • If anyone would like more details about current Work Group activities, please feel free to contact Sean from GS1 or any of the Chairs noted above • Info only 6. Zodiac / GDSN Release 3 Update • • Info only • Detailed update on Project Zodica and GDSN Release 3 was postponed indefinitely however updates are already being fed through the Master Data WG for now. • Info only 7. Other Business • Info only • Info only 7. Other Business • Info only in the Aster Data WG for now. • Info only 8.<		and no additional work group is needed to complete a review.		
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Discussion was had as to how to review and audit store barcodes for Direct to Store deliveries, which do not get the same attention as DC deliveries (from a quality review perspective) Discuss with Errol how to complete instore Audits on DTS lines only		 <u>http://www.gs1au.org/assets/documents/info/industry_guidelines/gl_hardware.pdf</u> 		download these at
 deliveries, which do not get the same attention as DC deliveries (from a quality review perspective) Discuss with Errol how to complete instore Audits on DTS lines only 		Discussion was had as to how to review and audit store barcodes for Direct to Store		the following url:
perspective) how to complete instore Audits on DTS lines only		deliveries, which do not get the same attention as DC deliveries (from a quality review	•	Discuss with Errol
DTS lines only		perspective)		now to complete
				DTS lines only



	\mathbf{v}		
8.	 Next Meeting: October 30th 2014 10am – 12pm 	•	Info only
	Meeting Closed at 11:45am		



Meeting Minutes	HGAG GreenLife W	ork Group Meeting	Meeting	29/05/2014	
Venue	GS1 Mt Waverley	Date	29/05/14	Time	Start time: 1.00pm
	GS1 Botany	Next Meeting	24/07/14	Time	Finish time: 2:30pm
Chair	Joseph Taylor	Minutes to be Taken By		Joseph Taylor	– GS1

Company	Attendee	Title	
John Danks	Errol Kennedy	Inventory & Procurement Manager	
John Danks	Myra Grinter	Buyer - Greenlife	
Bunnings	Robert Chin	Compliance Coordinator Bio-Security & Nursery Standards	
NGIA	Chris O' Connor	Policy & Technical Officer	
NGINA	David Foster	CEO	
Elegant Outdoors	Mike Mehigan	Managing Director	
Oasis Horticulture	Andrew White	General Manager	
Benara Nurseries	Carole Fudge	Sales & Marketing Manager	
GS1 Australia	Joseph Taylor Senior Advisor – Industry En		
GS1 Australia	Troy Denyer	Advisor – Industry Engagement	
GS1 NZ	Eddie Guinness	Professional Service Analyst	
Company	Apologies	Title	
Masters	Jayson-deForrest-Haddleton	Vendor Supply Chain Manager	
Bunnings	Cherie Bolton		
Nursery Traders	Tim Bunker	Managing Director	
Mitre 10	Janine Tam	Manager of e-Commerce	
NGIV	David Reid	Nursery Industry Development Officer	
GS1 Australia	Sean Sloan	Industry Manager – Consumer Goods	



Meeting Minutes					
ltem #	Description/Action Item	Action Items/Responsibility			
1.	 Welcome, Apologies & Anti-Trust Joseph Taylor (GS1) welcomed attendees, read apologies and full anti-trust statement. 				
2.	 HGAG Advisory Council Update & Group Charter Joseph Taylor (GS1) outlined the structure of the new HGAG Advisory Council and the position of the GreenLife Work Group within that structure. 				
3.	 Review previous meeting minutes and action items Joseph Taylor (GS1) reviewed previous action items which were complete except for two (See slides) 	 Review the GPC codes and provide feedback to GS1. Nominated volunteers to select a few of their plants/products and find a relevant GPC code for each and then to assign Attribute Values & Codes. 			
4.	 Call for Work Group Chair Responsibilities and role of the Work Group Chair were outlined and nominations were called for. Chris O'Connor (NGIA), nominated for the WG Chair. The group unanimously approved this nomination. Therefore Chris O'Connor (NGIA) was elected as Work Group Chair. 	 Work Group Chair to be invited to HGAG Advisory Council meetings. 			
5.	 Discuss and Agree Work Group Objectives & Measures The proposed Work Group objectives and measures were discussed in detail. Numbering & Bar Coding Guidelines - It was agreed that Bio-Security needs to be mentioned in section 10 of the Hardware N&BC Guidelines with a reference to the NGIA website. Chris O'Connor (NGIA) confirmed that the Bio-Security document being worked on by the NGIA is currently "on the back burner" GreenLife Value Proposition – It was thought that this needed to be more high level and demonstrate bar coding to track stock, for inventory management, data tracking and B2B on an e-business level. It was confirmed that a simple 1 page document articulating the supply chain benefits & opportunities of bar coding, ie better customer service etc was required. An additional more detailed document would then be required. It was felt that the major Retailers and Industry Associations should then send this document out. GS1 and the GreenLife industry group could also send. It was recommended to distribute this document also to the pot manufacturers/label printers so they are included in the education piece. Further discussion took place regarding the communication of the Value Proposition Document and it was suggested that "Groundswell" & "Horticultural Journal" magazines be used for publication. The group was asked to consider forthcoming events where GS1 could present including the 	 Update section 10 of Hardware N&BC guidelines, remove seeds example and replace with potted plants and add reference to Bio- Security and link to NGIA website and Bio Security document. One page value proposition document to be produced & approved and then communicated to the sector. Retailer assistance confirmed, need suppliers involvement. Groundswell and Horticultural Journal 			



	 Melbourne was discussed and suggested for a 1 day training session for GreenLife. It was confirmed that the NGIA is heading down a path of e- learning and could include numbering & bar coding and supply chain management. Bunnings confirmed that it would also support an e-learning approach. It was asked if e-learning could be included as an additional objective? Myra Grinter (Danks) and Mike Mehigan (Elegant Outdoors) volunteered to help develop the Value Proposition document from the retailer side. It was felt that a dummies guide on how to implement GS1 bar codes in a nursery was required, ie need bar codes, need systems, software and hardware. Potential funding for this was also discussed. Measurement of WG Objectives – It was suggested that a survey should be developed for GreenLife and it was agreed that this would need the support of both retailers and industry associations. Retailers & Suppliers lists need to be sourced in order to send the survey. Bar Code audits were also suggested ie of Plants Plus branded products or independents, as a means of providing feedback on the use and quality of barcoding in the industry. It was mentioned as a concern that the independents have a problem with infrastructure. 	 communicate Value Proposition. Group to consider forthcoming events for GS1 presentation. Include a new objective around e- learning. GS1 to develop a dummies guide to Numbering & Bar Coding for GreenLife GS1 to send draft survey questions to ask and also send Hardware survey to the group. GS1 to conduct a bar code audit with Danks and share the results with the group.
6.	 Update on recent Industry discussions. Joseph Taylor confirmed the recent positive discussions with the NGIA and state associations. 	•
7.	 Review Work Plan The work Plan was reviewed and it was agreed that this needed to be updated following the approval of the work group objectives. 	 Group to provide feedback on what objectives were deemed low, medium and high in terms of priority GS1 to update Work Plan in conjunction with the group.
8.	 Other Business and Next Steps Feedback from the group was positive regarding the content and structure of the meeting Andy Cameron's participation in the group was discussed because as a solution provider it was thought that there may potentially be a conflict of interest. However the group agreed that given Andy's experience in the sector that he would be a considerable asset to the group and should therefore be invited to future work group meetings. Robert Chin (Bunnings) suggested contacting the International Plant Propagators Society, which is essentially a guild and also includes NGIA members. Dates for forthcoming meetings were discussed with July, September and November proposed. It was felt that September was a bad month for most and that this should be brought forward to August. 	 Invite Andy Cameron to future work group meetings. GS1 to make contact with International Plant Propagators Society. GS1 to send out



		meeting requests for 2014
9.	 Next Meeting: Next meeting Thursday 24th July 2014 Venue: GS1 Melbourne and Sydney Time: 1.00pm – 2.30pm 	•
10.	Meeting Closed at 2:30pm	





Hardware GS1 Action Group – Greenlife Task Group meeting minutes

Date: May 9th, 2013

Face to Face:	GS1 Melbourne office
By Telephone:	Telecon Details Australia Toll Free: 1800 556 015 New Zealand: 0800 152 688 Conference code: *90551745*

1.0 Meeting Opening Activities

1.1 Introductions, Anti-Trust

John Szabo opened the meeting and welcomed the attendees and reiterated the antitrust guidelines for the meeting. John also welcomed Tim Bunker, Myra Grinter and Mike Mehigan to their first meeting.

1.2 <u>Approval of Minutes</u>

- **February 14th, Meeting -** the action items from the previous meeting were reviewed.
- 1.3 Agenda Finalization John Szabo outlined the discussion topics for the meeting

2.0 Meeting Topics

2.1 Work Queue Review

Topic Number & Description	Responsible Person	Comments
1. Review of Action Items	GS1	John Szabo tabled the action items arising from the previous meeting and provided an update on their progress. For specific details refer to section 2.3 below.
		With regards to the action item on reviewing GPC codes, John noted that to date he had not received any feedback and suggested that members of the task group tried to assign existing GPC codes to their products to see how good a fit these were.
		It was agreed that GPC codes were an important component of classifying plants particularly for reporting and analysis purposes.
		It was also agreed that members of the group would





		 attempt to find relevant Brick Codes and Attribute values for a selection of their products. The purpose of the mapping would be to see how developed the current GPC code list is and if any enhancements were required. The following people volunteered to have a go at finding GPC codes for a selection of plants: Jayson deforest-Haddleton (Masters), Andrew White (Oasis Nursery)), Andy Cameron (Nursery Management Systems), Carole Fudge (Benara Nursery), Tim Bunker (Nursery Traders QLD) and Janine Tam (Mitre 10). If others want to participate, you are most welcome. <u>Action:</u> Nominated volunteers to select a few of their plants/products and find a relevant GPC code for each and then to assign Attribute Values and Codes. It was also requested that clear instructions be provided to help with completing this activity: Instructions: Select a number of different plants and seedlings Using the word document provided, for each plant attempt to find the most relevant GPC brick code. If one does not exist, please note it in the document If a GPC Brick code has been found, complete assigning the next level of value for Attribute Type and Code Any identified gaps please note in the word document. If a Brick Code needs to be split, please also make note of that as well as any missing Attribute codes and values
2. GTIN Allocation Rules one pager review	All	John Szabo updated the group on progress of the GTIN allocation rules document (when to change a GTIN) and proposed that the following main subject areas be included in the one page document: • Quantity and Content Changes • Brand • Size Changes • Promotions • Measurements The group agreed that these were good to include in





	the document.
	The conversation then focused on the area of Promotions.
	It was commented that if a gift is added to the plant and thereby adding value, then a new GTIN would be required for that product.
	Jayson from Masters noted that anything that impacted the supply chain would require a new GTIN.
	e.g. Stock made and marked specifically for Mother's day would need to be managed accordingly to ensure that no stock was left over following mother's day. This was true for all Seasonal products and special events.
	It was also mentioned that where it was important to track sales and marketing activities it was recommended that new GTINs be assigned to products.
	There was group support for the above and John agreed to model specific examples in the GTIN allocation document.
	A question regarding promotions and Retailer specific pricing printed on labels was raised. What happens when a special promotional price was offered to customers? It was agreed that new GTINs would not be required in these instances as the product has not changed.
	Carole from Benara Nurseries commented that they re-label stock with Customer specific pricing for many of their customers. The GTIN does not change, but the price does vary from customer to customer. Their product is applied an initial barcoded label which is then over-stickered by the Customer specific label.
	No resolution was made with respect to printing pricing on labels as this will be covered once discussion commences on labeling formats etc.
	The next aspect of change raised related to the area of changes to packaging. E.g. plastic pot to bio- degradable pot.
	It was asked if this would constitute a change in





		GTINs. John commented that if the change in material was declared in the product that this would require a change in GTIN.
		Jayson from Masters raised the point that many organisations were signees to the Packaging Covenant and were required to report on packaging materials.
		John indicated that he would take up the discussion on packaging material changes internally at GS1 to see what the thoughts and directives were there.
		<u>Action</u> : John Szabo to review GTIN allocation rules with regards to changes in packaging materials and provide feedback to the group and incorporate requirements into GTIN Allocation rules document.
3. Value Proposition Discussion	GS1	John Szabo detailed to the group the work carried out by GS1 with the Agribusiness sector in developing a Value Proposition document for them.
		It was requested that John send out the Agribusiness document to the group and that they would provide feedback to John on what they believe should be included a value proposition for Small to Medium Nurseries as an initial focus.
		Action: John Szabo to send out Agribusiness Value Proposition document to the group for review
		<u>Action</u> : Review Agribusiness Value Proposition document and provide feedback to GS1 on what should be included for a Greenlife small to medium Nursery value proposition document.
4. GS1 GoScan app review	GS1	John Szabo presented the group an overview of the new GS1 GoScan app that GS1 had developed to assist consumers in identifying ingredients, nutritional information, allergens etc. in food items.
		GS1 had been approached by an interested customer to see if the app could be modified to include Greenlife products, hence why John tabled this topic to the group.
		There was general interest in an APP, with many different views on what information could be included and therefore usage by the industry ranging from Consumers through to Landscapers (who represent 50% of the Greenlife market).





		Chris O'Connor from the NGIA mentioned that he would discuss the idea of Apps at board level within the NGIA.	
5. Other Business	All	With regards to Supply Chain Week, it was requested that the session dates be sent out to the group.	
		It was also asked if the Breakfast session could be moved to a location that was closer to the growers in Sydney e.g. North Western Suburbs	
		Action: GS1 to send out Supply Chain week dates	
		Action: GS1 to see if Greenlife Breakfast seminar can be moved to an alternate location closer to the growers.	

2.2 Project Plan/Business Plan

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Topic Number & Description	Responsible Person	Meeting Goal/Objective

2.3 Review of Action Items

Topic Number & Description	Responsible Person	Status
John Szabo to update the 2013 Work plan	GS1	Completed
and include the Supply Chain week event.		
Andy Cameron to source relevant images to	Andy	Images received
be used in the GTIN Allocation Rules	Cameron	
document		
NGIA to send through link to Plant labeling	NGIA	Completed. Link sent through to
Policy document		GS1
GS1 to add Plant labeling Policy document	GS1	In progress
link to GTIN allocation document		
GS1 to discuss with Grocery team how they	GS1	In progress
manage common SKU products e.g.		
Bananas that have a PLU (Product Look Up)		
number		
GS1 to send out draft GTIN Allocation rules	GS1	In progress
to the group for additional comment and		
feedback		
Review the Greenlife section of the	All	Ongoing activity
Numbering and Bar coding guidelines		
document		
Review the GPC codes and provide	All	In progress
feedback to John Szabo at GS1		
Errol Kennedy to provide Plants Plus contact	Errol	Completed
details to GS1. GS1 to send out invites	Kennedy &	
accordingly	GS1	





2.4 Additional Action Items Arising

Topic Number & Description	Responsible Person	Meeting Goal/Objective
Nominated volunteers to select a few of their plants/products and find a relevant GPC code for each and then to assign Attribute Values and Codes	As per nominations	Review current GPC codes and identify if any gaps exist.
John Szabo to review GTIN allocation rules with regards to changes in packaging materials and provide feedback to the group and incorporate requirements into GTIN Allocation rules document	GS1	Ensure GTIN allocation rules clearly identify when to change a GTIN when packaging materials change e.g. Plastic to Bio-degradable
John Szabo to send out Agribusiness Value Proposition document to the group for review	GS1	Provide the group with an example of how a Value Proposition may look
Review Agribusiness Value Proposition document and provide feedback to GS1 on what should be included for a Greenlife small to medium Nursery value proposition document	All	Assist in build of a value proposition for small to medium growers
GS1 to send out Supply Chain week dates	GS1	Sydney session: Wednesday Sept 11 th Melbourne Session: Wednesday Sept 18 th Draft agenda attached
GS1 to see if Greenlife Breakfast seminar can be moved to an alternate location closer to the growers in Sydney.	GS1	Most growers are located around North West Sydney making Botany a difficult suburb to get to in Sydney. Moving the location may assist in getting greater number of attendees.

2.5 Discussion Topics for next meeting

Topic Number & Description	Meeting Goal/Objective
1. Review Action Items from Previous Meeting	
2. Update on work plan	
3. Continue review of GTIN Allocation rules one page	
4. Overview of draft Value Proposition documents	
5. Begun Label formatting discussions	
6. Other Business	

2.6 Any other Business

Topic Number & Description	Meeting Goal/Objective

3.0 Meeting Closure





3.1 Next Meeting August 28th





Attendance List

Company	Name	Title	Phone	Mobile	Email	Attendee
GS1 Australia	John Szabo	Industry Manager	(03) 9550 3483	0419 338 842	john.szabo@gs1au.org	Yes
GS1 Australia	Joseph Taylor	Senior Advisor	(02) 9695 2227		joseph.taylor@gs1au.org	Yes
GS1 New Zealand	Eddie Guinness	Professional Services Analyst	+64-9-820-3791		Eddie.guinness@gs1nz.org	Yes
NGIA	Chris O'Connor	Policy and Technical Officer	(02) 8861 5110		Chris.oconnor@ngia.com.au	Yes
NGINA	David Foster	CEO	(02) 9679-1472		davidfoster@ngina.com.au	Yes
NGINA/Nursery Management						
Systems	Andy Cameron		(02) 9653-3992		andy@nurserymanagement.com.au	Yes
Masters	Haddleton	Vendor Supply Chain Manager	(02) 8885-1636		JdeForrest-Haddleton@masters.com.au	Yes
Danks	Errol Kennedy	National Inventory and Procurement Manager	(03) 9264 5119		ekennedy@danks.com.au	Apology
Bunnings NZ	Cherie Bolton	Merchandise Compliance Coordinator	+64 (9) 573 4343		cherie.bolton@bunnings.co.nz	Apology
Mitre 10	Janine Tam	Manager eCommerce	(03) 9703-4545		itam@mitre10.com.au	Yes
Mitre 10 NZ	Mike Lee	Information Services Analyst	+64 (9) 442 9988		mike.lee@mitre10.co.nz	Apology
Benara Nurserv	Carole Eudoe	Sales and Marketing Manager	+61 (8) 9561 9053	+61 414 375 000	carole@benara.com.au	Ves
	Andrew White	General Manager	03 5008 3237	0/25 796 9/2		Vas
			07 2022 4027	0720130342		Vee
			07 3823 1027		um@nurserytraders.com.au	res
Plants Plus/Danks	Mrya Grinter	Greenlife Buyer	(03) 9264-5067		MGrinter@danks.com.au	Yes




Company	Name	Title	Phone	Mobile	Email	Attendee
Elegant Outdoors	Mike Mehigan		(02) 9449-1987		mike@elegantoutdoors.com.au	Yes

Appendix 4

Forums, Conferences and Workshops



2013 NGIV-IPPS CONFERENCE PROGRAM HORTICULTURE: MY BUSINESS, MY PASSION

	WEDNESDAY - 15TH MAY 2013				
10.00am	5.00pm	Annual Golf Tournament	Albert Park Golf Course		
10.00am	5.00pm	Pre Conference Tour	Botanical Gardens, Rooftop Gardens		
10.00am	3.00pm	IPPS Board Meeting	Sebel Room		
5.30pm	7.30pm	Conference Registrations			
7.00am	8.30pm	Dinner	Cocktail Reception—The Sebel on Albert Park		
	THURSDAY 16TH MAY 2013				
			PASSION FOR SUCCESS		
8.30am	8.40am	Introduction	MC - Glenn Fenton		
8.40am	8.50am	Welcome	NGIV/IPPS Presidents short address - David Howard/Peter Lewis		
8.50am	9.00am	Opening Address	TBC		
9.00am	9.15am				
9.15am	10.15am	Realising an Olympic Dream	Stephen Bradbury		
10.15am	10.45am	MORNING TEA			
			Passion of Youth - Clive Larkman MC		
10.45am	11 10am	Plant Production in China—Challenges &	Datar Lawis		
11 10am	11.100m	Impressions of Australia and South Africa	Senzo Khanvile		
11.100m	11.50am	NextGen Youth Presentation			
11.50am	12 20pm		Prad Smith - Praap Motorcycles		
11.30aill	12.30411	DIBREST ASSEL IS TOULSEII	brau Shinth - braap Motorcycles		
12 2000	1.20 mm				

	Business Commitment						
		TECHNICAL STREAM - Dav	vid Reid		B	USINESS STREAM - Alan Holle	ensen
		Integrated Pest Management					
1.30pm	2.00pm	in the Nursery	Paul Horne—IPM Technologies	1.30pm	2.00pm	Secrets all Buyers look for from Suppliers	Chris O'Connor
2.00pm	2.30pm	Myrtaceae Rust	David Smith—DPI Greg Fraser—CEO, Plant Health	2.00pm	2.30pm	Succession Planning	Leigh Riley
2.30pm	3.00pm	Industry Biosecurity Plan	Australia	2.30pm	3.00pm	Drugs & Alcohol in the Workplace	Sheena Kane
3.00pm	3.30pm	AFTERNOON TEA		3.00pm	3.30pm	AFTERNOON TEA	
3.30pm	4.00pm	Water Management	John McDonald - NGIQ	3.30pm	4.00pm	Performance Management	Helen Canny
4.00pm	4.30pm	Weed Management Strategies in the Nursery	Dr Samuel Stacey: Everris	4.00pm	4.30pm	Employer of Choice—Case Study	Simon Napthine -Tarrawarra Winery
4.30pm	5.00pm	Future Trends in Potting Media	Kevin Handreck—CSIRO	4.30pm	5.00pm	Motivating Staff	Helen Canny
5.00pm	5.30pm	PRE - DINNER DRINKS					

5.30pm Bollywood Night @ Mod Oz Café & Bar, 492 St Kilda Road, Melbourne

FRIDAY- 17TH MAY 2013

7.00am	8.00am	Breakfast	IPPS Fellows & NGIV Life Members - IPPS & NGIV Presidents
	8.30am	Registration	
		3 TOURS (6 Buses)	
8.15am	5.00pm	TOUR 1	PGA, Agribio Centre, Metro Trees, (One more)
8.45am	5.15pm	TOUR 2	Metro Trees, Agriobio Centre, PGA (One more)
8.30am	5.00pm	TOUR 3	Immij, PGA, Agribio Centre, Melbourne Zoo
8.45am	5.00pm	TOUR 4	Melbourne Zoo, Agribio Centre, PGA, Immij
8.15am	5.00pm	TOUR 5	Masters, Rivers GC, Agribio Centre, (One More)
8.30am	5.15pm	TOUR 6	Agribio Centre, Rivers GC, Masters (One More)
5.30pm		FREE NIGHT	Football, Restaurant

SATURDAY - 18TH MAY 2013

Commitment to our Profession

Commitment to Goals - Euan Laird MC

7.30am	8.30am	Registration					
8.30am	8.40am	Introduction	Euan Laird—MC				
8.40am	9.00am	Global finances and Australian Impacts	Marc Soccio - Rabobank				
9.00am	9.20am	Hort R & D—The Next Five Years Setting Appropriate Financial Goals for	John Lloyd, Managing Director H	IAL			
9.20am	9.50am	your Business Benchmarking Productivity & Financial	Jason Cunningham				
9.50am 10.15am	10.15am 10.45am	Performance MORNING TEA	Charles Thompson—RMCG				
			Commitment to Horti	culture	- Glenn	Fenton MC	
10.45am 11.15am	11.15am 11.35am	Driving Innovation—Plant Breeding Well Being and Plants Putting Plants on the Front Page -	Mark Lunghusen Jane Edmanson				
11.35am	12.00 M	Panel Discussion	Jim Fogarty, Debra Templar & Ja	ne Edmans	son– Mode	rated by Peter Wilkins (TBC)	
12.00 M	1.00pm	LUNCH					
	Business Commitment						
1.00 mm	1.25 mm	TECHNICAL STREAM - Anthony Kac	henko MC			BUSINESS STREAM - Alan Ho	llensen MC
1.00pm	1.25pm	Propagation & Classification of Rare	Don Teese—Yamina Collectors				
1.25pm	1.50pm	Plants Ornamental Eucalyptus —	Nursery Dr Kate Delaporte—University	1.00pm	1.45pm	How to Make your Business Lean	Craig Driscoll—Lean Management
1.50pm	2.15pm	Something for Everyone Challenges faced in creating green	SA	1.45pm	2.15pm	Bunnings Biosecurity Category Management—Masters Case	Robert Chin—Bunnings
2.15pm	2.40pm	roofs, walls and facades	John Rayner	2.15pm	2.40pm	Study	Anne McKeon - Masters
2.40pm	3.10pm	AFTERNOON TEA		2.40pm	3.10pm	AFTERNOON TEA	
3.10pm	3.35pm	Greenhouse Production—The Europe-	Will McIntosh	3.10pm	3.40pm	Communication Innovations	Ross Monaghan - Deakin
3.35pm	4.00pm	agement	Dr Graeme Smith	3.40pm	4.10pm	Future of Apps	Danny Gorog - Outware Mobile
4.00pm	4.25pm	Organic Growing Enchancing Phyto Nutrients in Vegeta-	James Gardner	4.10pm	4.30pm	Retail—POS & R&D Applying Social Media to the Nursery	Stella Minehan
4.25pm	4.50pm	bles	Rod Jones/Bruce Tomkins	4.30pm	5.00pm	Industry	Debra Templar
6.45pm	5.45pm 7.30pm			PRE - DI	NNER DRIN	IKS	
7.30pm	11.30pm		CONFERENCE DINNER - NGIV-I	PPS AWAR	DS - The S	ebel Albert Park—GRAND BALLROOM	
			SUNDAY - 1	L9TH M	AY 2013		
			MC - Cli	ve Lark	man		
9.00am	9.20am	National Plant Labelling Guidelines	Anthony Kachenko - NG	IA	inan		
9.20am	9.40am	National Urban Forest Alliance	Robert Prince - NGIA				
9.40am 10.10am	10.10am 10.30am	Biosecurity—Who's Pest is it Anyway LED Lighting in Propagation Technology	Stuart Holland—DPI Karen Brock—CEO NGIT				
10.30am	11.00am	MORNING TEA					
11.00	44.20	From Desert to Oasis—Construction of	Oman				
11.00am	11.20am	Botanical Gardens	Buthaina Rashid Al Raha	ili & Hanan	i Salim Al M	loqbali	
11.20411	11.50411	Improving Plant Growth with Selective	Breed-				
11.30am	11.40am	ing	Will Ashburner—Hanco	cks Bulbs			
11.40am	11.50am	Scholarship Award Winner	NGIV/T&S Scholarship w	/inner			
12.15pm	1.15pm			gers club			
1.15pm	2.45pm	Question Box	Clive Larkman & Ian Toll	ey MC			
2.45pm	3.00pm	2014 Presentations - IPPS, NGIA, NGIV 2	2015				
DD		V CONNECTED BV.					
FR	JUDL	I SPONSORED BI:					
			Department of Primary Industries	G.	Greenhi li s Propagati Nursery mu		s Hantmark Ball
Vic	toria		no courtere reastrone	:		-	· · · · · · · · · · · · · · · · · · ·
KOOT	ENAY PARK	NATIONWIDE TREES			Таказ	SHO BANGALAT	



16th July – Speaker program John Lees – How to make selling a safer bet - don't roll the dice Mark Bunn – How to make your life and work a safer bet Lachlan Baird – Know in advance what bets you should be taking on your finances. Chris O'Connor – Deal the retailers a full house Anthony Kachenko - Influence the influencers

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Nursery & Garden Industry Western Australia

Fostering Excellence & Business Resilience NGIWA State Conference

25 June 2013

BURSWOOD ON SWAN FUNCTION CENTRE River Room, 1 Camfield Drive Burswood

Schedule

Timing	Details	Speakers	Topics
8.00 - 8.15am	Registration		
8.15 - 8.30am	Introductions, Formalities, Housekeeping	MC, President, CEO, IDO	
8.30 - 9.05am		Janine Mendel, Cultivart (Landscape Designer)	"Greening Perth". Contemporary trends and plant palettes for our drying climate. A collaborative approach between Nurseries and Landscape Designers Understanding how designers work, the emerging trends in landscape design and the plant palettes that reflect these trends: "But I don't really like native plants" or "I only want natives because I don't want to do any maintenance": These are the catch phrases designers are regaled with by propective clients. Janine will talk about how, with a more eclectic approach to plant selection we can still respond to a changing climate.
9.05 - 9.35am		Digby Growns, Botanic Parks and Gardens Authority (BGPA - Senior Plant Breeder)	Plant breeding: process and challenges Research into new technology developments in plant tissue culture, biotechnology, grafting and plant breeding.
9.35 - 9.50am	Morning Tea Break		
9.50 - 10.15am		Harlen Henderson, Plants4Perth (General Manager)	How we found a niche market, streamline operations and distribution, and capitalised on technology via social marketing General Manager Harlen Henderson says Plants4Perth.com.au fills enormous gaps traditional suppliers have ignored. "People do not have the time to traipse around the suburbs looking for the plants that will best fill their garden – particularly when the same job can be done from home over the net – freeing up their time."
10.15 - 10.45am		Milton Vadoulis, Vadoulis Garden Centre Sth Australia (owner)	Clever retailing, and Get Dirty with Milton Milton is always looking at ways to improve his business and make it more profitable as well as promoting the essential benefits gardening provides us all.
10.45 - 11.00am	Panel – Garden Centre	Milton Vadoulis, Harlen Henderson, Jackie Hooper	
11.00 - 11.30am		Chris O'Connor, NGIA (Technical & Policy Officer)	Confessions of a Buyer: An insight into what's on the other side. Ever wondered what a Buyer is looking for? Chris will discuss some of the key things he looked for when dealing with growers, and some of the tips he had for both his retailers and growers.
11.30 - 12.15pm		Reuben Taylor, ActionCoach (Business Coach)	"Creating Raving Fans - Turning your best customers into salespeople" Make the complex simple, and create real bottom line results for businesses.

Timing	Details	Speakers	Topics
12.15 - 12.30pm	Panel - Business Matters	Reuben Taylor & Chris O'Connor	
12.30 - 1.20pm	Lunch Break		
1.20 - 2.00pm		Helen Frost, Red HotHealth (Nutrition Educator)	"Fuel Up" for HOTHealth. The Keys to a Powerful, Successful & Healthy Life Learn through a whole new connection to your body, food and nutrition. Walk away feeling excited, equipped and willing to take the easy steps to having up to 50% more energy, less stress and amazing personal and performance achievements
2.00 - 2.15pm	Short Break		
2.15 - 2.45pm		Anthony Kachenko, NGIA (National Environmental and Technical Policy Manager)	Topic: Influencing the influencers - how to get more greenlife in the Urban environment Anthony will detail initiatives the Australian nursery industry are undertaking to educate and influence key stakeholders responsible for planning, implementing and managing greenspace in communities across Australia. An overview of key industry research programs and business development activities will be explained including recent Australian research from CSIRO that links greenspace to a reduction in mortality during heat events as well as latest industry NewsPoll data. Activities arising from the National Urban Forest Alliance will also be discussed.
2.45 - 3.15pm		John McDonald, NGIQ (Nursery Industry Development Manager)	BioSecure HACCP & Market Access BioSecure <i>HACCP</i> is the on-farm biosecurity program for production nurseries in Australia. The program validates many of the Best Management Practice pest and disease strategies employed under the Nursery Industry Accreditation Scheme Australia (NIASA) and adds quarantine specific activities required to demonstrate compliance. BioSecure <i>HACCP</i> is a set of protocols and procedures that enable a business to manage biosecurity risks through hazard analysis and critical control point intervention. These establish an effective internal quarantine process for both domestic and international market access for plant material.
3.15 - 3.30pm	Afternoon Tea brea	ak	•
	Questionnaire/ Fee	edback Forms to be comp	leted
3.30 - 4.00pm		Neil Marriott	How will your business adjust to new water policies and regulations? How will further water restrictions impact on your business? What are watering options for your business? Alternate water supplies?
4.00 - 4.15pm	Panel - FMS	Anthony Kachenko, John McDonald, Neil Marriott	
4.15 - 4.30pm	Wrap Up Panel	CEO, President, IDO	

Speakers



Janine Mendel

Janine Mendel embarked on her career as a landscape designer 22 years ago. She has won many awards for her gardens and has designed more than 1000 residential landscapes from tiny contemporary courtyards to large formal estates. She is most sought after for her unique, sometimes cutting edge designs for small outdoor spaces.

Janine is also the author of two books, the most recent being Urban Sanctuary 'designing small gardens'. (Hardie Grant 2012) This book is a timely masterclass in small garden design, and an exciting showcase for a diverse range of contemporary urban landscapes. At the heart of Janine's design approach is sustainability and Urban Sanctuary provides the guidance and inspiration we need to make environmentally sustainable choices to create our own enduring urban gardens.

Janine has travelled extensively and has always had an abiding interest in the built environment.



Digby Growns

Digby Growns (B (Hort Sci) Hons) is the Senior Plant Breeder at the Botanic Parks and Gardens Authority in Western Australia, which manages Kings Park and Botanic Garden, and Bold Park. In this role he has overseen the release of varieties such as Anigozanthos rufus 'Kings Park Federation Flame', Scaevola aemula 'Blue Print' and Alyogyne wrayae 'Blue Heeler'.

Digby has worked for many years on the development of Australian native plants for horticulture, including 12 years at the Western Australian Department of Agriculture and Food (DAFWA), where he led the Floriculture sub-program. In this role he was responsible for the release of over 40 new varieties of native plants including 20 new varieties of waxflower. He has led research into new technology developments in plant tissue culture, biotechnology, grafting and plant breeding.



Harlen Henderson

Plants4Perth.com.au was the brainchild of Harlen Henderson and his mother, Margaret Stokes. The business started trading as Perth's first online nursery in 2008 and has seen excellent growth ever since. The basic premise was to provide an easier way for busy consumers to purchase their plants and garden products online, in their own time, and have them delivered in time to plant at the weekend.

Harlen and Margaret both had a keen interest in gardening but come from business and banking backgrounds. Over the years they have built up a team of staff with strengths in both horticulture and IT which are the two main areas of business. In addition to this, Lisa Passmore is the face of Plants4Perth.com.au, and provides customers with professional horticultural advice and a landscape design service.

Now in its sixth year, the business has had to innovate and keep up with the demands of consumers. Plants4Perth. com.au has had to make it through the recent GFC, not an easy task for any business, and an even greater ask for such a new concept in the very traditional nursery and garden market that has been dominated by the box stores in recent times.



Milton Vadoulis

Milton Vadoulis has been in the nursery industry for 35 years, mainly in retail but has been involved in open field growing and production in containers.

He owns and operates a multi award winning large garden centre in SA selling plants giftware imports pots, outdoor furniture and has a cafe seating 65 in the garden centre.

Milton is currently president of the nursery and garden industry of SA and is president of garden centres of Australia .and has been national and state chair of plants plus.

Milton has been involved in many overseas congresses in South Africa, England, Japan, Netherlands, New Zealand and Germany.Milton is always looking at ways to improve his business and make it more profitable.



Chris O'Connor

With a background in Hardware retail Chris O'Connor has had extensive experience with some of the key players in the Australian hardware sector. With Bunning's, Chris was employed as a Buyers Assistant for the NSW and QLD Greenlife Buyers and was also employed as a State Merchandise Coordinator. A move to Mitre 10 saw Chris become a State Greenlife Buyer and most recently National Plant Buyer where he gained a great insight into the independent market.

Chris is currently a Policy and Technical Officer with NGIA.

Speakers



Reuben Taylor

Rueben Taylor started his career as an engineer... and it was while he was studying he started his first business – breeding tropical fish. It was there Rueben realised how to truly add value... selling his fish around Australia for 3 times the price the average breeder would get. 3 years after graduating Rueben came across personal development when his best friend suggested he check out a program called Money and You. The event gave Rueben a real wakeup call and shortly after the event, he sat down and created a blue print for his life – to create his wealth in his late 20s / early 30s, to start a family in his mid 30s and to focus on philanthropy and giving some of his wealth away in his 40s.



Helen Frost

Helen Frost is recognised as Australia's Leading Nutrition Educator and renowned for her passionate down to earth approach.

When you walk out of Helens presentations your view on how you feed yourself and your children will have changed forever. Daily habits will be challenged as everyone is inspired to take action and make change through more conscious and smarter choices.

She has over 30 years experience in Education (ex teacher), Health, Nutrition and Fitness and specialises in addictions and eating disorders. Having studied nutrition to address her own health, weight and dieting issues Helen is passionate about bringing this important nutrition information to people all over the world.



Anthony Kachenko

Anthony Kachenko is the National Environmental and Technical Policy Manager at Nursery & Garden Industry Australia (NGIA). He has extensive practical experience in retail, production and property maintenance sectors through a variety of positions that include nursery hand, retail horticulturalist and lecturer at Sydney University. At NGIA, Anthony is responsible for driving the industry's research, development and extension programs which includes the industry development officer network. He is also involved in policy development and government/ stakeholder advocacy. He is the vice chair of the National Urban Forest Alliance which has been formed to raise the awareness of vegetation as an essential ingredient in healthy communities.



John McDonald

John McDonald, Queensland Nursery Industry Development Manager, has over 16 years experience in nursery production overseeing the Queensland development program as well as managing the national portfolios of biosecurity and pesticide minor use. Holding tertiary qualifications in Plant Protection, Horticulture, Nursery Production and Irrigation John has more than 25 years experience in production horticulture including perennial fruit, sugar cane and nursery production.

John has overseen the development of the industry guidelines and programs addressing on-farm biosecurity risk management and has driven the recognition by governments of these grower based programs as legal instruments. John will detail the current components, aspects and resources of BioSecure HACCP that have allowed government recognition of BioSecure HACCP as an alternative market access process meeting interstate quarantine controls.



Neil Marriott

Neil Marriott is a lecturer at Challenger Institute of Technology, in the field of specialty is irrigation. Works closely with various industry groups providing irrigation training across a variety of industry sectors including domestic, commercial, turf and landscape systems as well as nursery irrigation systems that have the ability to capture and re-use water that missed the target.

Neil is also a committee member of the state executive of Irrigation Australia Limited and works closely with this body to improve and provide irrigation training.

Neil is constantly motivated to seek out ways to improve our water use and do better with what we have.





Invitation

National Environmental Science Programme

to an information session & workshop

The Clean Air and Urban Landscapes Hub

is a new participant in the National Environmental Science Programme. The CAUL Hub is a consortium of the University of Melbourne, RMIT University, the University of Wollongong and the University of Western Australia.

Our mission is to undertake research on environmental quality in urban areas that is relevant to the needs of decision makers in government and industry, as well as the general public. We are undertaking major research projects in the themes: Air Quality, Urban Greening, Liveable Urban Systems and Urban Biodiversity.

To make our research relevant, we need your input. If you are interested in how our cities are planned, designed or built, we strongly encourage you to attend one of the sessions listed below.



To register your interest to attend a workshop please contact:

Cathy Oke, CAUL Hub Knowledge Broker e: cathy.oke@unimelb.edu.au t: 03 8344 7727 m: 0439 997 717

www.nespurban.edu.au



Information Session Dates & Venues

final venue details will be provided upon registration

Melbourne Mon 10 Aug 9:30am – 1:30pm University of Melbourne

Perth Thu 13 Aug 9:30am – 1:30pm Department of Planning, Murray St

Sydney Wed 19 Aug 9:30am – 1:30pm Royal Botanic Gardens

Western SydneyThu 20 Aug9:30am – 1:30pm5:30pm – 7pmHilda M Davis Senior Citizen CentreHilda M Davis Senior Citizen Centre

Canberra

Thu 3 Sep 9:30am – 1:30pm John Gorton Building, King Edward Tce



Workshop Schedule

final agenda details will be provided upon registration

Section 1General Information9:30 am - 11:00 amevening session in W Syd5:30 pm - 7 pm

- What is the Clean Air and Urban Landscapes Research Hub?
- Summary of Research Projects, including Q&A
- Opportunities for partnerships and collaborations
- General discussion

Section 2 Project discussions 11:30 am - 1:00 pm

- Opportunity to meet with research project groups
- Specific partnership opportunities discussion

Refreshments & Close

1:00 pm – 1:30 pm



Participant List

CSIRO Green Infrastructure Workshops Coogee Beach, September 2014 and July 2015

#	Title	Name	Organisation	Email
1	Mr	Guy Barnett	CSIRO Land & Water Flagship	guy.barnett@csiro.au
2	Dr	Matt Beaty	CSIRO Land & Water Flagship	<u>matt.beaty@csiro.au</u>
3	Ms	Meg Caffin	Consultant Urban Forester	megcaffin@gmail.com
4	Dr	Dong Chen	CSIRO Land & Water Flagship	dong.chen@csiro.au
5	Dr	Candice Delaney	Institute for Sustainable Futures, UTS	candice.delaney@uts.edu.au
6	Ms	Suzanne Dunford	NSW Office of Environment & Heritage	suzanne.dunford@environment.nsw.gov.au
7	Dr	Richard Griffiths	NSW Department of Planning & Environment	richard.griffiths@planning.nsw.gov.au
8	Dr	Brent Jacobs	Institute for Sustainable Futures, UTS	brent.jacobs@uts.edu.au
9	Ms	Catherine Keirnan	Environment and Planning, ACT Government	catherine.keirnan@act.gov.au
10	Dr	Brenda Lin	CSIRO Land & Water Flagship	brenda.lin@csiro.au
11	Ms	Clare Lombardi	City West Water	clombardi@citywestwater.com.au
12	Dr	Oswald Marinoni	CSIRO Land & Water Flagship	oswald.marinoni@csiro.au
13	Mr	David Martin	AILA NSW	david.martin@sopa.nsw.gov.au
14	Ms	Jacqui Meyers	CSIRO Land & Water Flagship	jacqui.meyers@csiro.au
15	Ms	Keysha Milenkovic	Blacktown City Council	keysha.milenkovic@blacktown.nsw.gov.au
16	Ms	Jess Miller	202020 Vision	jess@202020vision.com.au
17	Mr	Chris O'Connor	Nursery & Garden Industry Australia	chris.oconnor@ngia.com.au
18	Dr	Sheryn Pitman	Botanic Gardens of South Australia, DEWNR	<u>sheryn.pitman@sa.gov.au</u>
19	Ms	Lyndal Plant	The University of Queensland	lyndal.plant@uq.edu.au
20	Ms	Lyn Raffan	NSW Office of Environment & Heritage	lyn.raffan@environment.nsw.gov.au
21	Dr	Danielle Shanahan	The University of Queensland	d.shanahan@uq.edu.au
22	Ms	Karen Sweeney	City of Sydney	ksweeney@cityofsydney.nsw.gov.au
23	Dr	Anthony Kachenko	Horticulture Australia Limited	anthony.kachenko@horticulture.com.au
24	Dr	Nicholas Williams	The University of Melbourne	nsw@unimelb.edu.au
25	Dr	Brenda Kranz	Horticulture Australia Limited	brenda.kranz@horticulture.com.au
26	Dr	George Quezada	CSIRO Land & Water Flagship	george.quezada@csiro.au
27	Mr	Steve Spencer	CSIRO Land & Water Flagship	steve.spencer@csiro.au
28	Dr	Xiaoming Wang	CSIRO Land & Water Flagship	xiaoming.wang@csiro.au

Legend

Both Coogee Workshops Coogee 1 only - Sept 2014 Coogee 2 only - July 2015

Contact Information:

Guy Barnett, CSIRO Land & Water Flagship, mobile 0404 005 120 or email guy.barnett@csiro.au



Direction setting forum for a horticultural education strategy (AI13013)

Contents

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Jim Pratley: Ag sector learnings – translating the big picture into horticulture	
John Taylor: MLA scientist education portfolio	
Kathleen Allan: Building skills and capacity - GRDC	

Background

Horticulture Australia Limited (HAL) bought together a group of key stakeholders on Friday May 9 2014 at the HAL offices in Sydney to workshop an education framework strategy to guide future investment focus in this important area.

Workshop participants included representatives from the VET and tertiary sector, selected HAL Members, fellow RDCs and employers from large horticultural businesses. A full list of attendees can be found at Appendix A.

Prior to the meeting, all participants were contacted via telephone or email and asked to respond to the following questions:

- 1. What work is your organisation doing in horticulture education at present (if any)?
- 2. What initiatives are particularly important to ensure a vibrant future for the horticulture sector (from both your perspective and your organisations perspective)
- 3. What do you think HAL **should** be doing to support future generations of horticultural professionals through its leadership and training initiatives?
- 4. What should HAL not be doing in this space?

The compiled responses were circulated prior to the meeting. A copy of this document can be found in Appendix C.

Workshop discussions were framed by initial presentations from experts in the field of agricultural education and training. Speakers included Professor Jim Pratley, who conducted the review Agricultural Education and Training in New South Wales; John Taylor, a consultant who worked on the Meat and Livestock Association's Education Pipeline Review; and Kathleen Allen, the Grains Research Development Corporation's Program Manager for Capacity Building. Copies of these presentations can be found at Appendix C.

Discussions

Group brainstorming sessions at the workshop were formulated around the following three areas:

- 1. What initiatives are particularly important to ensure a vibrant future for the horticulture sector (from both your perspective and your organisations perspective)?
- 2. What do you think HAL **should** be doing to support future generations of horticultural professionals through its leadership and training initiatives?
- 3. What should HAL not be doing in this space?

Attendees were then asked to shortlist from the full list of key areas via a voting system. This enabled the facilitator to filter all responses into an agreed matrix of next steps. The following diagram illustrates the agreed way forward and visually summarises the framework HAL should take in developing its strategic approach to horticultural training and leadership.



One vision

Participants agreed that the future strategy underpinning HALs investment in training and leadership must be developed with a shared vision/purpose in mind. Critical to this vision is that it is agreed by all. It must be industry owned and developed with a shared purpose in mind to connect industry from the outset. It should be ambitious; future focussed and build industry capacity. In developing this vision, Australian horticulture needs to raise the bar to create a vision of the industry that sits well ahead of its competitors in New Zealand and Chile. The brand 'horticulture' needs to be defined and there must be a recognition that "we're all in the same basket."

There is a desire that this vision should draw clear links between the horticulture industry and its output – food - to engage future employees and retain existing employees. It was felt that connecting horticultural with food was more tangible and provided a clear indication of the importance of the sector in the broader community.

Through all activities and subsequent projects, the use of one message is a vital component in ensuring a shared vision is achieved and understood by all.

Collaboration and information

To achieve a consistent vision for the horticulture sector, there must be a strong sense of collaboration among the various organisations and bodies currently working in the education and leadership space. In the spirit of collaboration, these many and varied parties need to work together on building and collecting information to provide an overarching picture of the current training and leadership opportunities (including benchmarking current projects), gaps and initiatives taking place in horticultural training and leadership. A workforce review should form part of the information gathering phase to ensure future programs meet the needs of employers. Participants at the workshop noted that collaborative information collection is vital for reducing duplication, maximising investment and enabling the development of best practice projects.

Participants agreed that HALs role in this process should be to:

- Act as an information/knowledge broker on best practice
- Work with external service providers to gather hard data on current industry demographics and needs in relation to training and leadership
- Work with external service providers to review/map current employee training needs and develop a gap analysis
- Act as an intelligence broker to assist future employees understand the various employment pathways

Awareness, attraction, retention and development

Awareness, attraction, retention and development were considered the four key pillars of a future training and leadership strategy. These four pillars sit underneath the platforms of collaboration and information. They provide a roadmap for HAL in ensuring successful implementation of its future training and leadership strategy. Discussions around these four key pillars are listed below.

<u>Awareness</u>

To attract future employees and upskill current employees as the industry builds on its pool of future leaders, there is a need to raise awareness of the sector and its opportunities. In raising awareness, workshop participants requested that the following be noted:

- HAL needs to ensure that one voice/one message underpins all awareness based activities. It was suggested that a common brand be developed and that all awareness raising activities in the training and leadership space are pursued and promoted using the one message and consistent branding.
- HAL should consider tapping into existing popular culture trends (cooking programs such as Masterchef and My Kitchen Rules for example) to raise awareness among the general public of horticulture and its many leadership and training opportunities. There is also the opportunity to tap into primary school gardening programs to raise awareness of horticulture as a career option from an early age

- The industry is lacking resources to assist people in understanding the many and varies career opportunities. Resources of this nature should be developed as part of any awareness raising campaign.
- Employers need to be engaged in any awareness raising activities.

In raising awareness, participants agreed that HAL should NOT

- Hire a branding agency
- Reinvent the wheel/duplicate current awareness raising activities

Attraction

Awareness and attraction are closely linked as it is only through raising awareness that the industry can attract new entrants. It was noted by workshop participants that any efforts to attract future entrants should also include outreach to training providers. To attract future entrants into the sector, it was noted that:

- Career information is greatly needed. This career information should include details on minimum qualifications and skills sets for entry level positions and information on tertiary sector training links. This career information should be made available to graduates from many disciplines such as accounting, business and arts.
- Existing networks must be used in any attempts to attract new entrants to the sector.

Retention

The retention of existing employees in the horticulture sector was considered a key factor in the development of future training and leadership strategies. It was noted that employers need education on training and leadership opportunities they can provide to retain and upskill current employees. Employers need to be encouraged and assisted in building a culture within the industry which promotes ongoing training, leadership and professional pride.

Participants agreed that HAL should not be:

- Engaged in the doing HALs role should be to facilitate/ develop the framework to assist with employee retention and training
- Trying to create demand if it's not there
- Developing programs without partnering or in collaboration with related agencies and existing training providers
- Taking a narrow approach to employee retention. Efforts made in this area need to be focussed across the production horticulture sector as a whole.

Development

Workshop participants stressed that any work undertaken around workforce development needs to be focussed on the entire sector. They called for the need to backwards map any workforce development activities by first gathering information on the future perceived skills shortages. In all workforce development activities aimed at filling these gaps, workshop participants agreed that formal education is vital for ensuring future entrants meet the changing needs of the sector. However there is the need to recognise and promote the many existing training pathways to Level 7, 179 Elizabeth Street, Sydney, NSW, 2000, Australia Telephone 61 2 8295 2300 Facsimile 61 2 8295 2399 www.horticulture.com.au ABN 19 095 566 108 employment in horticulture including VET related programs, leadership programs and informal learning. To ensure a vibrant future workforce, particularly at the tertiary level, "university to useful job ready" courses are required.

Along with supporting new entrants to the sector, there is a need to retain and upskill existing employees via promotion of leadership development programs, the encouragement of mentoring and the identification of role models, industry champions, ambassadors and industry leaders. It was also noted that apprentices are vital to the future development of industry leaders. To support the existing horticultural workforce, workshop participants called for formal recognition of prior learning.

Recommendations

A number of projects were identified from the workshop. These projects sit under the four pillars of awareness, attraction, retention and development. It must be noted that prior to the establishment of any future projects, a clear, ambitious and future focussed cross sectoral vision must be developed and endorsed by the many and varied parties working in and across the horticultural training and leadership space.

Project 1: workforce scoping and mapping

This project would provide the basis and necessary information on which to build a future workforce development program. The project would also overcome the current lack of consolidated information on leadership and training in the horticultural sector. The proposed components of this project are as follows:

- 1. Map the current horticultural related training and leadership options and identify potential links
- 2. Identify future skills gaps via consultation with industry groups, training providers, employers and students/graduates
- 3. Identify duplications in currently available leadership and training programs available in the horticulture sector and wider agriculture sector
- 4. Investigate existing RDC training and leadership models and recommend, if appropriate, future joint initiatives/programs

Project 2: workforce development

Findings from the workforce scoping project would enable the development of a workforce development program. This program should be focussed on the whole of sector and aimed at advisors, researchers, growers, future employees and current employees. Workshop participants recommended that the proposed elements of any future workforce development program should incorporate:

1. The assessment of current and future mentoring and ambassador programs and recommendations on future programs which would assist in managing identified skill gaps

- 2. The promotion of current industry scholarships and the identification of future scholarships which attract new entrants to the sector and build leadership and skills among the existing workforce.
- 3. The identification and establishment of pathways to engage with graduates of VET and tertiary horticulture related training program.
- 4. The identification of institutional arrangements/hosts for best attracting new recruits into the many and varied training programs
- 5. The establishment of a pilot program outlining key skills for small to medium enterprises in the horticulture sector.
- 6. Consolidation of all workforce development information (scholarships, pathways to employment etc) into one portal/website. It was recommended that HAL avoid duplication by using existing portals/websites that promote agricultural education such as Career Harvest.

Other suggestions, which could be incorporated as part of a workforce development project, could include:

- 1. A travelling careers market
- 2. The development of best practice marketing and promotional material (national and international) to leverage any investments in promoting horticultural careers.

Unanswered questions

Workshop participants asked that the following answered questions be noted. The recommended projects would provide answers to many of these questions:

- 1. In attempting to put together the strategies on education and leadership, what does the production horticulture sector really need?
- 2. How are the RDCs/different ag sectors collaborating on strategy in this people, education and leadership areas?
- 3. Are there already good examples of horticulture about high ROI initiatives in capacity, education and leadership?
- 4. What are the specific development needs for the extension/advisory sector in horticulture? Are those different from other industries/sectors?
- 5. The big unanswered question how does HAL ensure it engages with both horticulture and employers with the end in mind (whatever that is) and wider agriculture/food science?
- 6. Why are we concerned about high end horticultural education when employers can't find enough jobs for the post-docs and Master students we already have?
- 7. Is horticultural education through universities monitoring and adapting to industry needs? Is it focussed less on production and more on value chain and consumer science?
- 8. How can we fully understand the drivers for students and then match that with employer expectations? How do we support providing more opportunities for students to spend time with employers via work experience, industry placements and internships?

- 9. "Universities are not funded to be useful" so what can HAL do to encourage industry to use universities and make their resources and capacity useful to industry?
- 10. How can we increase industry led projects?
- 11. How do you measure the employment outcomes of any education and leadership strategic program?
- 12. Why doesn't HAL appoint a workforce development skills manager to facilitate the sharing of information across the various RDCs and VET, tertiary sector providers?
- 13. How can we better close the gap between industry expectations and university expectations for graduate skills/qualifications?
- 14. How is HAL or the industry going to manage the potential student perceptions of horticulture and why they are not joining the industry?
- 15. What are the solutions to the identified barriers to entry in the industry and how will these solutions be communicated back to potential and current agriculture/horticulture students?
- 16. When will the rural industry carry out a total review of the school/VET and higher education sectors?

Next steps

This document will be developed into a discussion paper for the HAL Board. Following Board consultation, it is envisioned that a strategy outlining key initial activities will be developed for implementation in the third quarter of 2014.

Appendix A: Workshop attendees list

		Head of Department, Plant and Food	
Assoc Prof		Sciences, Faculty of Agriculture and	
Robyn	McConchie	Environment	The University of Sydney
			Australasian Pacific Extension Network (NT Dept
Austin	McLennan	President	of Primary Industries & Fisheries)
Ben	Graham	General Manager	Future Farmers Network
Ben	Stockwin	Executive Manager	Primary Industries Education Foundation (PIEF)
		Education & Training Adviser NSW &	
Charles	Impey	ACT	Rural Skills Australia
Chris	O'Connor	Policy and Technical Officer	Nursery and Garden Industry Association
David	Moore	GM R&D	Horticulture Australia
David	Low	Portfolio Manager	Horticulture Australia
Donna	Mogg	Acting CEO	Growcom
Dr John	Taylor	Consultant	MLA Education Pipeline Review report
Dr Simon	Livingstone	Principal	Marcus Oldham College
		National Horticulture Research	
Dugald	Close	Network	UTAS
Gordon	Stone	Program Manager	Primary Industries Centre for Science Education
lan	Macleod	Managing Director	Peracto
			Charles Sturt University and Secretary Australian
Professor Jim	Pratlev	Professor of Agriculture	Council of Deans of Ag
Jim	, Geltch	CEO	Nuffield Australia
John	Said	CEO	Fresh Select
Jolvon	Burnett*	CEO	Australian Macadamia Society Limited
Kathleen	Allan	Program Manager Capacity Building	Grains Research Development Corporation
			Rural Industries Research and Development
Margo	Andrae	Program Manager	Corporation
		General Manager Workforce	
Michael	Claessens	Development & Analysis	AgriFood Skills Australia
Mick	Hav	Managing Director	Career Harvest and Rimfire Resources
IVIICK	Thay		University of New England and Drasidant
Proflain	Voung	Read, School of Environmental and	Australian Council of Deans of Agriculture
Professor	Toung		
Robert	Clark	HAL Board	HAL Board
Robert	Prince*	CEO	Nurserv and Garden Industry Association
Sharvn	Casev	Portfolio Manager	Horticulture Australia
Trevor	Ranford	Executive Officer	Pistachio Growers Association Inc
	u		

*Unable to attend on the day due however provided feedback prior to the workshop

Appendix B: Pre-workshop consultation summary

Individual interviews were conducted with twelve attendees from 9th April to 15th April 2014. These interviews were structured to gain insight into what the group should consider when it convenes at the HAL strategy workshop to be held on 9th April 2014, the outcome of which will assist Horticulture Australia to set its strategy for training and leadership.

The following individuals were interviewed via telephone:

- Robyn McConchie, The University of Sydney
- Simon Livingstone, Marcus Oldham College
- Dugald Close, UTAS
- Jim Pratley, Charles Sturt University / Australian Council of Deans of Agriculture
- John Said, Fresh Select
- Jolyon Burnett, Australian Macadamia Society
- Michael Claessens, AgriFood Skills Australia
- Mick Hay, Career Harvest / Rimfire Resources
- Robert Prince, NGIA
- Ron Prestidge, Victorian DEPI
- Austin McLennan, APEN / NT Dept of Primary Industries & Fisheries
- Donna Mogg, Growcom

Additional feedback was sought from the further confirmed attendees. Feedback received from:

- Gordon Stone, Primary Industries Centre for Science Education
- Ian Macleod, Peracto
- Charles Impey, Rural Skills Australia
- Ben Graham, Future Farmers Network
- Ben Stockwin, Primary Industries Education Foundation
- Dr Shane Hetherington, NSW DPI
- Austin McLennan, APEN

The input from these interactions has been collated and forms the basis of this report.

Main Themes Identified During Interviews

Consider HAL's position as a Peak Body and its national role

- Currently no one is representing the industry as a whole.
- Reduce duplication of effort and improve quality of training.
- Identify opportunities for coordinated efforts across states, associations, universities.
- HAL needs to be clearer on its role and what it does/does not do for the industry.

Consider the full lifecycle of the individual who enters horticulture

- Offer support, education and mentorship on the journey from primary school on.
- Provide a career progression with the training to support, including business and soft skills, but not at the exclusion of specialised skills like micology and soil science.
- Consideration needs to be given to support the vocational side of the industry, as there will be requirements for the foreseeable future.

Hard data is required to make informed decisions

• Audit current needs and training availability across sectors. Consider role as coordinator.

Universities need to be engaged

1.

- Attendance is dropping and courses are reducing their support of horticulture.
- More skilled individuals need to be attracted into tertiary education, but they then need to be retained in the country to support horticulture industry.

What initiatives are important to ensure a vibrant future for the horticulture sector?

- We have to be smarter and identify the niches
- We need good grads, global thinkers, more strategic.
- We need sufficiently trained people for the Asian boom.
- Lot of training has been vocational. Where are tertiary degree qualified people in businesses? We need individuals with specialist training in soil science and mycology.
- We need to increase good domestic student enrolments. The drop is driven by poor public perception of horticulture as unfashionable.
- We need to shift from being an industry dependent on 457 visas.
- Sustainability is the biggest issue. Being profitable and remaining profitable.
- Farming is becoming more technical, more regulation and compliance involved. The best growers in our industry have some technical level of understanding. We would expect that most new entrants into the industry would have some qualification.
- We see the use of specialist consultants increasing. While farm owner may only have TAFE, the specialists need to be tertiary qualified. Need to be trained in decision making, not necessarily specific to horticulture, but the ability to apply critical thought to situation.
- We have the potential for a massive market failure due to lack of information. We need to remove opinion and focus on the facts. We need to capture and start focusing on the data.
- High-level business skills are needed across all sectors, including the implementation of energy saving techniques and practices.
- Need to close the gap between industry and academia
- We need to focus on the big-ticket issues cost of labour, technology drivers, Australia needs to be more export focused.
- Sector has to position itself as being more appealing with career paths.
- Continue to develop adult learning and extension skills to drive change in the industry. Developing personal leadership and effectiveness, implementing effective innovation systems, ensuring we have the relevant technical expertise for competitiveness.
- We need to consider whole of chain investments, from input suppliers through to retailers to where impact can be made.
- We need to develop diverse networks to outside the industry and build partnerships for collaboration (public / private).
- Duplication of effort is a major issue. We need to see an AUDIT of currently available services across all the industries.
- The future continues to be heavily reliant on recruiting, training and retaining the best possible people.
- We need to ensure positive messaging about the industry gets into the community.
- Introduction of national studies to understand the profile of the current production horticulture workforce in all States and Territories, to understand the future human resources requirements and to identify future skills needs and trends including technology,

increasing financial pressures, farmer initiated new markets, ageing workforce and innovative cost saving measures.

- Build a community with a strong and deep understanding of food and fibre production to maintain its social licence to operate.
- Our (NSW DPI) educational services will continue to support on-ground horticultural production and provide training for the next generation of farmers, researchers, agribusiness professionals and development specialists. Initiatives are currently underway to adapt to the changing face of Australian horticulture.
- Content: Almost all horticultural industries are intent on further development of new domestic and international markets. Our educational services will aim to support horticultural supply chains in producing and delivering products which meet the phytosanitary and quality specifications demanded by consumers. These developing industry priorities place particular emphasis on disciplines related to the delivery end of the supply chain and we are moving to strengthen our research and development activities in biosecurity (e.g. EMAI) and postharvest and consumer science (e.g. Ourimbah/ University of Newcastle).
- Delivery: NSW DPI has recently moved away from its historical regionally focussed horticultural extension model. Our commodity-aligned Development Officers have statewide mandates and are, thus, more dependent on remote information of delivery. NSW DPI will increase its dependence on electronic information delivery through web sites (including you-tube), phone apps, webinars and messaging services. Our model uses the delivery services of the newly formed (January 2014) Local Land Services as well as agribusiness and private providers. We will also be seeking to augment existing partnerships with other educational / information organisations (agribusiness etc) and establish further ties with industry representative bodies.
- Collaborations: while NSW DPI currently has formal collaborative information delivery through industry co-funded IDO positions in onions and blueberries we are likely to seek further formal and informal relationships with industry representative bodies.

2. What do you think HAL should be doing to support future generations of horticultural professionals through its leadership and training initiatives?

- Structure a pipeline of bright young people who want to work in the industry.
- Demystify the industry and ensure current and future careers can be described in exciting and contemporary terms.
- Intensive short training programs. Grads need to update themselves in what's new. Divide the masters credits into intensives. Work with universities to develop a suite of products to really lift the industry.
- Bring the universities together around developing a combined and collaborative solution.
- Start with getting young people interested and developing them over time scholarships and mentors mapping out a career path.
- A dedicated tranche of funding to PHD projects would be a good initiative. This would assist in attracting students to horticulture, would get them on level playing field with the other RDCs. Consider funding Masters.
- High-school engagement through PICSI HAL could look at its role in further supporting the PICSI initiative, as it is not really getting a horticulture focus.
- Mature age students need to be attracted back to education.
- Post-doc funding bottleneck hard to keep them in research.

- Horticulture is fragmented has no peak body. HAL is the RD body, but it is the defacto industry body. If HAL doesn't do it, nobody else will. The thing that keeps cropping up where is the industry leadership that is looking forward to the needs of the future. HAL needs to take on a more assertive leadership role in horticulture.
- A lot of what HAL does can get left on the shelf. Do an audit of investment opportunities in the industry plans they oversee and review offering accordingly.
- HAL should have oversight and connections with the institutions offering relevant training. We don't know where the Grads are going.
- Understand the metrics of the tertiary and vocational sector is definitely a priority for HAL. The situation may not be as dire as we think it is.
- They need to partner more closely with skills councils. How do you encourage Unis to change their curriculum. Focus on improving speed to market and relevance of training across all sectors.
- They have an obligation to be promoting and selling the attributes of sector to the future generations. On behalf of their members and their members' customers. They also need to be looking at the agenda across the major issues and also the technology piece. Need to prepare the industry for the future.
- Hal needs to be looking at business and professional skills development.
- We think that HAL should partner up with research providers in terms of scholarships and pooling universities and identifying priorities. Bring more experts in from overseas 'visiting fellow' to build capability in new area.
- Working and thinking in innovation skills extension skills, adult learning, group facilitation, develop leadership capacity.
- How are we connected across the industries represented by HAL? How do we accelerate innovation across the sectors?
- National approach, reduce duplication, promote collaboration between the states and the existing bodies within Horticulture.
- Active leadership/coordination in the Education and Training space and encourage state based bodies to link together on all workforce issues.
- Develop a National Workforce Development Plan for production horticulture together with a strong commitment for its implementation.
- Encourage collaboration wherever possible on whatever projects.
- Work with other industries instead of seeing them as the enemy.
- Horticulture is extremely diverse so one size fits all model never works, employ diverse methods when trying to engage and farmers or young people into the industry.
- Be proactive in engaging groups, organisations, growers outside of its "usual suspects" pool of people to make sure their message is getting through to the people it needs to.
- Find ways around increasing funding to enable Service Providers to 'value add' to projects to accomplish extra outcomes.
- Invest in existing education foundations to support endeavours to ensure that the context of Horticulture is embedded in the classroom.
- The industries serviced by HAL need to adopt a strategic approach to education to ensure the long-term profitability of Australian horticulture. While programs should be developed to educate value chain participants (including farmers), it is of equal importance to ensure the future of locally trained experts to support the industry to reach its objectives. As such HAL's current initiatives in providing funding postgraduate studies should continue and expand.

3. What should HAL not be doing in this space?

- I don't see any areas as off limits.
- Training in the vocational area is this really their space.
- Social media marketing is an example of a recent course that did not work for some attendees. Awareness raising it has a place, but for targeting and recruitment and managing perception it has limited effect.
- Don't know how much we need to push vocational enrolment, my understanding it that we need more people that can manage businesses and technology.
- It is not clear what HAL is doing it is hard to say what it should not be doing.
- Stay away from anything to do with how to market. Get on with stuff that is more applicable to supply chain.
- It shouldn't be investing in leadership courses just because it is superficially a good place to invest for example, putting people through Nuffield scholarships, unless they are part of a coordinated strategy.
- Without a more cohesive strategy on post-grad students, we should not be funding.
- Don't become one of those peak bodies that blocks us to getting to their members. We could do a lot more in collaboration.
- Surprised that they are throwing money at initiatives like Picsi. Got to have tangible results if you are going to put money into education.
- Should HAL being funding things like Chem Certifications? Is this specific to horticulture?
- Do not focus on non-core stuff. Digital Marketing 120 people came to one of the best things I've ever been to... those issues are there and are pertinent.
- Don't put people in a classroom or in front of a PC. Enable learning through networking.
- Take the foot off and let the ideas come up. Try to keep the innovation flowing.
- You need a diverse range of initiatives, so don't think it is worth saying no to anything.
- Avoid duplication with other bodies.
- A horticulture passport is a waste of time don't focus here.
- HAL is not the appropriate organisation to directly run initiatives; it needs to make it more attractive for others to do so.
- HAL should not let the opportunity to take the lead on leadership in this space pass it by.
- Not qualified to comment.

4. Additional comments raised post-participant survey

- Industry training is very fragmented in horticulture and as a result there is a lot of lost opportunity.
- In saying that there are some very good initiatives at different levels across the sector, so it's not about reinventing the wheel but more about:
- Identifying the training that works (and promoting it madly to the whole sector so there is greater uptake)
- Identifying gaps and identifying training and service providers that can deliver in these gaps

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- Encouraging across industry training initiatives rather than, for example, the vegetable industry having an initiative and the banana industry having a separate initiative, that are effectively the same. There is a lot of benefit for producers from different sectors to work together in training initiatives
- Developing an 'Australian Horticultural Industry Offering' clearly branded and easily accessible a one-stop shop (hub / website whatever you want to call it) where industry employers / employees can go to get information about training / training providers / funding support etc and also to provide a pathway / suggestion on the training that industry participants should be undertaking, at whatever level they are in the industry. Currently it's too hard to identify what is available for industry and too hard to work out if there are any incentives from govt. (although probably not after the next budget). Also training participants could provide feedback on the quality and benefits of the training (like a TripAdvisor for training), hopefully to give greater confidence to those investing in training.
- Start to invest more in changing the culture of the industry, so training isn't seen as a cost but rather an investment.
- Having the capacity to respond to topical issues (e.g. the social marketing forum that HAL did last year)
- HAL can provide the investment to support all of the above set up the structure and support communication (and it probably wouldn't be a additional cost because of the efficiencies HAL could gain by taking a more strategic role). Although cost of training should be user pays.
- Would like to see a discussion about market segments, measuring impact, measuring ROI, who is responsible for what in the pipeline and who gets the benefit (can pay/can not)
- Would like to see additional themes discussed as follows: review the market segments of audiences for attention (students of different ages, schools, teachers – different types, universities, employers etc. Would like a discussion on how to engage with each segment to generate attention/interest/participation (the extension KASAP model)
- Would like to see a discussion on the impact of evaluation and metrics for measuring success (impact versus process metrics)
- Need to consider is developing a 'horticulture framework' from primary school to tertiary education. What is missing at the moment is encouraging very young people to consider horticulture in their early years. It is very hard to transfer the focus of a teenager or older student to horticulture in their late teens/early 20's. Horticulture has been very poor in promoting itself to young people and to build that career pathway.
- The 'horticulture framework' or puzzle if developed would allow all relevant issues to become part of the framework/puzzle. In effect we need to start with a blank page at the foundations and build up from there.
- The process must be driven by industry in partnership with the other players. Too often in the past one of the sectors has driven training for their particular need and not necessarily in

the best interests of industry. In addition it is important that any training and education leads to an employment outcome. Again we continue to see programs funded at all levels for training sake and we never get any major employment outcomes.

- Support the need for good workplace development this could be done by each industry member of HAL and then broad together in a full horticulture profile. This workforce development could be something HAL could fund with support from government.
- Concerned that the relevant Skills Council's are not truly industry focussed and this needs to be addressed as a part of the process

Current work being done in horticulture education by respondents

The University of Sydney

Horticulture is a specialism within in the ag-science degree. Industry really wants people with business skills. Bachelor of food and agribusiness launched this year with good attendance, focuses on wonderful careers post-farm gate, with a 3-month internship out in industry. 4th year honours.

Marcus Oldham College

We run an APAL 1 week leadership course to develop young leaders in the sector.

UTAS

Combined school of land and food, has two undergrad degrees - Bachelor of ag-science, 3yr Bachelor of agriculture. MBA in agri-innovation. Broad cover of horticulture through horticulture science modules. Dropped the dedicated/applied degree. 4th year ag-science has a horticultural science component.

Charles Sturt University

Only university with a degree in horticulture.

Australian Macadamia Society Limited

Work with the local TAFE - introduction to macadamia production. We do work with UWS, USyd, UQ have all brought undergrads on an ad-hoc basis. We support post-grad students through HAL.

AgriFood Skills Australia

Brokers involvement in national training initiatives. National oversight. Part of state bodies. Performs skills needs analyses. Sets the standards for training in all industries for training organisations.

Rimfire Resources

Have a grad program called GradLink - interview 150+ grads across industry - educating the uneducated in agri-business. Talk at events on opportunities. One of the founding members of CareerHarvest.com.au.

NGIA

Over the last 5 years, major investment into industry training. Undertook a gap analysis to understand where our members were lacking in training. We developed training through HAL.

Victorian DEPI

2 research divisions, with 500 people. 200 PHDs. Big emphasis on PHD training. Working at Unimelb and JV with Latrobe. Have students at regionals. We see this as capability building.

Australasian Pacific Extension Network

APEN provides opportunities for networking, training and professional development for industry advisors across all agricultural sectors, including natural resource management. Leadership and training initiatives include a mentoring scheme, an awards program for effectiveness in extension, national and international conferences and webinars. APEN is a major supporter of the "Enabling Change and Innovation" webinar series.

In horticulture, APEN recently worked with HAL to provide scholarships to attend the 2013 APEN International Conference and subsequent APEN professional development activities. APEN's Education, Training and Accreditation subcommittee recently developed a comprehensive database of tertiary, vocational and professional development offerings related to extension/innovation across Australian agriculture. This resource would assist HAL and others to more easily identify education and training options in this area for horticultural industry professionals."

Growcom

Puts workforce development programs in place, both regional and national. Horticulture is bigger than beef in QLD, so focus on upskilling people to realise they are working on a business. 1-on-1 relationships to assist business owners identify the gaps. Currently doing case studies on ROI of training, with the aim of improving perceptions of training in the industry.

Rural Skills Australia

Instrumental in the implementation of Traineeships at Certificate II Production Horticulture.

Member of the Bundaberg Agricultural Training Group. Developed a CD ROM 'Your Future is Here – Careers in Production Horticulture' and a DVD Video 'Your Future is Here – Production Horticulture Careers in the Bundaberg Region' - Copies were sent to all Queensland Schools and interested State and National agencies. RSA QLD works with Growcom in the rollout of the State funded 'Workforce Development Plan 2013-2015 Queensland Production Horticulture'.

The NSW ETA has advised the NSW Nursery & Garden Industry Association on suitable training funding opportunities, to service the training needs of their members. The NSW ETA acts as the link between farmers and training providers, on issues including biosecurity, horticulture business and marketing needs and financial management needs for farmers, to ensure training providers are able to integrate these farmer needs into their training programs.

Primary Industries Centre for Science Education

Undertaking a national project that engages across primary industry sectors; including hort [particularly bananas and almonds] to attract bright young professional personnel and engage with science teachers. This has been in operation since 2006. It includes experiential element where young people / teachers get to engage direct with handpicked research and operations personnel in private and public sectors

Peracto

Provide a range of training opportunities to our staff. We also participate in assisting external organisations such as PICSE (Primary Industry Centre for Science Education) and UTAS / TIA. We also run various seminars for the broader Horticultural community.

Primary Industries Education Foundation

Provide strategic advice to government and industry, strategically facilitate and coordinate activities, initiatives related to food and fibre education, and commission projects where identified gaps exist. PIEF has also actively argued for the inclusion of Horticulture, among other industries, within the Australian curriculum.

NSW DPI

Provides educational support to Australia's horticultural industries through a number of avenues targeting various industry sectors (farmers, the value chain, school students and tertiary students). It employs development officers who are aligned with the state's priority horticulture crops and works with industry and research staff to produce educational packages which are provided to information delivery organisations including the Local Land Services (LLS), agribusiness etc. NSW DPI can and does develop and deliver training to key industry groups to address specific issues and produces and publishes a wide range of short advisory documents which are available free of charge through the Department's website. The Department produces production manuals which provide detailed information to current and prospective industry participants to allow them to establish and improve their farm enterprises. NSW DPI training colleges provide accredited farm training through full time, part time and external courses with students graduating to diploma level. Studies provide practical farm skills. NSW DPI also coordinates, runs and evaluates short courses including chemical use and management accreditation programs. NSW DPI conducts horticultural research and educational activities through its MoUs with Charles Sturt University (CSU), University of Newcastle (UoN) and Southern Cross University (SCU). A further MoU is currently under development with Macquarie University (MU). NSW DPI horticultural researchers have adjunct lecturing appointments at five universities (CSU, University of New England, UoN, University of Tasmania, and University of Western Sydney) and are currently supervisors for 21 higher degree students. They provide tertiary training across a wide range of disciplines including physiology, production and plant protection.

Appendix C: Presentations

HORTICULTURE AUSTRALIA LIMITED INDUSTRY DEVELOPMENT FORUM



Saturday August 16, 6.30pm – 10.30pm

Room M1, Brisbane Convention and Exhibition Centre (Merivale Street)

Industry Devel	lopment Forum Dinner
6.30pm	Arrival drinks
7.00pm	Welcome Alison Anderson, HAL MC for evening: Robbie Commens, Australian Macadamia Society
7.10pm	Entree
7.30pm	Fruit quality, biosecurity/disease and waste management Paul Inderbitzen, Nuffield Scholar
7.45pm	Main meal
8.15pm	Value adding and sustainability after the farm gate Trent DePaoli, Nuffield Scholar
8.30pm	Dessert
10.30pm	Close

Sunday August 17, 8.15am – 5.00pm

Room M1, Brisbane Convention and Exhibition Centre (Merivale Street)

Industry Development Forum

8.15am Tea and coffee

SESSION ONE: Chair – Andrew Harty, Citrus Australia

- 8.30am Welcome
 Alison Anderson, HAL
 8.45am Using eExtension to enable change
 John James, DAFF Queensland
 10.15am Using the ADOPT tool to explore the extent and rate of adoption of new technologies
 Anne-Maree Boland, RM Consulting Group
- 10.35am Morning tea

SESSION TWO: Chair – Jay Anderson, Australian Banana Growers' Council

- 11.00am Capacity building case studies
 - 1. Driving best practice uptake in the macadamia industry Robbie Commens,

Australian Macadamia Society

- 2. E-learning in the nursery industry Chris O'Connor, Nursery & Garden Industry Australia
- 3. Citrus market development Andrew Harty, Citrus Australia
- 4. Pineapple study groups; facilitated adult learning Simon Newett, DAFF Qld
- Strategic R&D planning in the almond industry Ben Brown, Almond Board of Australia
- A multi-faceted approach to communicating R&D outputs and outcomes in the vegetable industry – Tim Shue, AUSVEG
- 12.00pm Panel session
- 12.30pm Lunch

SESSION THREE: Chair – Sharyn Casey, HAL

- 1.15pm
 Attributing success to capacity building projects

 Jeff Coutts, Coutts J&R/QualDATA
- 2.45pm *Afternoon tea* (with the ISHS Board)

SESSION FOUR: Chair – Anthony Kachenko, HAL

- 3.00pm Co-operative conversations
 Ian Plowman, Organisational psychologist
 4.45pm Wrap up discussion
 Alison Anderson & Anthony Kachenko, HAL
- 5.00pm Close and IHC2014 opening ceremony

NGIQ Nursery Production Supply Chain Forum



THURSDAY 14 AUGUST 2014 COLMSLIE HOTEL & MOTEL Cnr Wynnum Road & Junction Road MORNINGSIDE QLD 10.00am to 3.30pm Morning Tea, Lunch, Afternoon Tea included



NURSERY PRODUCTION FORUM Thursday 14th August 2014

9.30am	Registration & morning tea
10.00am	Nursery Production Supply Chain Report – Chris O'Connor Policy & Technical Officer. NGIA
10.30am	The Process of Costing Nursery Stock – Andy Cameron. Nursery Management Systems
11.00am	Radio Frequency Identification (RFID) in Nursery Production – <i>Dr Tom Fernandez. Michigan State</i> <i>University (USA)</i>
12.00pm	Lunch
1.00pm	Barcode Utilisation Beyond Retail Compliance – Joseph Taylor Senior Advisor. GS1
1.30pm	Nursery Production Management Systems – Andy Cameron. Nursery Management Systems
2.00pm	Afternoon Tea
2.30pm	Supply Chain Expectations of a Greenlife Retailer – Chris O'Connor Policy & Technical Officer. NGIA
3.00pm	Current and Future Trends in Nursery Production Mechanisation – Theo Arvanitakis. Transplant Systems
3.30pm	Close of Day's Proceedings
Appendix 5

Nursery Papers

Urban Vegetation and Heat Related Mortality

In this month's Nursery Paper, Dr Dong Chen and the team from Commonwealth Scientific and Industrial Research Organisation (CSIRO) look at urban vegetation and its impact upon heat related mortality. This research represents one of the first attempts to develop quantitative estimates of the potential benefit of urban vegetation in reducing heat related mortality. It was undertaken by a research team from CSIRO working closely with the NGIA, and involved modelling of vegetation and mortality relationships for the summer of 2009 and projected future climates in 2030 and 2050 for the city of Melbourne. The team found some differences among the results for 2009, 2030 and 2050, but the overall trend was that urban vegetation can potentially reduce excess heat related mortality. Different urban vegetation scenarios were tested, with the forest scheme predicted to achieve 60-100% reduction in excess mortality rate in comparison with the CBD vegetation scheme. From these results it is recommended that urban vegetation be a key component in heat wave mitigation and for preventative health.

Urban Vegetation and Heat Related Mortality

Extreme environmental temperature can cause serious health impacts and can lead to increased mortality. The heat wave event in Melbourne during the summer of 2009 is estimated to have claimed 374 excess deaths over what would normally have been expected for that period (DHS, 2009). The relationship between heat and mortality has long been recognised (Haines et al. 2006) and several researchers have attempted to quantify this relationship for the city of Melbourne. Nicholls et al. (2008) analysed the mortality rate in Melbourne for people over 65 from 1979 to 2001. They reported that excess heat related mortality amongst the population over 65 may increase rapidly when the mean daily temperatures (the average of yesterday's maximum and this morning's minimum) exceed 30°C. Consequently, a 30°C mean daily temperature was recommended for Melbourne's trigger point for its heat alert system. Chen and Wang (2012) also observed a triggering mean daily temperature of around 30°C for Melbourne based on analysis of historical mortality data from 1988 to 2009 for people over 75. In almost all previous research, the focus has been on the linkage between ambient weather conditions and the mortality rate. Finding this linkage is important and can lead to improved public health alerts and emergency preparedness. However, with increasing focus on health prevention, a better strategy is to try and mitigate the heat stress in the first place, such as through improvements to urban vegetation coverage and the use of cool roofs. Cadot et al. (2007) reported that 74% of excess

Jump to page



Urban vegetation can potentially reduce excess heat related mortality.



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deaths during the 2003 summer heat wave in Paris occurred among those who were living at home. They concluded that the most important risk factors for dying was being a female \geq 75 years old and living alone. Although there is little available information on the locations and specifics of heat stress related excess deaths in Australia, being old and living alone have been identified as significant heat related health risk factors. Consequently, more research effort should be directed towards the indoor thermal environment, particularly those housing vulnerable populations, and mitigating the heat stress in residential buildings. The current study aims at quantitatively estimating the potential benefit of urban vegetation in reducing heat related mortality through improvement to the indoor thermal environment.

2 Methodologies and Modelling Results

2.1 Weather Data Preparation Using a CSIRO developed urban climate model known as UCM-TAPM (Thatcher and Hurley 2012), the impact of different urban vegetation schemes on the local climate can be estimated as the change in monthlymean ambient temperature, monthlymean daily maximum temperature and daily minimum temperature relative to the Melbourne CBD vegetation scheme. Table 1 lists the main characteristics of the urban vegetation schemes investigated in this



The elderly are most at risk from excess heat related mortality.

study. The predicted changes in the above three mean air temperatures associated with different vegetation schemes were then used to modify the 2009 weather data and the projected 2030 and 2050 average weather data for Melbourne. Climate change projections used in the study were based on the MIROC global climate model using the A1FI emission scenario.

2.2 Sample Residential Buildings In Melbourne, detached houses represent around 76% of the residential housing stock, while the remainder consists of semi-detached buildings, flats, units and apartments (ABS, 2011). In this study, three residential buildings were used which include a detached single-storey four bedroom house, a semi-detached three bedroom two-storey townhouse, and a two bedroom apartment at the top of a two-storey building. It was assumed there was no insulation in these buildings in order to represent low-end Melbourne housing stock and potential exposure of occupants to health risks during heat waves.

Table 1 The main characteristics of the urban vegetation schemes investigated in this study

Urban Type	Vegetation coverage of entire land area (%)	Vegetation coverage fraction within vegetation area	Leaf Area Index	Green Roof Coverage of Building Roof Area (%)	Building Coverage over entire land area (%)	Building Height (m)	Irrigation
Forest (low sparse)	100	0.25	2.0	0	0	-	No
Shrub-land	100	0.50	2.6	0	0	-	No
Grassland	100	0.50	2.0	0	0	-	No
Urban (leafy)	49	1.00	3	0	40	6.0	Yes
Urban(generic)	38	1.00	3	0	45	6.0	Yes
CBD	15	1.00	3	0	65	12.0	Yes
CBD (with 1/3 Vegetation)	5	1.00	3	0	65	12.0	Yes
CBD(Double Vegetation)	33	1.00	3	0	62	12.0	Yes
CBD(50% Green Roof)	15	1.00	3 1.5 (GR)	50	65	12.0	Yes
CBD(Double Vegetation + 50% Green Roof)	33	1.00	3 1.5 (GR)	50	62	12.0	Yes





2.3 Indoor Thermal Performance Modelling

The residential building simulation software AccuRate developed by CSIRO (Delsante 2005) was used to calculate the indoor thermal environment in the three sample buildings with the generated weather data for 2009, 2030 and 2050. The buildings were assumed to be without space heating and air conditioning. It was also assumed that occupants would actively operate the windows and doors to minimise extremes in indoor air temperatures, based on the following assumptions about behaviour:

- Windows and doors are closed if indoor air temperature is below 22°C; and
- If indoor air temperature is above 24°C and ambient air temperature is below indoor air temperature, windows and doors are opened. Otherwise, windows and doors are closed.

Using the AccuRate software, hourly air temperatures in the living room and the master bedroom were predicted using the generated weather files, and recorded for use in the mortality rate analysis.

2.4 Impact on Mortality Rate

Historical mortality data from 1988 to 2009 were obtained from the Australian Bureau of Statistics (ABS) for the Melbourne Statistical Division. This data was organised by the place of usual residence, by sex, and by two age groups, i.e. 0-75 and 75+. The Melbourne Statistical Division covers the metropolitan area of Melbourne as well as its surrounding urban fringe, including the Dandenong Ranges, the Yarra Valley and the Mornington Peninsula. It defines an area with a population of over 3.5 million, and accounts for approximately 70% of the entire Victorian population.

To understand the potential linkage between indoor air temperature and mortality rate in Melbourne, hourly simulations were carried out for the 20 year period from 1st January 1988 to 31st December 2007 for the three buildings and four different building orientations (i.e. north, east, south and west).

Considering that occupants are normally in the living room during daytime and in the bedroom at night time, the mean daily indoor temperatures for a building were defined here as the average of yesterday's daytime (after 7am) maximum in the living room and this morning's (before 7am) minimum in the master bedroom. Over the 20 year period from 1st January 1988 to 31st December 2007 there was a total of 7305 days. These 7305 mean daily indoor temperatures for each building and four facing directions were then grouped into consecutive temperature bands of 0.5°C. The average mortality rates corresponding to a particular mean daily indoor temperature band were then obtained. For example, the average mortality rate corresponding to the mean daily indoor temperature band from 28°C to 28.5°C is the average of the mortality rates for all the days (in the 20 years) within that band.

With the three different buildings and four building orientations, 12 sets of relationships between the mean daily indoor temperatures and average mortality rate can be established. Figure 1 shows the 4 sets of relationships for the house in four orientations between the average mortality rates for males and females over 75 years old and the mean daily indoor temperature. It is seen that high

mean daily indoor temperature of the buildings corresponds to high average mortality rates. This is especially true for females over 75 years old. Based on these 12 relationships between the mean daily indoor temperatures and average mortality rate, the impact of urban vegetation can then be estimated using AccuRate simulations of the indoor thermal performance for the three buildings. The impact assessment considered the three buildings and their four orientations using the generated climate data for 2009, 2030 and 2050 with different urban vegetation schemes. The potential impact on excess mortality rate has been estimated in this research as the difference in the heat related mortality rate when the entire Melbourne metropolitan area has a specific urban vegetation scheme, as outlined in Table 1, relative to the Melbourne CBD vegetation scheme as a baseline.

Figure 2 shows the potential impact on excess mortality rate with different urban vegetation schemes in 2009, 2030 and 2050 relative to the Melbourne CBD vegetation scheme. While there are differences among the results for 2009, 2030 and 2050, the overall trends are consistent in finding that urban vegetation can potentially reduce the rate of excess heat related mortality. In general, the reduction in the excess mortality rate increases with an increase in vegetation coverage and intensity. The leafy urban scheme for the Melbourne region is predicted to reduce 20-60% mortality rate in comparison with the CBD vegetation scheme. The forest scheme (assuming the Melbourne Statistical Division is converted to forest) is predicted to achieve the best performance with a 60-100% reduction in excess mortality rate in comparison with the CBD vegetation scheme. Although total forest coverage for the Melbourne area is unrealistic, the research attempts to show the maximum benefit that may be achieved through urban greening.

This research serves as one of the first attempts to relate the indoor thermal environment with excess heat related mortality, quantifying the impacts of various urban vegetation schemes. The model established as part of this study is currently undergoing further testing, verification and development.

CONCLUSIONS

Simulations of indoor thermal environment were carried out using the AccuRate software to quantify the potential benefit of urban vegetation in reducing heat related mortality. This was done for the 2009 summer and also for projected 2030 and 2050 future climates in Melbourne. Results show that urban vegetation can potentially reduce excess heat related mortality. The forest scheme in particular, was predicted to deliver a 60-100% reduction in excess heat related mortality in comparison with CBD vegetation scheme. Urban vegetation is therefore recommended as a vitally important component of heat wave mitigation strategies for urban planning.



Figure 1. Relationships between mean daily indoor temperature of the house and average mortality rate in Melbourne from 1st January 1988 to 31th December 2007



Figure 2. The potential impact on excess mortality rate with different urban vegetation schemes relatively to the CBD vegetation scheme

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Related Nursery Papers

June 2012 Mitigating extreme summer temperatures with vegetation, Dong Chen

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Emerging Biosecurity threats and industry preparedness.

Biosecurity is an ongoing challenge for our Industry with new exotic plant pests and diseases emerging around the globe. In this month's Nursery Paper NSW Industry Development Officer Michael Danelon looks at some of these emerging threats to Australia and how our industry is positioned to deal with these.

Emerging Biosecurity threats and industry preparedness.

A large amount of plants introduced, grown and sold by the nursery industry are threatened by a range of different pests across different climatic conditions and environments in Australia.

Freedom from exotic pests not known to exist in Australia is vital to the future profitability, productivity and sustainability of Australia's plant industries. It is also key in protecting the natural environment and landscapes of Australia.

Should exotic pests be detected, how will industry and the government look to respond to their presence and set about eradicating them? This nursery paper will define what biosecurity is, the biosecurity tools and framework available for the nursery industry, current threat list and outline the process in responding to a pest once identified.

WHAT IS BIOSECURITY?

Biosecurity is a set of measures which can be implemented at national, regional or business levels to protect against the introduction and spread of new pests and to effectively deal with them should they arrive.

The definition of a nursery industry pest is all: insects, mites, snails, nematodes, pathogens (diseases) and weeds that may harm plants or plant products. Exotic pests are those not currently known to exist in Australia, whilst established pests are those already present.

Biosecurity is a whole of community responsibility, however for the nursery industry it begins at the farm level. Growers have the responsibility to maintain sound on-farm biosecurity practices to protect their plants, livelihood and the greater industry from both established and exotic pests.

Nursery hygiene is critical to maintaining effective biosecurity. Hygiene is more than just using clean nursery inputs and supplying clean outputs to the wider industry. It is very much about assessing the risk of what is introduced to the nursery and how these inputs are managed to maintain freedom of pests throughout the product cycle. Personal hygiene for example is often overlooked. For example, dirty clothes may carry pathogens or pests and boots may carry soil borne pathogenic spores.

BIOSECURITY THREATS LIKELY TO INCREASE

Australia has been fortunate to be geographically isolated. This has been of great benefit as the isolation has made the introduction of exotic pests difficult as long travel times provided an inherent form of quarantine. However much has changed in recent years. For example, air travel has made access to exotic locations across the globe much easier to access, new tourist destinations have opened up and the value of the Australian dollar has made travel more affordable. The internet has also opened up a new level of small scale trading allowing facilities for individuals to source and supply goods across the world with ease. All of these developments have



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increased our risk of exposure to new exotic pests and increased the likelihood of border protections being penetrated and an incursion occurring. In view of this, it is likely that the nursery industry will continue to be threatened with biosecurity issues.

NEW BIOSECURITY LEGISLATION

The current legislation concerned with biosecurity in Australia is the *Quarantine Act 1908*. This legislation is being reviewed and will be replaced with a new piece of legislation in the near future. This new Bill is the Biosecurity Bill 2012 and was submitted to federal parliament in November 2012. Several issues with this Bill were identified by industries and it was forwarded for further review by the Senate Rural and Regional Affairs and Transport Legislation Committee who will report their findings on 24th June 2013.

BIOSECURITY AWARENESS OF AN EXOTIC PEST – MYRTLE RUST

Myrtle Rust (*Uredo rangelii*) is a recently introduced disease which has heightened the need for awareness of exotic diseases and the potential impact they may have if they are detected but are not contained.

The first formal detection of *Uredo rangelii* (Myrtle rust) was in April 2010 on a cut flower and foliage property in the Central Coast region of NSW. Within 8 months from the first detection, numerous Myrtle Rust infections were reported across NSW and also into South East Queensland in gardens, public areas and nurseries which made eradication impractical. Since then it has been detected and declared as established in areas of Victoria.

The financial cost to industry is difficult to measure, however we do know there are costs which businesses continue to absorb in:

- prevention, treatment and management of the disease,
- complying with market access requirements should they exist and
- loss of potential markets from quarantine restrictions.

Myrtle rust is the first and nor is it likely to be the last exotic plant pest to affect the nursery industry and environment. For example there are several exotic pests classified as significant to the nursery industry being managed now with the objective to eradicate them from Australia. These include chestnut blight and red imported fire ants.

The need for early detection followed by a rapid and coordinated approach to eradication is critical to limit the potential establishment of exotic pests in Australia. To assist in this area, the Nursery and Garden Industry has undertaken a number of initiatives to assist in the prevention of exotic plant pests and disease incursion and plans for the eradication of exotic plant pests and diseases if they occur.

PREPARING FOR EXOTIC PLANT PESTS

The nursery and garden industry in partnership with Plant Health Australia (PHA) has examined the potential threats to the industry. Through the support of industry levy funds, the nursery industry has developed a number of **Threat Specific Contingency Plans** **for priority exotic pests.** These plans were developed with consultation and support of PHA which is the national coordinator of the government-industry partnership for plant biosecurity in Australia.

The contingency plans provide guidelines and options for steps to be undertaken and considered when developing a Response Plan for incursion of exotic plant pests or diseases. Any Response Plan developed using information in whole or in part from this contingency plan must follow procedures as set out in PLANTPLAN under the EPPRD and be endorsed by the National Management Group prior to implementation.

There are 12 Specific Contingency Plans for the industry to be aware of:

- Aphid transmitted viruses Potyviridae (include Plum pox potyvirus; Asparagus potyvirus)
- Asian gypsy moth (Lymantria dispar)
- Banded greenhouse thrips (Echinothrips americanus)
- Glassy winged sharp shooter (Homalodisca coagulate)
- Guava rust (causal agent Puccinia psidii)
- Longicorn beetles (Anolophora chinensis and A. malasiaca)
- Pierce's disease (*Xyella fastidiosa*) linked with Glassy winged sharp shooter contingency plan
- Serpentine leaf miner (Liriomyza huidobrensis)
- Sudden oak death (Phytophthora ramorum)
- Tarnished plant bug (Lygus lineolaris)
- Thrips transmitted viruses Tospovirus (including Chrysanthemum stem necrosis tospovirus; Impatiens necrotic ringspot tospovirus and Tomato spotted wilt tospovirus) and
- Whitefly transmitted viruses Various (including Tomato yellow leaf curl virus; Tomato leaf curl virus; Lettuce infectious yellows virus and Diodia vein chlorosis virus)

The contingency plans have been incorporated into the Nursery Industry Biosecurity Plan and are available from NGIA and PHA. Each contingency plan provides guidelines to assist in developing a Response Plan to this exotic pest incursion and proposed eradication. This nursery paper does not aim to set out the specific detail of each Contingency Plan. However, the aim of this nursery paper is to raise the awareness of industry participants (growers/ retailers and allied suppliers) of these contingency plans in order to become familiar with the exotic pests threatening the Australian nursery industry.

HOW INDUSTRY CAN RESPOND TO EXOTIC PESTS

The NGIA is engaged in several biosecurity initiatives across Australia. These initiatives include the Nursery & Garden Industry Biosecurity Plan (IBP), Biosecurity Manual for the Nursery Production Industry, the EPPRD and Nursery Production Farm Management System - BioSecure *HACCP* Guidelines for managing biosecurity in nursery production.

INDSUSTRY BIOSECURITY PLAN (IBP)

The Nursery and Garden IBP provides a framework for biosecurity risk mitigation measures in the nursery industry. The current IBP was launched in 2008 and provided a blueprint for the exclusion,



eradication and control of key exotic pests relevant to the nursery and garden industry. The IBP has been developed to ensure the industry has the capacity to minimise risks of exotic pests and respond effectively to any exotic pest threats, ensuring the future sustainability and viability of the industry.

An updated release of the IBP is due in mid-2013.

- practicing good sanitation keep it clean
- frequently monitoring crops and the nursery

Biosecurity Manual

- abiding by the law and
- reporting anything unusual to the Exotic Plant Pest Hotline on 1800 084 881.

A key aspect to consider is the implementation by responsible businesses will reduce the risk of exotic pests to the wider industry.







Nursery & Garden Industry Australia in partnership with PHA have developed *The Biosecurity Manual for the Nursery Production Industry*. The manual was formally launched in August 2010 by Dr Anthony Kachenko and provides the framework to reduce the risk of pests entering and becoming established in production nurseries.

The Biosecurity Manual has been designed to assist nursery producers and the industry from the introduction of new and invasive pests by offering six simple routine biosecurity practices which can be embedded into the daily management of the nursery.

The practices include:

- awareness of biosecurity threats
- using only clean, pest-free and certified production nursery inputs



EMERGENCY PLANT PEST RESPONSE DEED (EPPRD)

In 2005, NGIA became a signatory to the EPPRD. As a signatory to the EPPRD, NGIA is at the forefront of developments in biosecurity. The EPPRD is a progressive partnership arrangement between governments and NGIA that sees Australian industries and Governments cooperating as equal parties in the management of emergency plant pests (or exotic pests).

As part of this deed, NGIA is directly involved in categorising the emergency plant pests based on their likely environmental, human health, trade, economic and industry impacts. In the event of an incursion, NGIA is also directly involved in decision making about mounting and managing emergency plant pests relevant to industry.

BIOSECURE HACCP - AN ON-FARM BIOSECURITY MANAGEMENT SYSTEM FOR PRODUCTION NURSERIES

BioSecure *HACCP* is the industry specific, on farm biosecurity program for production nurseries, designed to assist growers in assessing their current and future pest risks. The program guides businesses in the implementation of management strategies at critical control points and provides a systematic approach to assess on-farm biosecurity hazards and responsibilities, detailing how to best manage identified risks.

The program validates many of the best management practice strategies employed under the Nursery Industry Accreditation Scheme Australia (NIASA).



WHAT CAN YOU DO?

Emergency pest threats are very real for the nursery industry and need to be considered and provisions made by businesses and industry to prepare for them. Obtaining the resources which have been developed and implemented biosecurity practices in your businesses and becoming familiar with exotic pests are critical.

SPOTTED ANYTHING UNUSUAL?

When it comes to dealing with exotic pests, speed is of the essence. Detecting an exotic pest early and mounting a swift eradication

Further information

- Reducing the pest risk; The Australian Nursery and Garden Industry's Policy Position on Quarantine and Biosecurity. NGIA 2012.
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response is crucial in order to successfully eradicate an emerging exotic pest threat.

Businesses should be constantly on the lookout for something unusual in their nursery. Nursery workers' eyes and experience are the most important tools that we have.

If you have spotted something unusual, or suspect a pest that represents a risk to your business and the Australian nursery industry, simply call the **Exotic Plant Pest** Hotline on 1800 084 881

Your call will be forwarded to an experienced person in the state department of agriculture who will ask some questions about what you have seen and may arrange to collect a sample. Every report will



be taken seriously, checked out and treated confidentially.

CONCLUSION

Biosecurity planning provides a system for the nursery and garden industry, government and other relevant stakeholders to assess current and future biosecurity needs and practices. Biosecurity planning identifies procedures that can established to reduce the likelihood of pests reaching our borders and minimise the impact if a pest incursion occurs.

Everyone involved in the Australian nursery industry has a role to play in adopting biosecurity practices. Prevention of introducing new pests is far better than dealing with the long term consequences of a new pest. Considering the risks and implementing changes to protect your business, industry and the environment are surely worth doing for everyone's sake.

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TECHNICAL DURDSERS PAPERS June 2013 Issue no.5

Management of fungus gnats in nursery production

Fungus gnats (*Bradysia* spp., Sciaridae) are small, mosquito-like flies which are a common problem in production nurseries and propagation greenhouses where seedlings are being grown. Larvae can cause significant damage, substantial economic loss and both adults and larvae can spread fungal diseases such as Chalara, Botrytis, Pythium, Phytophthora, *Chalara*, *Fusarium*, *Rhizoctonia* and *Verticillium*. Management of fungus gnats requires careful and deliberate planning.

Management of fungus gnats in nursery production

This months nursery paper was prepared by Andrew Manners (Senior Entomologist at the Queensland Department of Agriculture, Fisheries and Forestry) in conjunction with the 'Fungus gnat pest management plan for production nurseries' as part of a levy funded project NY11001 Plant health, biosecurity, risk management and capacity building for the nursery industry. This nursery paper summarises aspects of the more detailed pest management plan which is also available at www.ngia.com.au.

General biology

Adult fungus gnats are small mosquito-like flies which fly in erratic zig-zag patterns over growing media and around plants. Eggs are laid in the soil or potting media and hatch after about 4 days (depending on temperature). Larval fungus gnats are white maggots with a shiny black head and are 1-8 mm in length (Fig. 1) that tend to inhabit the top 3 cm of growing media. Larvae are primarily fungus feeders and will readily feed on organic matter in the growing media. They will also feed on root hairs and callus, present in the growing media, including leaves touching the soil in the absence of fungus food. Large larvae may feed on the insides of roots and large infestations may see larvae boring into larger roots or stems in the soil. Furthermore, larvae and adults can spread diseases, which can cause significant crop loss. Establishment of disease may also be enhanced from wounds created by larval feeding, particularly at high densities.

Managing fungus gnats

Sole reliance on synthetic pesticides to control fungus gnats will eventually fail. Preventative measures, predators and biopesticides can be used very effectively to the exclusion of all traditional insecticide applications. Taking an integrated approach, using a wide array of options to minimise and manage fungus gnat populations, is very effective for keeping fungus gnats under damaging levels. Populations should be actively monitored and a pest management plan established and updated over time to account for the individual nature of your business and the plant species that you grow.



Fig. 1. Fungus gnat larvae heavily infesting a plant cutting (top) and an adult on a tomato seedling (bottom).



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NURSERY PAPERS TECHNICAL June 2013 Issue no.5

Monitoring fungus gnats

Plants should be inspected daily with results of monitoring recorded weekly. Frequent monitoring will enable infestations to be spotted while they are still light, and thus easier and cheaper to manage. Different methods can be used for monitoring adults and larvae. For more information on monitoring fungus gnats, refer to the nursery production fungus gnat pest management plan.

Monitoring adults:

 Yellow sticky traps are essential in cuttings and seedlings (Fig. 2). Position traps about 10 cm above the crop canopy, particularly near susceptible crops. Traps should also be placed near doors, vents and any susceptible crops or areas. At least one trap per 100 m2 for greenhouse crops, more in varieties that are known to be susceptible to fungus gnats. Inspect sticky traps at least weekly and change traps every 2 to 4 weeks. Numbers less than 20 flies per trap/week may be under the economic threshold but will vary with each crop variety. Sticky traps also physically kill adults, precluding their ability to reproduce and further infest the crop.



Fig. 2. Yellow sticky trap with fungus gnats and close-up of adult on sticky trap in topright corner.

2. Visual inspection of the crop can also provide valuable qualitative information about the abundance of adult populations. If relatively large numbers are observed when plants are disturbed further investigation should be undertaken.

Monitoring larvae

3. Visual inspection of cuttings and surrounding media can reveal the presence of fungus gnat larvae but is time consuming and may damage cuttings/roots. Small larvae can also be difficult to detect.

Cultural control for fungus gnats

Growing media and storage

- Use growing media low in organic content. High organic content can promote fungus gnats. However, this must be balanced by using a mix that provides beneficial growth properties for the plant species in question.
- Store growing media in a clean, dry area. Storage of media in an unprotected area subject to rain or other sources of moisture may promote fungal growth, which in turn will promote fungus gnat populations. Ideally, cover unused media in a sealable container to prevent further infestations.
- Pasteurise media prior to use to ensure that it is not contaminated.

Protect your growing area

- Prevent entry to the growing area by using an insect proof glasshouse or tunnel.
- Check incoming stock and growing media, either before purchase or on arrival for signs of infestation.
- Quarantine incoming stock as per NIASA Best Practice Guidelines and monitor plants for fungus gnats and other pests prior to incorporation in production areas.
- Grow cultivars that are more resistant to fungus gnats.

Irrigation and fertilising

- Avoid excess watering. Fungus gnat numbers are lower when moisture levels are relatively low.
- Fertilise using the minimum amount required to maintained required growth. Excess fertiliser will favour the growth of algae in the growing area which will promote fungus gnat populations.

Sanitation and general hygiene

- Reduce fungus growth in the media and growing area.
- Disinfest growing surfaces and paths to remove algae
- Ensure that growing surfaces, below benches, walkways and areas around the growing area are free-draining and free of algal growth.
- Remove weeds and plant waste regularly.
- Modify the growing area so water does not pool in or near the growing area; regrade floors if necessary.
- Remove unsold or unsaleable infested crops from the growing area quickly to reduce populations spread.



Fig. 3. Poor establishment caused by fungus gnats.





4. Potato plugs can be used to lure larvae to the surface. Place a slice of uncooked potato about 3-5 cm in diameter (and about a cm thick) without skin face down on the growing media. Smaller chunks or slices can be used in small plugs/ containers. Ensure that most of the surface is in contact with the media so that the potato does not dry out. After 24-48 hours, lift the potato plug and first examine the growing media under the potato, as larvae will rapidly vanish from view on the surface. Then check the potato itself for larvae. It is recommended to mark pots or plugs where potatoes are placed so you can find them more easily. If not removed, potato chunks can rot, sprout, promote fungus gnats and other pests e.g. mice.

Keep long-term records to assist identifying areas and varieties that are more susceptible to fungus gnat infestations. It is also important to continue monitoring following application of biological control agents and other control measures to determine the effectiveness of each treatment. These records can assist with making management decisions in the future. For example, one might modify the composition of growing media to reduce infestations or select varieties that are found to be more resistant to fungus gnat attack. Insect monitoring data sheets are available in the BioSecure *HACCP* protocols. Alternatively, simple spread sheets can be created and modified to suit your farm.

Pesticides and fungus gnats

Pesticides can be used to assist management of fungus gnat larvae. In Australia, there have not been any confirmed cases of pesticide resistance in horticultural or mushroom crops. However, resistance has been reported for certain organophosphates (e.g. diazinon) and permethrin overseas and it is possible that resistance occurs in Australia but has not been reported. It is important to rotate between products from different mode of action groups regularly. Do not to continue using a product that has failed (particularly if it was applied correctly and good control has been achieved in the past). For more information on use of pesticides refer to the nursery production fungus gnat pest management plan.

Biological control of fungus gnats

Biological control is very effective against fungus gnats and is most effective when released in a preventative manner, so that populations of predators are always present in the growing area. If predators are only released after a large infestation has occurred it will take longer to manage the population (regardless of whether predators or pesticides are employed). It is recommended to release predators routinely, particularly after potting-up to reduce the likelihood of populations reaching damaging levels. A brief summary of commercially available predators are provided below with more detail in the nursery production fungus gnat pest management plan.

Predatory mites

There are two species of predatory mites available from Biological Services listed as the products Hypoaspis A and Hypoaspis M. These relatively large, brown to orange coloured mites feed on fungus gnat larvae, thrips pupae and on a variety of other soil organisms, including nematodes, springtails, root aphids and mites. While soil predators may have some protection from foliar sprays of insecticides, run-off from high impact pesticides can still have a severe negative effect on predators, particularly if they have long residual activity.

Case study #1 Propagation Australia, Queensland

In the past, fungus gnats have been a big problem for us, particularly in poinsettias, gerberas, young carnations and all bedding plants. A long time ago, we didn't treat the growing media when it arrived; we used to accept that the media was clean and pot-up. On a couple of occasions we lost entire crops, a large amount of stock. Now, we rarely have such problems because we manage fungus gnats from the beginning of the production cycle. We assume that all potting media is infested with fungus gnats when it arrives at our nursery. We pasteurise media for very sensitive plants that have zero tolerance (e.g. plants in quarantine, plants grown from tissue culture and nuclear stock), however the volume of media used across all crops doesn't allow us to pasteurise everything. Regardless, all stored media is kept covered and dry.

Cultural management practices make a big difference. Fungus gnats love water and we have noticed that areas that remain over-watered for a period of time tend to have larger populations than less watered areas. Therefore, our irrigation is monitored daily and modified to suit climatic conditions on a daily basis. This helps reduce algal growth, which promotes fungus gnats. Much of our growing area is within insect-proof tunnels and this significantly reduces populations of many pests, including fungus gnats. In addition, we use two types of yellow sticky traps. Long rolls of sticky traps are used in the growing areas with susceptible crops and remain in the crop for the entire season; this acts as a mass trapping device. Smaller, more traditional, sticky traps are used for weekly monitoring (both available at Bugs for Bugs).

Unfortunately, we've found fungus gnats to be very persistent and almost impossible to eliminate completely. We use an IPM crop consultant on a weekly basis to make sure that all pests, including fungus gnats, are managed before they reach economically damaging levels. We have a regular regime for management of fungus gnats (described below) but sometimes additional treatments are necessary; our crop consultant informs us when these are needed.

When we first pot-up, we treat the media with entomopathogenic nematodes and we reapply nematodes on a fortnightly basis. On the off week we drench with Vectobac. In addition, for important stock which has very low tolerance we will drench with a imidacloprid on three consecutive weeks. These applications are made after a tunnel has been completely filled. We will also sometimes apply Agri-50 if numbers of adults are relatively high. Agri-50 acts like yellow sticky traps, but can be sprayed on plants, physically trapping adults and killing them; it doesn't damage most plant varieties.

By doing all of these things we now have very few problems with fungus gnats.

Rove beetle

Adults and larvae of the rove beetle, Dalotia coriaria, feed on a range of small insects and mites, feeding heavily on fungus gnat and shorefly eggs and larvae and thrips pupae. Adults have wings and may fly to find food. Adults live about 21 days and lay up to

about 8 eggs per day, and may eat up to about 150 fungus gnat larvae. Adults prefer to eat fungus gnat larvae more than shorefly or western flower thrips pupae, when given a choice. Biological services is the only provider of D. coriaria in Australia.

Insect-killing nematodes (e.g. Steinernema feltiae)

Insect-killing (entomopathogenic) nematodes (ENs) are tiny, very slender, worm-like, soil-dwelling organisms that are a little less than 1 mm in length. The ENs must be drenched into the growing media. Once they come in contact with a host, they enter and kill it. Application of ENs can be completed using a high volume low pressure spray to drench nematodes into the media a short distance or through existing irrigation. In either case, ensure that all filters are removed and speak to your distributor for more specific instructions before applying for the first time. ENs are UV sensitive, so application when the area is in high levels of direct sun is not recommended. There are two suppliers of insect-eating nematodes in Australia, Ecogrow and Becker Underwood. Ecogrow produces nematodes in Australia, Becker Underwood imports their nematodes from the UK.

Bacillus thuringiensis subsp. israelensis (Bti)

Bacillus thuringiensis subsp. israelensis (Bti) is an entomopathogenic bacteria which causes diseases in insects, e.g. Vectobac or Bactivate. After ingestion by an insect host, the bacteria produce a number of substances which cause cell disruption and other physiological problems which cause the cuticle to disintegrate and the insect to die. There are a large number of Bt subspecies which are specific to certain pest groups, e.g. flies or caterpillars. Bti is specific to various fly larvae, including fungus gnats. Research has shown that Bti is mainly effective against first instar fungus gnat larvae, not larger second or third instars. This is because larger larvae must consume more bacteria to cause mortality than smaller larvae. If using Bti one must apply the product when fungus gnats first appear and may require multiple applications.

Conclusion

Managing fungus gnats without pesticides is feasible but may require modifying the growing environment through cultural management practices. The fungus gnat pest management strategy for production nurseries provides a good basis but may need to be altered to suit your region and growing environment. Be creative and record changes in fungus gnat populations with different management techniques.

Case Study #2 Brocklands Nursery, Tasmania

In the past I used a one application of Crown, Confidor and Azamax over a four week period. At the time, I thought this managed fungus gnats, even though there were adults found commonly on yellow sticky traps. I modified my irrigation system to super-fine foggers which wet the soil but dissipated before reaching the ground. In effect, propagation plants received adequate water, without being too wet, and walkways remain dry. Despite this water saving, relatively dry system, I still had major fungus gnat problems, although it was not recognised at the time. I investigated the use of the product Bactivate primarily for the control of mildews in the propagation house. I now drench Bactivate, which is a combination of five beneficial bacteria active against fungus gnats and pathogens and increasing uptake of certain nutrients, e.g. phosphorous. After the first application, dead fungus gnat larvae appeared everywhere on the surface of the media and resembled a world war battle scene. Now fungus gnats only ever remain at very low levels, plants show higher nutrient uptake and have increased rooting rate.



Fig. 4. Fungus gnats that surfaced and died after application of Bactivate.

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Managing iron in nursery irrigation systems

Having a source of good quality water is vital to any professional nursery operation. In this month's Nursery Paper, Victorian Industry Development Officer David Reid examines iron content in nursery irrigation systems, covering why it may be of concern and how best to manage it.

Managing iron in nursery irrigation systems

Iron is one of earth's most common resources, making up at least 5% of the earths crust. The action of rainfall seeping through this crust dissolves iron and then transports it into natural water sources. The majority of groundwater sources in irrigation systems will exhibit at least some level of dissolved iron.

Although iron in nursery irrigation water could be an essential nutrient, when coming into contact with oxygen in the air it will oxidise, often appearing as an insoluble reddish-brown sediment. Levels of this sediment above 1mg/L of water will ultimately play havoc with a production nursery environment:

- Blocking drippers, filters and spray nozzles through sediment and bacteria that thrive in iron rich environments;
- Contributing to scale build-up in irrigation pipes;
- Decreasing water pressure and overall irrigation efficiency;
- Increasing maintenance and replacement costs over time;
- Staining nursery structures;
- Depositing sediment on foliage, impairing photosynthetic efficiency and ultimately their sale quality (in systems where the level of iron in water exceeds 3-4mg/L).
- Problems may be increased when an iron rich water source is combined with fertigant (calcium salts or unchelated phosphates), accelerating the natural process of iron precipitation considerably.

Water from dams, or surface waterways are unlikely to have iron levels that will contribute to problems within irrigation systems as the iron will have dropped out the water prior to being extracted. The use of a town source or that collected from rainwater are also unlikely to exhibit iron induced problems, unless it comes in contact with degraded steel tanks or pipes.

The problem of iron in irrigation water centres on its extraction from iron-rich groundwater, with bore water a key source. As soil-types are highly variable, groundwater quality at different bore depths will also exhibit variable iron levels.

NB: The document **Minimum construction requirements for** water bores in Australia suggest numerous methods to mitigate the presence of iron prior to accessing underground water sources.



As more nurseries look to draw water from sources other than town water or a source with low iron concentration, the following may provide some direction to manage iron levels in your irrigation water.

Types of iron

The presence of iron in a nurseries water source may be appear in many different forms; chelated, organic and precipated, with these forms including:

- **ferrous (Fe²⁺) or dissolved iron**, which is soluble and colourless when dissolved in water. It is this form that can be introduced into an irrigation system.
- ferric (Fe³⁺), which occurs when ferrous iron is moved to the surface and oxidised to highly insoluble or oxidised (rusted) iron, appearing when precipitated as brownish red colored particles



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suspended in the water. If this water is left to settle most of the rust particles will sink to the bottom of the storage vessel (tank/ dam) over time.

The conversion from the soluble ferrous to the insoluble ferric is affected by numerous factors, with the dominant being:

- **pH** Iron is more soluble at lower pH values and iron precipitation can be caused by raising the pH.
- O₂ content the ferrous form occurs when oxygen concentration is low (i.e.: bore water). When water is moved from anaerobic (without O₂) to aerobic (with O₂) conditions above ground the ferrous form rapidly converts to ferric, with resulting precipitation. Precipitate usually coagulates near O₂ sources such as leaking pipes or emitters.
- **temperature** lower temperatures contribute to longer oxidation reaction times

For example, for 90% ferrous iron, oxidation at:

- pH 7.0, it will occur within 1 hour at 21°C and 10 hours at 5°C.
- pH 8.0, it will occur within 30 seconds.
- At pH 6.0, it will occur within 100 hours.

The critical dissolved oxygen concentration is 2mg/L (2ppm). Below this concentration, ferrous iron oxidation occurs very slowly.



Iron precipitate can clearly be seen in this example (picture courtesy of Mr Phil Heath Botanica Nurseries)

So what is the first step to fixing the issue?

Regardless of how clean the water looks, a full elemental water test should be completed on at least a yearly basis to determine iron content.

Not only is it prudent to discover the level of iron that is being sent through your irrigation system and onto your plants, it is vital to your business to identify the presence of other potential contaminants that could compete/react with the iron. Understanding your water's pH, electrical conductivity (EC) and numerous other elemental characteristics are also important, as some of these may inhibit management approaches.

These characteristics may vary greatly between different sites, water sources and times of the year, so regular monitoring is required to ensure your management choices are suitable and able to maintain the quality of your water.

Nutrient and other factor levels in irrigation water for general ornamental plant production.

Based on Hart (1974); Ayres and Westcot (1976), Aikman (1983), Degremont (1991), Yeager et al (1994), Bienbaum 1993.

Factor Nitrate (as NO3 not N)	<i>Phytotoxic limits</i> <100mg/L (excessive soft growth)
Phosphorus (as phosphate)	<15mg/L for phosphate sensitive
	plants
Iron (Fe++) (Yeager et al)	5mg/L
Copper	0.2mg/L
Boron	0.3mg/L
Zinc	2.0mg/L
Manganese	0.2mg/L
Aluminium	5.0mg/L
Molybdenum	0.01mg/L
pH (nutrient imbalances)	5.5 to 7.0
Salinity (EC–dS/m)	0.75 to 3.0 (low to severe
	problem*)
Chloride	200mg/L
Sodium	100mg/L
Alkalinity	40 to 500mg/L CaCO3
-	(low to severe problem)
* Safe salinity limits will dener	ad on the type of crops grown

* Safe salinity limits will depend on the type of crops grow The optimum levels of nutrients in irrigation

Plugging potential of drip irrigation system water sources

<0.1mg/L	should not present much of an issue
0.1-1.5mg/L	minor to moderate clogging of
	drippers. Iron bacteria will develop
>1.5mg/L	severe clogging
>3mg/L	iron rust stains and discoloration
	of foliage plants in overhead
	application.
>4mg/L	phytotoxicity (this will occur w/
	lower value if pH is less than 5.5.
	Values above this are difficult and
	expensive to treat.
	-

Before implementing any management options, samples must be taken.

- Draw water sample directly from source
- Place into a plastic container; filling completely.



- Seal tightly to avoid oxidation
- Send off to lab for analysis. Portable test kits are available (speak to IDO in your state for further information.

Clear water samples does not mean that iron is not present, as invisible iron may be present as ferrous bicarbonate (Fe(HCO₃)₂). However, during sampling and by the time the water sample reaches the laboratory, oxidation of some or all iron can occur and turbidity may show up in the results. Ferrous bicarbonate, when oxidised, changes into ferric hydroxide Fe(OH)₃] producing carbon dioxide and lowering the pH.

Water testing is needed before considering or selecting the appropriate treatment equipment for effective and efficient removal of iron.

Depth of irrigation intake

After identifying that iron content in bore water is causing some of the aforementioned issues, a good first step is to ensure that the irrigation intake is located 50-75cm below the surface of the water. When an intake is too close to the bottom, settled iron sediment will be drawn from the bottom of the pond and those too close to the surface will draw higher levels of the oxidised form and other organisms that flourish on the oxidized from, such as iron fixing bacteria.

Managing emitter blockages /filters

In addition to staining of plants and structures, the blocking of irrigation equipment with iron sediment is a common problem if not managed. This issue of emitter plugging may not be from iron levels alone, but other particulates from soil or water sources. Filters are the first line of defence against particles entering the irrigation system, with the best approach being to install the best filtration system you can afford and regularly maintaining it.

A screen filter is ideal for removing particles from the water source prior to distributing them throughout the irrigation system, with multiple screens system recommended for surface water sources. Disc filters trap particulates on adjacent discs as water flows from outside edges toward the inside of the discs, with filtered water exiting through the central conduit.

Filtration alone does not remove iron efficiently as it only removes particles of oxidised iron. A sand media filter is the most appropriate filter for removing ferric oxide.

The recommended treatment to remove iron is oxidation, sedimentation and filtration, with the use of settling, aeration, chlorination and even potassium permanganate. Aeration and oxidation should take upstream of the filter.

Aeration and settling to precipitate iron

Where iron concentration is above 1mg/L, aeration and settling is recommended prior to use in irrigation systems. Pumping water from the bore and spraying it into the air over a dam (or into a tank) is a reliable way to remove the iron. Another option is cascading the bore water over baffles. Allowing the water to flow over a large surface such as rocks, a corrugated surface or baffle plates will encourage aeration, before settling in a dam. As previously mentioned, during the aeration process the iron is oxidised into is insoluble form that can then be settled in the



Bore pump Iron precipitate can decrease pump performance and lead to pump failure

dam/tank. A clear disadvantage is that the water must be double pumped, with an extra pressurisation required after aeration.

If you wish to settle it in a tank, it is ideal to draw the water off from a high level outlet and into another storage tank, with a regular drawing off of the iron rich sludge from the settling tank via a bottom outlet plug.

Chlorination to control iron

Chlorination can be utilised as a further control following aeration and sedimentation. As well as controlling zoospores and spores of particular pathogens, if the pH is below 6.5 and the iron concentration is less than 3.5mg/L chlorination can also manage iron content.

NB: If pH is above 6.5, the iron concentration must be below 1.5mg/L.

Chlorination can be considered as a treatment method, especially when iron exists in organic form. Chlorination breaks down the organic complexes, and the iron then may be oxidised and precipitated by aeration and pH adjustment. Iron is more soluble at lower pH, with the ideal precipitation value is likely to occur at a pH of 7.2, so it may require the addition of hydrate lime to raise pH. Prudent use of lime is encouraged as too much will create hard water.

Furthermore, chlorination also kills iron bacteria (a type of brownreddish slime that precipitates from water that contains iron) on contact. The bacteria can live on iron or sulphur and produce a mass of slime that quickly attach to PVC and polyethylene tubing and clogs emitters and filters. This slime can also act as an adhesive to bind other solids together to exacerbate clogging. They can also cause soluble iron and sulphur to precipitate out of the water. A continuous residual rate of 1-2ppm of free available chlorine at the distant end of the irrigation system should be sufficient. (Bucks and Nakayama 1980)

Ion exchange / softeners filters

A further option is through softeners to remove the ferrous bicarbonate in water. The simplest method (but not necessarily the most cost effective) is to remove ferrous bicarbonate iron from the water by passing it through an air tight water softener containing a resinous cation exchanger: an insoluble matrix normally in the form of small (1–2mm diameter) beads, fabricated from an organic polymer substrate with a surface that easily traps and releases ions in a sodium ion exchange using coated resin beads or zeolite process called ion exchange. The capacity for removing iron depends on the capacity of resin.

By using a basic softener regenerated with sodium chloride, iron can be removed along with calcium and magnesium. Filters such as these require regular backwashing to maintain effectiveness.

Potassium permanganate

This compound is another option for iron removal from irrigation water, often combined with manganese greensand, acting as a filter to capture ferrous oxide, by oxidising the iron into an insoluble oxide (1:1.06mg/L) The main advantage is the high rate of reaction, many times faster than that of chlorine. The reaction is also not sensitive to pH within the range of 5 to 9.

After backwashing to remove the insoluble iron oxide, regeneration with potassium permanganate solution is carried out to maintain the process. The greensand is recharged until pink water flows out of the greensand media. The flow is then decreased until a slight pink colour appears. There should be no pink colour after filtration.

Other products such as zeolites and birm can be used instead of greensand and potassium permanganate to improve the oxidation process.

Complexing the iron to stop oxidisation

If the iron in the water is complexed to stop oxidation, precipitate will not form and blockages are not likely to occur. A simple means of complexing the iron is to add sodium silicate to the water with an injection pump located near the main pump. Sodium silicate is a dense sticky liquid available in 200L drums. Each litre of sodium silicate contains 450g of silicate. To help mix it sodium silicate may be pre-mixed with water to make it less sticky, but do not dilute with more than two parts of water to one part of sodium silicate.

The amount of sodium silicate required depends on the amount of iron in the water. The recommended rate is 7g of silicate per 1g of iron. This is the equivalent to 0.015L of sodium silicate, pet 1mg/L of iron, per 1kL of water.



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Bridging the Ebusiness Technology Gap in the NSW Nursery and Garden Industry

In this month's Nursery Paper NGINA Business Skills Development Officer, Bob Wynyard reports on recent work undertaken in developing E business solutions and training in the Nursery Industry.

Bridging the Ebusiness Technology Gap in the NSW Nursery and Garden Industry

1.Background

A 2009 industry supply chain review in Australia's nursery and garden industry confirmed the need to up-skill all industry sectors. It concluded that urgent action was necessary to improve efficiency, reverse declining profit margins, capture market opportunities and improve business sustainability. Importantly, adoption levels of Information and Communication Technology (ICT) in the industry were very low and a significant impediment to development of strong supply chain management.

In line with Nursery & Garden Industry Australia's (NGIA) strategic objectives and with the aid of a grant from the NSW Department of Education and Community's Skills Enhancement Program (SEP) an ebusiness project was initiated . SEP projects are designed to develop and deliver complementary training activities leading to broader skill development, improved business productivity and better job outcomes for individuals.

From the outset, the project focus was aimed to provide managers and employees of the many industry Small and Medium Enterprises (SME) with improved ICT skills. Through the enhancement of individual skill-sets, would flow; improved processes in stock ordering, invoicing, delivery, sales and payment, as well as identifying and preventing waste.

The project also presented the opportunity to provide a better understanding of how costs are constituted, resulting in the inclusion of an interim Stage 2. This stage focussed on reviewing, upgrading and simplifying costing activities in production nurseries, as well as complementing subsequent developments from the main project.

The project's first major task was to define the ebusiness skill shortages which formed the greatest impediment to improving productivity. Subsequent matching of the relevant units of competency chosen to fill the skill gaps was then tested in a series of pilot workshops. Represented in these workshops were a range of industry owner/managers and employees. Subject to the final outcome of this stage and with any refinements made, NGINA would then be in a position to roll training out to industry and make it available nationally.

Key tangible objectives of the project include;

- A major overhaul of the nursery costing program including development of a workshop and associated resources.
- Building e-business skills and competencies across the industry through the development of a workshop, templates and resources.





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BUSINESS

2. Ebusiness Skills a Must for Efficiency and Profitability The primary objective of Stage 1 was research and gathering information for which Gerard McEvilly (Horticulture Supply Chain Services) was commissioned to assist. His work consisted of in depth interviews with 30 key industry players, scrolling through literally hundreds of research publications and producing a report identifying likely threats and opportunities. His initial observations identified the following key emerging patterns:

- The challenge of getting up to speed on e-business practices is across industry, including production, retail, landscape, all other channels and end users.
- A common occurrence across the industry known as 'Monday Madness' describes the disorderly nature of weekly greenlife ordering, with little knowledge of stock-outs until delivery.
- Training targets are likely to be aimed at more willing 'ready adopters'.
- Lack of e-business preparedness will almost certainly compromise business success in the next 5 years.
- Promoting e-business involvement needs to focus on communicating cost benefits.
- Maintaining post-project momentum will need to focus on adoption of industry guidelines.

More importantly McEvilly identified a broad training pathway based on eight key topics. Further refinement by a subcommittee and a cross section of growers using the criteria of 'most needed' and 'most achievable' resulted in the publication of the "*Better e-business Skills underpin Industry Supply Chain Blueprint*, which included related skills listed below:

1. Step-wise introduction and development of e-business capability

SKILLS: Need and benefits of using e-technology; Introduction to technology used in the supply chain; Performing tasks across industry

2. Development of guidelines and protocols to maximise e-business efficiencies in the supply chain

SKILLS: Industry conventions; Protocols and gaining maximum efficiency; Understanding the supply chain.

- **3.** Introduction of online stock availability SKILLS: Writing electronic supply catalogues; developing online templates and ordering procedures.
- Smarter inventory management SKILLS: Inventory management; Stock control; Planning and forecasting.
- 5. Effective communication between producer and consumer

SKILLS: Effective customer relationship management; Better B2B communication

 Costs, benefits and implementation of barcoding SKILLS: Implementation of stock ID; Electronic data interchange (EDI)

E-Business Skills Pathway in the NSW Nursery Industry Supply Chain



3. Management and Communication; Stronger from Improved Ebusiness Skills

A separate survey was conducted to gauge ebusiness proficiency. In general this supported the view that better ebusiness skills would result in better management and improved communication. Whilst this was conducted via Survey Monkey and the sample was small here are some of the key points:

- 90% of managers/owners are comfortable using computers
- 45% of staff have their own work email address.
- 60% of respondents have never used social media.
- Most respondents use computer/internet for invoicing, data storage, sales quotes and banking.
- When asked to rate their workforce skill levels, 'Accounting System' was the only category rated as 'good' by over half (52.6%) of the respondents.
- Cost, hardware/software required and time to set up new system were listed as the 3 major obstacles to improving electronic business skills.
- Businesses with websites seemed more aware of cost than all other groups.
- In order of priority the greatest needs for e-business skills improvements were in Sales and Marketing, Customer Database, Inventory Management and Social Media.
- 75% of all respondents have websites but 39% take 3 months or more to update them.







4. Eureka! The True Farm Gate Cost of a Plant

Stage 2 of the project was a review of production costing. This involved a total rework undertaken by Andy Cameron (Nursery Management Systems) prior to rigorous testing at a pilot workshop and then subsequent review by workshop attendees. The key objective was to enable growers to accurately determine the cost of a plant before it leaves their nursery. This information enables more accurate decisions to be made on factors affecting profitability:

- Setting a selling price which returns a desired profit margin
- Evaluating production costs
- Improving productivity techniques
- Eliminating unprofitable lines.

Rather than being over analytical this system takes a more pragmatic approach, allowing grouping plants according to their size, growth characteristics and production requirements. As a starting point a grower may select all 140 mm pots and calculate the costs overall. They can then work back to look at specific crops that have different cultural requirements, or particular costs which appear to be excessive. Note that this component of the project is an Excel based Costing Calculator which (once key data is determined) can quickly arrive at the farm gate cost. The next step is to roll the workshop out to industry and workshops are already planned for NSW. It's worth noting that this Level 4 Unit of Competency can now be studied towards a Cert IV or Diploma qualification.

Quote from a NSW grower

"This is a must for every nursery business. It forces you to look at every part of the business and even allows you to calculate your productivity per hour. It's a business health check which is why it's so valuable."





5. Content Finalised for e-business Skills Training Program

Working in consultation with the Project Steering Committee (representing stakeholders) the next major step was to match needs to skills. Assistance from key staff from the logistics and IT faculty at Nirimba College in western Sydney was paramount in finalising content and materials for the delivery of four pilot workshops and a contract was signed with TAFE NSW - Western Sydney Institute (WSI). Three of the six priority Blueprint needs listed in section 2 above with were selected and delivery outcomes defined:

1. Step-wise introduction and development of e-business capability

TRAINING OUTCOME: The availability, benefits and application of current technologies to support efficiencies and productivity in nursery business operations

- Development of guidelines and protocols to maximize e-business efficiencies in the supply chain TRAINING OUTCOME: The development of protocols and standards of practice relevant to current market conditions and emerging trends and how this impacts on performance
- 3. Smarter inventory management TRAINING OUTCOME: Creating a structured strategic framework to planning, forecasting and managing inventory appropriate to business needs.

The Units of Competency selected and contextualised to the industry were:

BSBEBU501A	Investigate and Design e-business Solutions
TLX4028A	Apply Knowledge of Logistics
ICAICT306A	Migrate to New Technology

BUSINESS

6. Delivery of Pilot Workshops

The first workshop was broad ranging touching on live inventories and the perceived difficulties in running them in production nurseries. A number of more common problems or opportunities were teased out and became the centre of attention in the next two workshops with great interest in the opportunities for more effective methods of B2B communication. This led to exploring a range of applications on offer with first- hand experience.

The second workshop had an in depth look at inventories and their management. It highlighted the difficulty of keeping an accurate inventory. It was apparent that some growers are becoming frustrated as demands of trading partners threaten to compromise profit. The reasons why accurate inventories are important include:

- Delivery of short or incorrect orders will steer your customer to more reliable suppliers.
- It's impossible to know if profits are real or not without an accurate inventory.
- Overstocking chews up cash which could be better used elsewhere in your business.
- Better control on theft and losses
- Knowing you have accurate information means you can trust your systems.
- Makes for more efficient stocktake and end of year process.
- Meets the needs of the ATO to ensure correct tax is paid.

A healthy ensuing discussion looked at stocktaking and the need for robust business management practices to deal with variances.

Perhaps the biggest opportunity ebusiness presents for small business however is the capacity for them to punch above their weight with cloud computing, smart phones and the access to so many new applications. During the workshops participants either trialled or had demonstrations on many of these and other aids to business improvement including: MailChimp, DropBox, CRM, Office HQ, CMS Platforms, Search Engine Optimisation, CRM,



EDI and many others. Following the four 6 hour pilot workshops each participant is followed up for a further 4 hour face-to-face mentoring session culminating in an Action Plan.



Next Steps for Ebusiness Skills Program

The completion of the pilot workshops capped off nearly two years of groundwork involving many people across industry. Once the current student assessments are completed and a report is received from Nirimba College, a series of workshops will be rolled out to industry, although it is not yet decided what form these will take.

Finally

It is worthy to note that in order for the industry to become more efficient, many issues need to be addressed both vertically and horizontally. Many listed below are not ebusiness problems but if not addressed will continue to have a profound effect on ongoing efficiency:

- A better understanding is needed of how cost activities (especially labour) are made up and could be deployed more effectively.
- The lack of effective live inventories is compromising the ability of many SME to satisfy customer needs and operate efficiently.
- Modification and improvement is needed in the many nursery stock handling processes— in fact poor systems and procedures severely compromise e-technology.
- Retraining nursery people to be IT experts rarely works better to set up the right system at first attempt.
- Cloud computing and advanced software applications mean small businesses can perform well above their size in many areas.
- More effective industry communication either are widely available with a raft of affordable applications either internally, business-to-business or business-to-customer
- There is a role for industry organisations to become repositories for access to ebusiness information, applications and templates.

For more information

Nursery paper November 2009 Supply Chain Management holds the key to the viability of nursery enterprises. Gerard McEvilly, Horticulture Supply Chain Services and Tom Rafferty, Supply Chain STO

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TECHNICAL Jump to page **NURSERY PAPERS** September 2013 Issue no.8

Automating Irrigation Scheduling in Nursery Production

Traditionally irrigation scheduling in production nurseries has been determined by past experience (gut feel) and the setting of specific run times depending on the season. Other common methods employed include manual moisture assessment of individual containers, daily evaporation measurements or using a weight method to determine a container's water holding capacity. In this month's Nursery Paper Queensland Industry Development Manager John McDonald and Research Scientist David Hunt describe the water use efficiency and cost savings achieved through the automation of irrigation scheduling.

Automating Irrigation Scheduling in Nursery Production

Managing plant production and increasing productivity through reduced input cost is an ongoing issue for all production nurseries. Whether the crop is vegetable or forestry seedlings, containerised fruit trees or ornamental plants, the resource inputs and costs of production are a constant. Retail prices may fluctuate due to post-production expenses and varying profit margins but the actual resources and costs involved in producing a plant are relatively fixed. Therefore developing new methods and technologies to assist producers in managing input resources and costs e.g. water, nutrients and energy is paramount for ongoing sustainable development of the horticultural industry.

Irrigation scheduling for nursery crops is the science of establishing a balance between the application rate of an irrigation system and the time period that is required to replace the amount of water previously lost from a container or to re-fill the container to the capacity of the growing media. It allows us to replace

the water lost through plant transpiration and evaporation (Evapotranspiration) and maintain the growing media water content at a point that does not drought or waterlog the crop, therefore providing the optimum growing conditions.

Modern manufacturing techniques and design methods allow irrigation distribution systems, e.g. pipes, pumps and emitters, to be designed with highly accurate and constant application rates, if installed and maintained correctly. The use of blended organic growing media with known and relatively stable water holding capacity, air filled porosity and infiltration rates are available and only change due to plant/root growth. As the physical properties of the irrigation system and growing media remain fairly constant, developing an irrigation control system that responds to the plants daily water requirements can help to reduce input costs and improve both water and energy use efficiency.



NGIQ Weight Based Irrigation Scheduling Controller (WBIC) research project - Redlands Research Station



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Most of the current systems employed by production nurseries to schedule irrigation are either dictated by the season, e.g. summer = two irrigations/day (am & pm) at 20 minutes each and in winter = one irrigation/day at 10 minutes or variations to this based on "testing" container moisture content by feel and visual assessment or weight by lifting a container. A system also used in the past by a few growers has been through the measurement of daily evaporation (Class A Evaporation pan) and replacing the water lost each day in the next day's irrigation.

The operating parameter common to all of the above scheduling systems is they are all an approximation, at a given point in time, of the amount of water lost to evapotranspiration and what is required to re-fill to container capacity. With many growers unsure of the initial total water holding capacity of their growing media, crop wilting points, container recharge points, etc the whole scheduling system requires greater and more accurate tools for production nurseries.

Over the past four years NGIQ has been actively researching the technology available to automate irrigation scheduling in container crops through a dedicated research program funded under the South East Queensland-Irrigation Futures (SEQ-IF). Field based crops have for many years been able to use a range of soil moisture measuring tools from tensiometers, neutron probes, capacitance probes and Enviroscans to support infield irrigation scheduling and apply water at the precise time the crops require it. The research has shown that many of the technologies used in soil based cropping are either not suitable or will require alterations to container cropping practices e.g. reduced air filled porosity, that render them inappropriate for use.

The one area that has shown promising results in container irrigation scheduling is through the use of electronic loadcells measuring the container weight and through basic calibration the water content of a container (container capacity). The loadcells can take a number of "sample" containers in-situ that represent the crop in the field and through the averaging of the weights give a very accurate water content measurement at any given time. As a result of the NGIQ research the gravimetric weight method utilising loadcells has been developed into a complete weight-based irrigation controller (WBIC) that monitors plant container weights and triggers irrigation according to the plants daily water use. The WBIC has the flexibility to allow pre-set irrigation times, multiple zones, frost settings, individual trigger points for both re-charge and container capacity and can operate off a PC or a standalone touch screen controller.

Research Results

The use of loadcells to schedule irrigation has demonstrated significant savings in water use and energy consumption as well as improving the overall operation of the irrigation system by removing the 'human factor' from most of the decision making. Data from a trial completed in 2010 is described below which demonstrated water saving between WBIC and timed irrigation can be as high as 70% (Figure 1). Water use for the trial was calculated on the output flow rate of four MP1000 sprinklers (6.93 L/min) per irrigation zone. The irrigation system met NGIA best management practice for minimum requirements of uniformity with the system measured at 85% coefficient of uniformity, mean application rate of 17.7 mm/hr and a scheduling coefficient of 1.5.



Irrigation events were initiated within seconds of container weights reaching the lower trigger weight and continued until the upper stop weight was reached. Irrigations varied between the three loadcell groups according to plant water use. An irrigation event is characterised by a sharp increase in weight, while the rate of water use is represented by the angle or slope of the decline in weight and shows that during the period of high evapotranspiration two irrigations were triggered during the day and the rate of moisture loss was high, represented by the steep decline in container weight (Figure 2). During periods of lower evapotranspiration (B), only one irrigation occurred and the rate of moisture loss was slower, represented by a slower decline in container weight. Evapotranspiration reduces or stops during the night and is seen as a constant container weight or horizontal line between 6 p.m. and 6 a.m.



The research also identified the need to accommodate plant growth and the impact on the weight of the container and the relationship to the re-charge/re-fill trigger. A pre-set stop weight would need to be adjusted to account for weight increases attributed to foliage or root growth, and a reduction in the water holding capacity due to growing media degradation. The development of a self-adjusting or feed-back mechanism that identifies when the maximum water holding capacity of the container, or a state of constant weight, has been reached would account for these variations and is being built into the WBIC.

Weight Based Irrigation Controller (WBIC)

The weight-based irrigation controller (WBIC) was developed by Pacific Data Systems Pty Ltd (PDS) specifically for the NGIQ research trials (*Figure 3-7*). The system uses a 2-wire network to communicate between the master controller and remote nodes positioned throughout the production area. Each node has the capability to connect a variety of digital and analogue sensors, solenoids or inputs. Other systems and sensors such as pump and filter pressure transducers could be connected as an advance warning of equipment failure or an entry switch could be connected to pause irrigation for zone access.



Figure 3: An in-field WBIC network node for connection solenoids, weighing devices and other sensors



Figure 4: WBIC unit with touch screen interface

The WBIC can be programmed with different levels of security using passwords to allow access to different functions. The nursery manager could setup a low level password for staff to use for minor adjustment or corrections but restrict access to the core program. Several irrigation alarms have also been included to monitor any system failures. For example, a wilt alarm can be programmed to inform the manager that an irrigation zone needs immediate attention or a high water alarm can be programmed to trigger if container water content goes above the irrigation stop point. These will provide a self-check mechanism to ensure that plants are not over or under irrigated and highlight any issues with the irrigation system or program.



Figure 5: Loadcell used to monitor plant weights and trigger irrigations



Figure 6: WBIC unit with touch screen interface and security logon screen

The main difference between this irrigation controller and other irrigation controllers is it incorporates the use of loadcells, or a weighing device, to monitor plant growth and water use. The WBIC uses a method similar to the gravimetric water holding capacity method mainly used for research to determine the water holding capacity of a growing medium. The WBIC combines this with the concept of evapotranspiration (ET) to control and trigger irrigation according to the plants water usage. This weight-based irrigation scheduling method has the potential not only to improve water and energy use efficiencies in a containerised production nursery, via reduced pumping times, it also allows the plant to control irrigation in real-time as the growing environment changes.

Weight Based Irrigation Controller (WBIC) Features

WBIC Feature			
Colour touch screen with graphical user interface allows setting / editing of all irrigation parameters. Wired or wireless pc link between controller and office computer Pds-wx-3 weather station interface provides satellite positioning, rainfall, wind speed, wind direction, relative humidity and temperature information		Node inputs: • Three 24-bit load cell inputs • Three analogue inputs for solar radiation, relative humidity etc. • Rain counter • Digital inputs	
Controls three methods of irrigation: time-based, evapotranspiration, and weight-based	Optional master solenoid control which (if selected to be used) will switch on when any zones are irrigating	List of the wbic functions and features	
Et irrigation scheduling can use either daily et values or the accumulated et value to trigger irrigation. Manual irrigation ability for each zone which will irrigate for the number of hours & minutes set by the operator		Easily adjustable set points for weight based irrigation	
Irrigation zones can be created and moved around the screen over top of a plan view of the nursery		Monitor water level in the container or total weight	
Visual animated feedback for each zone currently irrigating	Robust ip67 waterproof enclosure	Calculates root mass and above ground weight while the plant grows	
Maximum simultaneous irrigations parameter prevents too many zones irrigating beyond the pumps capability Usb download of data in csv format will load directly into spread sheet software	Power and communication between nodes occurs over a single pair of 24vac wires (no separate communications or power wiring required) Controls latching or non-latching relays	Can be used with growing media other than soil where traditional soil moisture probes are ineffective Access to the settings are protected by security password	
Data storage length: 12months Alarm output to indicate problems		All irrigation zones can be programmed to operate within time-windows	



Figure 7: WBIC Touch Screen – diagrammatic view for setting Stop Point, Start Point, Wilt Point and over irrigation alarm point.

Further Information

For further information contact NGIQ Industry Development Manager John McDonald on 07 3277 7900 or nido@ngiq.asn.au

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Certified Budwood Schemes – helping to protect: you, your business, industry, environment and the community.

The ability of the nursery industry to secure "high-health" plant propagation material does exist for some commodities via certification and improvement schemes. However, material is not available for all types of material needed by plant industries In this month's Nursery Paper, NGINA Industry Development Officer Michael Danelon looks at some of the options available to the industry to secure plant propagation material with the purity, authenticity and reliability to perform and enhance both the industry and environment.

Industry accreditation and certification of production nursery inputs

The nursery and garden industry propagates, grows and sells a wide range of plants to a variety of market sectors and customers.

The outbreak of Myrtle Rust (now referred to as Eucalyptus/ Guava Rust) on the east coast of Australia in May 2010 has been at a significant cost to the nursery industry, environment and community. However, it has helped to highlight the importance of biosecurity risks associated with moving nursery plants around the country and the impact exotic pests and diseases can have.

Anyone growing and selling plants needs to be aware of the pest and disease threats to the plants you grow and sell and what steps are required to prevent and manage them for your long term viability. Awareness and adoption of industry best management practice, guidelines and industry policy position should be common place for those in the nursery and garden industry.

To support the professional operation of the nursery industry, Nursery & Garden Industry of Australia (NGIA) through the support of levy funds from Horticulture Australia (HAL) developed the Nursery Production Farm Management System (NPFMS) for production nurseries, growing media manufacturers and greenlife markets.

The NPFMS is the framework supporting a sustainable future by allowing businesses to evaluate and manage areas of concern to them. The three industry on-farm programs consider:

- NIASA Nursery Industry Accreditation Scheme Australia detailing industry best management practice
- EcoHort Environmental Management System to demonstrate sound environmental stewardship and natural resource management and
- BioSecure HACCP Biosecurity program to assist businesses to assess their current and future pest, disease and weed risks for imported and exported material.

Supporting NIASA accreditation as a source of consistent product and product performance is the BioSecure *HACCP* certification program. BioSecure *HACCP* addresses hazards through anticipation and prevention rather than reliance of end point inspection and treatment of products. BioSecure *HACCP* builds the integrity of the products by implementing critical control points within the business with the aim of achieving a high-health status product.



Stock within Auscitrus citrus repository



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International certification entry requirements for australia

Imported plant material (seed, cuttings, budwood, cutflowers, live plants, tissue culture etc.) introduced to Australia requires assessment and formal testing as outlined by the import conditions (ICON) set by Department of Agriculture, Forestry and Fisheries¹ (DAFF). These conditions are based on the probable threat/risk of introducing pests and diseases with the imported material. For example, tissue culture flasks may be visually inspected for the presence of disease symptoms, or entry into an approved DAFF Post-Entry Quarantine facility may be required to assess high risk material for pest and diseases before release.

Refer to the DAFF ICON¹ website database listed below for more information on importing conditions.

Not all plant propagation material may display disease symptoms

In all plant production systems pests and diseases (e.g. insects, mites, fungi, bacteria, nematodes, viruses, viroids etc.) can cause varying degrees of damage and affect the quality of the plant, including its vigour and longevity.

Fortunately most of these pest problems can be managed, although some can be more challenging to detect and may go unnoticed for a period of time or disease expression may be masked under certain environmental conditions.

Graft-transmissible diseases pose threats to production nursery inputs

Viruses and other graft-transmissible diseases pose a significant threat as they can be difficult to detect and prevent if infected plant material is not managed appropriately. Graft-transmissible diseases are usually viruses or viroids which can be transferred from plant to plant by mechanical transmission (pruning/budding/grafting) or through infected propagation material. Some diseases can also be spread by insect vectors like aphids and thrips. To reduce the risk of transferring virus and virus-like diseases in plant propagation material nursery hygiene and Biosecurity practices are paramount.

A number of methods are used to check the health status of plant propagation material. Tests include greenhouse biological indexing (transfer of sap and expression of the disease to indicator plants under ideal environmental conditions) and laboratory based molecular techniques.

When virus and virus-like diseases have been diagnosed and no source of healthy planting material is available, the infection can be eliminated from diseased material of some plant types via nucellar production (derived from cells of a maternal tissue in the ovule/seed without sexual reproduction), tissue culture, thermotherapy (hot water treatment/exposure) and shoot-tip micrografting.

Development of certified budwood schemes for specific plant inputs

Management of viruses or other graft-transmissible diseases can be achieved for some commodities using healthy (virus-free) planting material. The maintenance, testing and distribution of healthy stocks form the framework of a phytosanitation programme for certified seed, budwood and plant propagation material.

Such phytosanitary programs and repositories (a collection of 'clean' pest and disease-free germplasm to be utilised for propagation) do exist in certain intensive horticultural industries in Australia with some examples being: Almond Budwood Program (Almond)², Auscitrus Certified Budwood and Seed (Citrus)³, Australian Pome Fruit Improvement Program Ltd (Apple and Pear)⁴ and the National Vine Accreditation Scheme (Grape)⁵.

Phytosanitation programs provide industry with an ongoing supply of high health status propagation material of the varieties sought by growers, including new material with commercial potential.



Auscitrus citrus repository



Case study - auscitrus certified budwood and seed

Citrus is one of the most important commercial fruit crops grown throughout the world. It provides a basis for local agricultural industries, generates employment, raises income and provides an important source of foreign revenue. It is also a widely planted tree by gardeners.

The Australian Citrus Propagation Association (Auscitrus) was started in 1927 by a group of NSW Citrus nurserymen as a not for profit organisation to protect the citrus industry from various pest and disease problems. They have become the primary supplier of certified citrus seed and the only supplier of scientifically tested citrus budwood to citrus nurseries.

Auscitrus works in close partnership with New South Wales Department of Primary Industries (NSW DPI) who provide independent laboratory and greenhouse testing at the Elizabeth Macarthur Agricultural Institute (EMAI) in Camden NSW.

One particularly serious exotic citrus disease is Huanglongbing (HLB) which has not been detected in Australia. Within the Nursery Industry, HLB is considered a pest threat not only for citrus but also *Murraya paniculata* (Orange Jessamine) and *M. koeniggii* (Curry Leaf plant) which are hosts of this disease.

Internationally, HLB has forced many citrus nurseries and orchardists out of business in Florida in the United States (US), Brazil and South Africa and threatens to impact the industry in California in the US where it was detected in 2012.

HLB is a graft-transmissible bacterial disease that is also spread by insect vectors. If HLB and an insect vector (one of which is the *Asian Citrus Psyllid*) were to arrive in Australia, it could have a catastrophic effect on the Australian citrus industry, citrus nurseries and ornamental nursery growers of the host *Murraya sp*. Diseases that are endemic (i.e. known to occur in Australia) of most concern to citrus include:

Citrus exocortis viroid (CEVd). CEVd or scaly butt, infection can lead to bark scaling below the bud union as well as severe dwarfing and decline. The disease is caused by a viroid that is symptomless in most citrus varieties but symptoms typically appear when infected



Citrus repository Nursery Auscitrus

budwood is grafted onto a susceptible rootstock. Studies have found that production can be reduced by up to 70%.

Citrus tristeza virus (CTV)⁶ There are many strains of CTV and some strains can cause a range of disease symptoms. Most citrus trees in Australia are likely to carry various mild strains of CTV that can be spread by aphids and infected plant material.

There are severe strains of CTV that cause stem pitting, tree decline and reduced production in infected grapefruit and sweet orange trees. The sweet orange stem pitting (OSP) strains are only known to occur in Queensland. **Government legislation is in place prohibiting the movement of citrus propagating material** (with the exception of seed) from Queensland to other states.

For over 40 years CTV has been successfully managed in grapefruit orchards by inoculating trees with a mild strain of CTV to protect against the more severe stem pitting strains. The diseases mentioned above are symptomless in certain rootstock/scion combinations. This means an old tree in an orchard or backyard may appear healthy, but may in fact be carrying a serious graft transmissible disease. If budwood was sourced from this tree and was grafted onto a susceptible rootstock the resulting



Auscitrus nursery



Healthy citrus versus citrus with CEVd.

NURSERY PAPERS BUSINESS October 2013 Issue no.9

tree will begin to show symptoms and become a possible host for wider infection.

If you can't see the disease, how can you control it?

Auscitrus has extensive plantings of the majority of the commercially significant citrus varieties, and many of the more ornamental citrus lines. These plantings are regularly tested for disease (indexed) and maintained under strict biosecurity conditions to prevent cross-infection (hygiene/access restrictions/ facilities/staff training/preventive measures).

Plantings are tested for trueness to type, and are actively managed for budwood production in field plantings and a NIASA accredited citrus nursery.

Citrus viruses and viroids can be killed by sterilising cutting tools with a fresh solution of 1.25% (12 000ppm) chlorine. A 10 second dip of cutting tools is adequate and should be followed by a rinse in clean (distilled/deionised) water.

Obligations to supply clean pest and disease free plant material

Any nursery producing or distributing plants has a responsibility to ensure that they are not distributing pest and diseases around Australia. To honour your obligations under federal and/or state/ territory legislation consider:

- only propagating plants from parent material of a known high health status
- obtain plant propagation material from clean disease-free suppliers
- ensure internal controls are in place to prevent cross infection
- maintain records of source material and plant movements (allow traceability) and
- abide by the quarantine regulations of intra and interstate plant movements.

Securing clean plant material – think about the future

In many situations it may be a challenge to secure plant propagation material with the purity, authenticity and reliability to perform and enhance your business. There are however options individual businesses have in requesting and working toward receiving the type of material you are wanting from your suppliers. Plant health and the integrity of the plant products with regard to possible pest and disease infection are often taken for granted until it is too late.

Whilst there is the industry NPFMS programs available to all within the industry, the adoption by industry and industry stakeholders is one area where it should be recognised to help secure the future of businesses propagating, growing and selling plants. At the end of the day you are better to invest in a product with low risk rather than one produced in an environment that may cost you money in the long term.

Further Information

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Acknowledgements

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- ³ Auscitrus Certified Budwood and Seed- http://www.auscitrus.com.au/docs/why auscitrus.asp
- ⁴ Australian Pome Fruit Improvement Program Ltd (APFIP) was established in February 1997 by the Australian Apple and Pear Growers Association Inc (AAPGA – now Apple and Pear Australia Ltd) for the benefit of the Australian pome fruit (apple and pear) industry http://www.apfip.com.au/1102.aspx
- ⁵ National Vine Accreditation Scheme http://www.avia.org.au/pdf/accreditationscheme.pdf
- ⁶ Citrus Tristeza Virus http://www.daff.qld.gov.au/ data/assets/pdf file/0019/71830/Citrus-Citrus-tristeza.pdf

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Managing Chemicals of Security Concern Across the Nursery & Garden Industry Supply Chain

The Council of Australian Governments has identified 11 chemicals that are considered high-risk because they can be used to make homemade explosives. Australian governments in partnership with industries have developed a voluntary National Code of Practice for Chemicals of Security Concern to provide information and guidance on minimising the risk of these chemicals falling into the wrong hands.

In this month's Nursery Paper, NGIA Research & Market Development Manager, Dr Anthony Kachenko provides an overview of the voluntary code as well as existing industry resources to manage chemicals of security concern across the nursery & garden industry supply chain.

Managing Chemicals of Security Concern Across the Nursery Industry Supply Chain

A large and diverse number of chemicals are used in fertilisers and pesticides and for other horticultural applications by members of the nursery & garden industry supply chain on a regular basis. Of these chemicals, a small percentage can be used for unlawful purposes, which includes lethal homemade bombs and terrorist attack.

Australian intelligence and law enforcement agencies have identified 96 chemicals as being attractive for these unlawful purposes. A full list of these 'Chemicals of Security Concern' can be viewed at www.chemicalsecurity.gov.au. These chemicals include chlorine, which is commonly used to disinfest irrigation water in production nurseries, and hydrochloric acid which is commonly used in production nurseries as an effective neutralisation agent for alkaline irrigation water. Other chemicals on this list and used by members of the nursery & garden industry supply chain include hydrogen peroxide and nitric acid (at a concentration of 30% or higher).

Eleven of these 96 chemicals have undergone a risk assessment and deemed as being particularly high risk because they have been identified as precursors to homemade explosives. These 11 chemicals include hydrogen peroxide and nitric acid.

For these chemicals, Australian governments in partnership with industries have developed a voluntary National Code of Practice. It is important to note that although this Code of Practice applies to the 11 chemical precursors to homemade explosives; it could apply to any of the 96 chemicals of security concern in the near future.

A key part of the voluntary Code is common sense and good business practice. The voluntary Code aims to promote effective chemical security management practices throughout the chemical supply chain from manufacture and distribution through to retail and use. Indeed, all members of the nursery & garden industry supply chain that handle chemicals, irrespective of the risk they may pose to a business and the wider Australian community, should be aware of the voluntary Code.



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Objective of the Voluntary National Code of Practice

The Voluntary National Code of Practice has three key objectives to:

- 1. Protect against the diversion of chemicals for terrorist and criminal purposes.
- 2. Encourage cooperation between businesses and organisations that handle chemicals and law enforcement agencies on chemical security matters.
- 3. Educate and train staff to be alert to warning signs and report suspicious activity.

How can I use the voluntary Code?

The voluntary Code is not about making it harder to access chemicals, but rather, about users keeping an eye out for anything suspicious. Nursery & Garden Industry Australia (NGIA) and several other industry Associations were engaged in the development of the voluntary Code to ensure it didn't create unnecessary hurdles or excessive red tape for industry.

Several practical measure are detailed in the voluntary Code that can be implemented without spending too much time or money, to reduce the likelihood that chemicals will be diverted or misused for terrorist or criminal activities. Indeed, many of these measures support those listed within the Nursery Production Farm Management System (FMS) and the Australian Garden Centre Accreditation Scheme (AGCAS).

Nursery Production FMS

The Nursery Industry Accreditation Scheme Australia (NIASA) – Best Management Practices is the cornerstone of industry best practice in production nurseries, greenlife markets and growing media manufacturers. This third party audited industry program is voluntary and includes guidance and support from an experienced team of technical officers operating regionally across Australia.



Section 1.2.4 of these guidelines details industry best practice on storing and using chemicals as well as information on appropriate record keeping.

Building on from NIASA is EcoHort, which promotes best practices in environmental and natural resource management. This industry program is also voluntary and like NIASA, is third party audited by an experienced team of technical officers. Section 3 calls for business to be aware of legislative requirements affecting them. In addition to this, Section 5.2 provides further detailed information on using pesticides and chemicals responsibly including safe storage and disposal. For example, EcoHort stipulates that pesticides and chemicals should be stored in a lockable, weatherproof, fire-proof and well-ventilated area.

Both NIASA and EcoHort should be considered a necessary part of good business practice by all production nurseries, greenlife markets and growing media manufacturers across Australia. These programs incorporate years of industry and international research to ensure businesses engaged with these programs are up-to-date with world's best practice.

AGCAS

This voluntary third party audited business improvement program for retail garden centres also contains pertinent information on safe retailing of chemicals and associated products. For example, these guidelines request that relevant chemicals and associated products are stored to meet the statutory requirements of state and territory legislation. Like NIASA and EcoHort, AGCAS should be considered an integral component of good business practice in all retail garden centres.

Security Risk Management

The following information is part of good business practice and should be integrated into business culture and philosophy across all members of the Australian nursery industry supply chain.

Assign Responsibility

Security management within the business should be assigned to a person(s) to undertake the following tasks:

- Introduce and maintain security measures based on threat and risk and ensure compliance with relevant legislation.
- Establish relationships with government agencies and others (where applicable) to address security issues.
- Develop and manage reporting systems.
- Assist in raising employee security awareness.
- Include security in employer and contractor training and induction.

In addition to the above, it is vitally important that suspicious incidents and security breaches are investigated and reported to the **National Security Hotline 1800 1234 00**. These incidents may be internal or external to your business. Examples of suspicious incidents could include:

- Unauthorised entry into restricted areas such as chemical sheds.
- Unexplained losses of chemicals.
- Unexplained disruptions to business processes.
- Major cyber-attack on internal process controls or inventory systems.





Unusual behaviour in purchasing chemicals should also be regarded as a suspicious incident, such as attempts to purchase chemicals for no clear purpose.

Security Measures

A suite of security measures are listed within the voluntary Code. Some of the key measures that should be considered by members of the nursery & garden industry supply chain are summarised in table 1.

Table 1: Examples of recommended security measures and for whom such measures are likely to be relevant.

Measure	Suggested Actions	Relevant To
Employee and contractor checking	 Basic background checking prior to and during employment Educate staff on security issues and controls Verify identity and referee information and follow up on anomalies 	Manufacturer, Importer, Processor, Transport/Logistics, Wholesaler, Retailer, End User (Business)
Personnel security awareness	 Educate staff on potential misuse of chemicals being handled in induction and on-going training and provide clear instructions for reporting suspicious activity 	Manufacturer, Importer, Processor, Transport/Logistics, Wholesaler, Retailer, End User (Business)

Physical access	 Install deterrent signage Require visitors to sign in Control access to keys to secure areas 	Manufacturer, Importer, Processor, Transport/Logistics, Wholesaler, Retailer, End User (Business)
Personnel access	 Restrict access to authorised personnel Always escort or monitor visitors and contractors 	Manufacturer, Importer, Processor, Wholesaler, Retailer, End User (Business)
Point of sale procedures	 Only sell to customers with known identity and verified legitimate use Report suspicious transactions (including unusual or different sales to account customers) 	Manufacturer, Importer, Processor, Wholesaler, Retailer
Sale and distribution procedures	 Only sell to customers with known identity and verified legitimate use Report suspicious transactions (including unusual or different sales to account customers) Do not leave chemicals unattended at point of delivery 	Manufacturer, Importer, Processor, Wholesaler, Retailer
Transporting chemicals of security concern procedures	 Ensure chemicals are secure at all times during transport Do not leave vehicles unattended Use secure parking for loads in transit Monitor the location of vehicles transporting chemicals 	Manufacturer, Importer, Processor, Transport/Logistics, Wholesaler, Retailer, End User (Business)

F YOU SUSPECT IT

CHEMICAL SECURITY

Conclusions

The examples of security measures indicate that it is important to have an open and trustworthy relationship with supply chain partners. This is vital in order to share safety and security advice, expertise, resources and to foster awareness of chemical security. The following six tips are important consideration for you to secure your chemicals:

- 1. Adopt industry best practice through NIASA, EcoHort and AGCAS programs
- 2. Ensure prospective, seasonal or casual employees are trustworthy
- 3. Limit access to your chemicals
- 4. Lock your chemicals up when they aren't being used
- 5. Keep track of your chemicals
- 6. Educate and train your staff to be aware of suspicious behaviours

If you suspect it, report it to the National Security Hotline on 1800 1234 00 or hotline@nationalsecurity.gov.au



NATIONAL CODE OF PRACTICE FOR CHEMICALS OF SECURITY CONCERN

www.chemicalsecurity.gov.au

Further Information

More resources on assessing, identifying and addressing your security risks, including the National Code of Practice for Chemicals of Security Concern and guidance materials are available on the chemical security website: www.chemicalsecurity.gov.au

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Further Information

For additional information, consult the following nursery papers which are all available electronically from www.ngia.com.au

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Valuing the urban forest in Sydney

Any grower can tell you the price of a tree but how many can tell you the value that trees offer to the community? The objective of the project "Understanding the carbon and pollution mitigation potential of Australia's urban forest" was to test and improve methodologies for evaluating the ecological and social value of the urban forest. In this nursery paper Dr Marco Amati of La Trobe University explains how this was done along two major highways in Sydney.

Valuing the urban forest in Sydney

The urban forest holds a particular role in the Australian urban landscape. A mixture of remnant, native and exotic trees, it exists at once as an expenditure for local authorities while providing a range of unquantified benefits such as habitats for wildlife, air pollution removal and flood prevention. Despite its prominence as an identifier for an urban area or as the backdrop in the lives of urban residents, the urban forest continues to be undervalued as part of the policy process. The aim of this project was to contribute to the development of tools that help value the urban forest, while seeking an understanding of the feelings of residents towards urban trees.

Current planning policies and recent research work highlight the urgency of this task. For example, the current 'Draft Metropolitan Strategy for Sydney' outlines that by 2036 Sydney's population is expected to reach 6 million, an increase of 1.7 million since the 2006 ABS Census, which means Sydney will need to provide 770,000 more homes than in 2006 (NSW Government, 2013). Much of this development will be suburban infill and redevelopment at higher density leading to potential losses of green space. At the same time, research on housing has described how houses in all capital cities in Australia are getting larger and backyards are disappearing (Hall, 2010). The twin drivers of 'densification' through policy and preference work against the welldocumented positive impacts that green spaces and especially trees can have on the sustainability of suburban areas. Trees and green spaces can reduce the need for storm water provision, prevent floods and save on air conditioning, mitigating greenhouse gas emissions and improve biodiversity (Stone and Rodgers, 2001).

While a great deal of research exists internationally on urban forests, little work has been undertaken to ensure that this research is appropriate to Australian conditions, which include soils with a uniquely low nitrogen content and frequent drought conditions. A model for the city of Canberra was developed by Cris Brack, one of the researchers in this study (Brack, 2002). Some postgraduate level research has been performed to evaluate the use of the US model STRATUM on street trees in Melbourne, funded by the NGIA. The City of Melbourne has applied i-Tree to its local government authority (LGA) area. CITYgreen and UFORE are two of the most well known models for calculating carbon benefits of tree canopy cover. UFORE's models have been incorporated into i-Tree and the package has been recalibrated to

Australian conditions. 'i-Tree' can estimate tree composition, carbon sequestration and storage potential, storm water benefits, air pollution mitigation capability, energy savings and related economic benefits (US Forest Service, 2012). It requires field sample tree data to be collected from a number of sample plots or all plots distributed across the study area. So far the suitability of these packages to Australian conditions remains an ongoing topic of investigation.

Method:

Our study focused on two corridors both 400 m wide: 11 km along the Parramatta Road and 19 km along the Pacific Highway, with both cutting through a variety of different suburbs in Sydney. Figure 1 shows a map of the overlapping study areas. The area shaded in blue shows the area of hyperspectral data collected, the area inside the red line shows the area of LIDAR data collected, the black lines show the area for the sample sites used in the i-Tree component of the study.

Post-graduate students Shi-Hsien Yung and Angela Maria Gomez used the i-Tree methodology to measure trees and model the benefits that derive from the canopy throughout most of 2012. At the same



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time another student, Mingzhu Wang scheduled an aerial survey of the roads. The survey collected Light Detection and Ranging (LiDAR) and hyperspectral data of the ground surface and canopy. The LiDAR system scans the ground with a radar pulse to a very high degree of accuracy (Figure 2). This data was initially analysed with the help of the company DiMAP in Perth. Subsequently, Mingzhu used the data to identify the shape and extent of the canopy cover and employed a GIS to model the impact that the canopy would have on reducing the solar radiation on building and roofs. This research is ongoing and is part of her PhD project at Macquarie University.

Lastly, during the final quarter of 2012 and the first half of 2013 another post-graduate student, Natalia Saldarriaga, designed and conducted a postal response survey of 1500 residents on their views about the trees in North Sydney and Parramatta LGA areas. The aim of her survey was to identify





Figure 2



and evaluate the positive and negative attitudes of residents' towards trees and their willingness to plant and manage trees on their private land according to their socio-economic situation. She received a response rate of 8-19%. This research is an ongoing project as part of a Masters of Philosophy at the University New South Wales, and Natalia will undertake a second survey with council officers responsible for the management of trees along the two transport corridors used in this study.

Results:

The i-Tree data shows that the Pacific Highway has a much larger coverage of trees when compared with Parramatta Road (40.3% versus 14.2%). This means that at a basic kilometre-by-kilometre comparison, the Pacific Highway performs better on all of the variables looked at. I-Tree enables the estimation of a variety of parameters related to the ecological value of the canopy. For example, the canopy along the Pacific Highway is estimated to remove 11 tonnes of air pollution per year. This is equivalent to \$5,200 per year. The total value of ecological services delivered by the canopy along the Pacific Highway is \$97,700 per year and is \$18,100 along the Parramatta Road. For the Pacific Highway the lion's share of this value is delivered by the savings on building heating and cooling at \$55,700 per year whereas for the Parramatta Road, carbon sequestration comprises the most important function at \$13,200 per year.



More surprisingly, the results showed that the urban forest along the Pacific Highway corridor is also adding more value per tree to the urban environment than its Parramatta Road counterpart. It is in the areas of pollution removal and building energy savings (and therefore avoided carbon emissions) where the biggest differences between both sites are seen. According to i-Tree the trees along the Pacific Highway are 1.7 times more effective at removing pollution when compared to those along Parramatta Road. Building energy savings delivered by a tree on average are 5 times higher for the Pacific Highway than for the Parramatta Road.

A large amount of data is produced from the i-Tree software that can also show differences between sites. Firstly, the most prevalent species along the Pacific Highway is Syagrus romanzoffiana (Queen Palm) which typically has a sparse canopy. The model within i-Tree, however, calibrates the importance of this tree by adding the percent leaf area and the species percentage. This means that trees such as the third most-prevalent species, Eucalyptus saligna (Sydney blue gum), which are larger and have a denser canopy and a higher leaf area, contribute proportionately more to pollution removal and building energy savings (cf. Saunders et al., 2011).

In general, the institutional, recreational and other (IRO) land uses are where the greatest density of trees is found (112 trees/ ha along the Pacific Highway and 92 trees/ ha for Parramatta Road). It is in these schools, parks and other open spaces such as hospital grounds where trees are able to flourish and where a large amount of control can be exerted on planting and maintenance by government authorities. Along the more urbanised Parramatta Road corridor, trees on IRO lands constitute islands of native vegetation. The IRO tree density here is significantly higher than for residential land uses (92 trees/ha compared with 42 trees/ha residential), whereas along the Pacific Highway the residential tree density is comparable to the IRO tree density (both around 110 trees/ ha). A consideration of the land use is important since this will affect the overall management of the urban forest canopy.

These initial comparisons of the two roads are reinforced by the results from the LiDAR and hyperspectral data. Mingzhu Wang compared the average solar radiation in WH



per square meter (WH/m²) modelled for the whole area when trees are to be included and when they are removed. As Figures 3 and 4 show the data when modelled can clearly show the detail in the reduction of the solar radiation that i-Tree cannot. At the peak of summer for example the trees along Parramatta Road can reduce the solar radiation from a potential radiation of 7136.7 WH/m² to 6424.5 WH/m² as seen in Figure 5.

An area where a difference between the two roads cannot be seen is in the attitude of residents of North Sydney and Parramatta local government areas towards the trees. Despite some differences in the characteristics of respondents along both corridors, both show a striking similarity in their responses. Groups along both roads cite beauty as the most common reason to value trees, followed by a tree's role in environment processes. The aesthetic value judgement also plays out in the response


towards the view of trees as a problem - for which the most popular answer was that they are unattractive. This indicates that respondents are highly sensitive to the aesthetics of different trees.

Discussion

A key contribution of this study is to show the difference between LiDAR and i-Tree methodologies for measuring trees in the urban environment. The i-Tree methodology requires relatively low levels of technological input but does require a certain degree of expertise to measure trees, collect samples and input data accurately. i-Tree certainly provides more complete information than the LiDAR hyperspectral components. It would be impossible to calculate the amount of stored carbon in the tree using airborne LiDAR for example. The modelling that i-Tree uses to calculate the value of the tree canopy is peer-reviewed and has been developed over many years. The outputs provided in dollar terms certainly proves a powerful argument for the use of the

tool in policy work. On the other hand, we would argue that the LiDAR technique has enormous potential moving forward. The technique does not require a stratified random sample that i-Tree uses. i-Tree's sampling technique is based on 19th century methods and the LiDAR method makes full use of the latest technology. LiDAR can also provide a much more accurate picture of the shape and height of the canopy, allowing accurate modelling of the shading on nearby buildings as we have shown. This modelling could also be performed for the canopy's impact on pollution removal. Further work is required to bring this work to the same level of policy relevance as i-Tree, but the basis for advances is stronger being based on actual measurements as opposed to the allometric calculations that form the basis of i-Tree. Furthermore, rapid development in the use of drones for carrying out LiDAR surveys, suggests that this technique will become cheaper in the future. The possibilities of mapping the trees using LiDAR and hyperspectral data also open up

the potential to map other aspect of the tree canopy, for example the distribution of different groups of trees. Finally, it is important to note that both techniques could be used in a complementary way. LiDAR could be used to measure the heights of the trees making the field survey for i-Tree quicker and cheaper.

In conclusion, this project sought to improve the valuation and monitoring of the urban forest – a crucial resource as cities adapt to climate change in the future. The work moving forward will be of relevance to policy makers and planners by highlighting the ecological value of the services that the urban forest provides and showing how valued this green infrastructure is by the community in two very different areas of Sydney.

Further Information

This project was funded by the nursery industry levy with matched funds from the Australian Government through Horticulture Australia Limited (HAL). Other team members included: Sumita Ghosh (University of Technology Sydney), Phil McManus (University of Sydney), Krishna Shrestha (University of New South Wales), Cris Brack (Australian National University), Anthony Kachenko, (Nursery and Garden Industry Australia), Shih-Hsien Yung (University of Technology Sydney), Mingzhu Wang (Macquarie University), Natalia Saldarriaga (University of New South Wales) and Angela Maria Gomez (Macquarie University). Further details can be obtained in the final report for the project: Amati, M. Ghosh, S. Shrestha, K. McManus, P. Brack, C. Kachenko, A. Wang, M. Yung, S.-H. Saldarriaga, N. Gomez, A. M. (2013) *Understanding the carbon and pollution mitigation potential of Australia's urban forest: final report* Horticulture Australia Ltd: Sydney.

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Accurately diagnosing weeds, pests and diseases affecting nursery crops.

Accurately diagnosing weeds, pests and diseases affecting nursery crops can be challenging. If left unchecked these pests can increase costs and reduce productivity. Therefore it is important to take action early to prevent widespread infestations through correct diagnostics.

This months nursery paper was prepared by Andrew Manners* (Senior Entomologist and manager of Grow Help Australia) and John Duff* (Senior Plant Protectionist) as part of the levy funded project 'NY11001 Plant health, biosecurity, risk management and capacity building for the nursery industry'.

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Accurately diagnosing weeds, pests and diseases affecting nursery crops.



Fig.1. Bracteantha infected with *Ralsonia solanacearum*. This species cannot be identified without specialist knowledge and diagnostic capacity.

Infestations of pests, diseases and weeds can reduce growth rates and crop uniformity, as well as increase throw-outs and other costs associated with the crop. Active and regular monitoring can reduce the extent and impact of infestations. Once a problem is observed, it is of critical importance to make an accurate diagnosis. For very obvious symptoms, e.g. presence of spider mites, aphids, caterpillars, etc, a field diagnosis is possible. However, identical symptoms can be produced by multiple diseases and can sometimes be confused with damage produced by insects or mites. In other cases multiple causal agents may be present and identifying the primary cause of symptoms may not be straight forward (e.g. Fig 1). Incorrect diagnosis can lead to increased costs due to inappropriate treatments and allow the pest or pathogen to spread and infect healthy plants.

Information accompanying a plant submitted for diagnosis

It is critical to send detailed information with any plant sent in for diagnostics. This helps the diagnostician put the symptoms and any pest or disease observed/isolated from the plant into perspective and give the most accurate diagnosis possible. If thorough information does not accompany a sample, incorrect recommendations may be provided. For example, if a plant with a leaf spot symptom is submitted and no pathogen is associated with the spots it

When submitting diagnostic samples provide as much information about the crop as possible:

- Species and variety of plant.
- Where the crop has been grown.
- How the crop is being grown, e.g. in containers or in-ground, containers on the ground or raised on benches or under protected cropping.
- History of the crop, e.g. age of plants, length of time the crop has had symptoms, if your plants have ever experienced these symptoms in the past and how they were successfully and or unsuccessfully managed.
- Symptoms of the crop, e.g. leaf spot, root rot etc.
- The percentage of crop affected and the size of the crop (area, number of plants).
- Treatments that have been applied to the crop (fertiliser, insecticides, fungicides or anything else). Provide an estimate of when these treatments were applied.
- Environmental conditions, e.g. rainfall, temperature, high wind, frost, hail etc.
- Provide a photo of the whole crop.



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could be due to the spot being caused by 1) a physiological reaction associated with environmental or growing conditions, 2) fertiliser burn, 3) pesticide phytotoxicity, 4) recent application of a fungicide which has reduced the pathogen to such an extent that it can no longer be isolated from the leaf spot or 5) some other factor. Without further information an incorrect diagnosis may occur, so it is recommended to include as much detail as possible.

Collecting samples for disease diagnosis

Plant pathogens tend to grow in and on plant material. For most groups, pathogens cannot be readily identified from symptoms and must be isolated from the plant (see exceptions below). This involves taking small pieces of plant material from the advancing margin of pathogen activity (e.g. the leading edge of a stem rot or leaf spot) and placing it on a specific media for the pathogen to grow. Once growing on the media it can be examined in various ways to determine its identity. The pathogen must be taken from the advancing margin as secondary pathogens (bacterial and fungal) rapidly develop on dead plant material. For this reason, dead plants are not suitable for the diagnosis of plant diseases as secondary pathogens are likely to mask the primary pathogen. Not all pathogens can be isolated in this way. Some pathogens will not grow on specialist media and spores must be collected and identified directly from plant tissue, e.g. powdery mildew, downy mildew and rusts.

Plant selection can greatly impact a diagnostician's ability to isolate and accurately diagnose the causal agent. It is therefore extremely important that plants with advancing symptoms be presented to diagnosticians. If possible, send in multiple plants so diagnosticians can observe which symptoms are consistent. Having plants with early, intermediate and advanced symptoms (but never dead plants) is beneficial and gives the best chance of isolating the causal agent.

Provide your diagnostic provider a photo of the entire crop and individual plants. This can assist your diagnostician in the diagnosis by putting the symptoms in perspective. It can be beneficial to email photos prior to sending the sample, particularly when whole plants can not be submitted. It can be tempting to submit only symptomatic plant parts, particularly in cases of stem or leaf dieback. While these symptoms can be caused by pathogens that may be isolated from above ground parts it is also possible that the causal agent is acting upon the roots of the plant. It is always better to submit whole plants and allow the diagnostician to determine from which areas to isolate, however, for large plants this is not always possible. In such cases, send in symptomatic parts of the plant, along with soil and root samples.

Molecular techniques are increasingly part of diagnosing plant pathogens, particularly viruses. Isolations often are able to determine the genus of a pathogen from the morphology of spores and other structures. Determining the species of a pathogen from morphology can be difficult and time consuming. Molecular biology can often be used to ascertain the species identity and confirm initial morphological examinations.

Collecting insect and mite samples

Insects and mites tend to be easier to identify than plant pathogens, at least to a common group e.g. caterpillars, spider mites, aphids, scarab beetles etc. Species level identifications can often require

laborious preparations and may not be possible for groups for which diagnostic keys do not exist. However, often knowing the group of insect is sufficient for nursery production managers to put in strategies to reduce the impact of arthropod pests. Sometimes this is not the case, particularly when one species is resistant to insecticides, e.g. western flower thrips or green peach aphid, and other species may have no or differing levels of resistance. In such cases it can be advisable to gain a species level identification. Contact the diagnostic service you plan to use prior to sending insect or mite samples for species level identification as certain organisms have special requirements, e.g. flies cannot be identified using larvae and spider mites must have males and females for identification. In general, it is easiest to submit plants infested with pests as opposed individual insects or mites (Fig. 2). This allows the diagnostician to pick which individuals will be selected for closer examination and avoids sending preservatives in the mail which are most often considered dangerous goods, e.g. 70% ethanol, methanol or other substances.



Fig.2. Waterhausia with stunted growing tips (left) caused by eriophyid mites (right). Eriophyid mites are not visible to the naked eye and require at least x20 magnification to be observed. Adults are about 0.1mm in length, eggs about a third of this size.

Diagnosing pathogens in growing media and water

Many plant pathogens are spread through the movement of growing media and/or in water. As such, it is extremely important to purchase and use pathogen free growing media and appropriately disinfested water. However, pathogens may still occur in growing media and water sources and could therefore require testing. Since many saprophytic fungi and bacteria are often present in growing media and water, testing for these pathogens must be specific. These tests, commonly called baits, should only be undertaken when you suspect a particular pathogen, or when it has been isolated from plants during previous tests. Baiting growing media and water may then serve to determine where the infection has or has not originated. Baiting involves using a seedling, leaf or other plant material from a species which is particularly sensitive to a specific pathogen. Such plant material is the 'bait' from which the pathogen can then be readily observed and isolated.

Soil and growing media

Phytophthora is the most commonly baited soil, growing media and water-borne pathogen, though many pathogens can be baited using different methods. To facilitate your diagnostician completing a Phytophthora bait, collect a number of sub-samples of soil or growing media and roots (up to a depth of 15cm) beneath each plant in a certain location. Multiple plants may be bulked together to make a representative sample for each location. For each sample, include about 500g soil or growing media and roots from plants with early and advanced symptoms. It is particularly important to include roots in the sample as this will increase the accuracy of the test. Include several samples if practical to narrow down which areas are being affected. Soil or growing media and roots are then sent to a diagnostic laboratory for analysis.

As mentioned above, many other baits can be completed to test for specific pathogens. For example *Cylindrocladium*, and allied genera, can be baited using caster oil leaves, black root rot (*Thielaviopsis sp.*) using carrots and *Pythium* and *Phytophthora* can be baited using a variety of leaves including lemon, umbrella tree, azalea, avocado and apple flesh. Refer to your diagnostic service provider if you would like a specific test completed.

Irrigation and dam water

The same principles apply to pathogen baiting in water used for irrigation. Many fungal and bacterial pathogens can be spread in water including Pythium, Phytophthora, Fusarium, Cylindrocladium, etc. The same baits can be used for baiting water as used for growing media ; they are simply left in irrigation water for a period of time and examined for fungal activity. For example, for *Phytophthora*, poke holes in semi-mature umbrella tree leaves and place them inside plastic bottles. Thoroughly cleaned milk containers work well as they have an easy handle from which a string can be tied. The bottle can then be 'floated' in irrigation water such that the entire bottle remains under the surface for 1-2 days before being sent to a diagnostic provider for further testing. This may require a small weight to be attached to one part of the bottle so that the opening remains under the water, but the entire bottle is still at the surface. Testing water can be beneficial, however rainfall and other events can drastically alter the species present in irrigation and dam water over short periods of time.

Nutrient analyses

Growing media and water is of utmost importance to growing high quality plants. It is recommended to monitor such parameters as EC, pH and other nutrients on a regular basis to ensure that growing conditions are optimal. For more information on sampling water and growing media for nutrient analysis refer to the 'Sampling for Analysis' nursery paper, September 2011. Relatively inexpensive commercial EC and pH meters are readily available through many scientific equipment suppliers.

Weeds

In simple terms, a weed is a plant out of place. Weeds are able to spread rapidly and have unwanted economic, environmental or social impacts. Weeds can be very difficult to identify, and may be confused with plants that are not weeds, including native or endangered species. Sometimes weeds look very different between their juvenile and mature stages.

It is important to correctly identify a weed to ensure that control methods are effective and appropriate. Some factors to consider when identifying a weed are where and when the weed grows, its shape, size, leaf form and flower colour. There are several online tools to help you identify weeds on your property.

The Biosecurity Queensland edition of the Weeds of Australia identification tool and the A-Z listing of weeds help to easily identify a weed based on the features of a particular plant. The tool includes over 1000 current and potential weeds. Once you have confirmed the identity of a weed, you can then access management information. Another Australian Weed identification tool provides a detailed summary of major weeds specific to each regional area of each state and territory.

If you cannot identify the plant using online tools or weed identification publications, you can send a sample to your state herbarium for analysis (this usually incurs a fee – check their website for details). Their websites provide information on collecting and preparing weed specimens for identification. Information or the ability to submit plants or photos of weeds is often available through your state department of agriculture or primary. For more information from local community groups refer to the National Landcare Directory.

Packaging considerations

Regardless of the type of material you are sending, be it plants for pest and disease diagnosis, weed or insect identification, water or growing media, it is important to ensure that your sample gets to its destination in good condition (Fig. 3). Samples that become crushed, overheated or stay in transit for long periods can become too degraded for analysis. For this

reason it is recommended to use express post or overnight couriers whenever possible. Wrap plant material in paper towels or newspaper, which can be lightly dampened to prevent desiccation (important for seedlings). If containerised plants are being posted, wrap containers so that growing media does not contaminate the entire sample (Fig. 4). Provide adequate support so that plants cannot move or become damaged if tipped. Alternatively, bare root plants (bag roots if significant amounts of growing media cannot be removed easily) and provide about 500g of growing media bagged separately within the package. For seedlings and delicate plants, it is recommended to package plants in a box to prevent squash damage. Remember to pack with enough padding so that plants do not move around.

For insect or mite pests, send in whole plants (though roots may not be required for above ground pests). It is often important to include growing tips as damage often occurs in this region, even if it is not evident until leaves grow-out. Place samples in a sealed plastic bag or unbreakable container. Sending samples in ethanol or other preservative is not recommended due to current regulations associated with posting dangerous goods; refer to your diagnostic service provider if this is required.

Label each sample clearly with a waterproof marker or with pencil and paper within each bag. Most diagnostic laboratories require a sample submission form to be submitted with the sample. If this form is not submitted, samples will either be delayed or not completed at all. Each laboratory is likely to have slightly different guidelines, refer to your service provider for more detail.

Finally, ensure that you use the correct address. Incorrect addresses can result in samples going missing for days or



Fig.3. Begonias delivered to diagnostic service provider in plastic bags for disease diagnosis. Such a sample would require hand delivery or be packaged in a box such that plants could not move or be damaged in transit.



Fig.4. Plants should be packaged to preserve the current state of the plant (left), not so it can fall out of the pot and become contaminated with soil (right).

even weeks, particularly if the diagnostic laboratory is part of a large, multiorganisational facility. In many cases this can result in a sample becoming too degraded for analysis. When in doubt, contact your diagnostic service provider.

Diagnostic services

Diagnostic samples can be sent to your

local Department of Agriculture, Primary Industries or Biosecurity branch and sometimes to your state herbarium. Private consultants are also available. Each service is slightly different, offering different tests and with different costs. In addition, as part of a nursery levy funded project, Grow Help Australia provides contract rates to all nursery producers.

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Grow Help Australia http://www.daff.qld.gov.au/plants/health-pests-diseases/grow-help Weed Identification tool http://www.weeds.org.au/weedident.htm Nursery Paper September 2011 Sampling for Analysis

Further Information

Refer to your State Departments of Primary Industries, Biosecurity Authorities or Herbariums

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Pruning & Staking- Back to basics

In light of the recent work being conducted to draft an Australian standard for tree stock, there has been renewed focus throughout the industry on tree quality. In this month's Nursery Paper NGINA IDO for the Northern Rivers Des Boorman will undertake a back to basics review of the importance, use and techniques of root control, pruning and staking stock for consistent quality production.

Pruning & Staking- Back to basics

How do we address this?

Root Quality

Root number and structure are fundamental in development of quality plants for all applications, especially when being utilised for growing on into advanced specimens where stability and longevity are crucial to success. A root system that develops in the first few months of a plants' life will be with it for the life of the plant so it is critical to get the first step right. Root remediation can be carried out on small plants such as tubestock at potting-on but this causes significant set-back to the plant and additional costs to the production cycle.

If quality root systems are not produced in the initial stages of production the issue will be compounded throughout the life of the plant if not remediated. Rather than undertake costly remediation conditions should be specified for the production cycle, such as root number and quality.

Root circling and root direction are fundamental when attempting to produce quality stock be they tree, shrub or groundcover so that they will perform post production. Unfortunately due to a range of reasons root quality issues have been broadly ignored or dismissed as a 'luxury' that we can't afford in recent years.

Pricking out

There are basic processes such as pricking out seedlings, taproot pruning and the correct technique to insert seedlings into the container to prevent J-rooting that need to be addressed. There are also other issues associated with this such as lateral root development that also compound poor pricking out activities, contributing to the need for root remediation and subsequently staking.

Direct seeding is not necessarily the answer either as many seedlings can still develop poor root characteristics when direct seeded into the growing container especially.

Active management of processes and excellent pricking out or tubing technique are the key to success rather than leaving them to their own devices. The first opportunity to grade plants for quality is at the pricking out / tubing stage where defects and poor quality can be rouged out. Cutting grown stock should also be graded prior to potting and any defects removed from production, it is cheaper to throw out a cutting than a potted plant.

Staffing

Staff should be selected on their aptitude and ability to undertake training. Once they have achieved trade level they should be encouraged to regularly undertake additional training to ensure continual improvement of their technical knowledge and maintenance of their skills.

Staking Trunks



Flexible rubber tie loosely tied to trunk and secured to wire allow for movement but prevent the tree falling over (Image 1). Of note is the double twist which prevents the tie slipping on the wire.

Tie systems are available that allow the tree to move independently of the trellis which allow for secondary thickening to occur as in image 2, which is the system used at Dooralong Valley Native Plants. (image 2 courtesy of F, Howarth Dooralong Valley Native Plants).





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Systems where the stake to support the tree is not anchored into the media also facilitate the development of secondary thickening and is a technique used at Dooralong Valley Native Plants to help produce guality trees (image3)



This is opposed to the following picture Image 4, which demonstrates that poor staking and tying can actually be detrimental to plant performance. In addition poor tying of plants to stakes can also cause failure of the plant and render it unsaleable.



The other focus for quality trees of either clonal or seed origin is to ensure secondary thickening or taper. This is critical as secondary thickening is what gives trees the ability to support themselves and produce healthy trunk characteristics. Secondary thickening is the laying down of lignin (wood) within or between the cell walls in plants as a response to movement of the stem typically from wind. This also has root implications as roots also respond to secondary thickening pressures and compression or tensile strain from the trunk and canopy mass offsetting their growth to compensate for the strain.

In the book Modern arboriculture, Shigo et al 1998 states that 'Conifers form compression wood as a type of reaction wood' & 'In hardwoods cell walls thicken on the upside of the lean; hardwoods have tension wood as a type of reaction wood' (Shigo 1998, pg 63) This is well documented research and shows the importance of self-support for trees to produce suitable trunk characteristics. He also states that roots react to similar forces of tension and compression changing their profile to more elliptical when exposed to load forces. Depicted in Image 5 (pg 63 Shigo et al 1998), RT shows the centre of a root as being on the lower side of the root indicating additional wood is laid down above the centre to provide the required compression support. Buttress roots are an extreme example of this. The B diagram shows a branch reaction. In both the dot is the centre of the branch/ root.





Image 6 depicts a *Eucalyptus tereticornis* trunk base showing definite secondary thickening i.e. broadening towards the base of the trunk compared to an olive tree on the right (Image 7) that has been rigidly tied for too long. Note: consistent trunk calliper top to bottom and an inability for the plant to support top mass. Hence it bends over and would likely snap in adverse wind conditions.

The *E. tereticornis* pictured above (Image 6) is a seedling recruit in a small container, was in heavy shade and not staked yet still produced an exceptionally strong trunk conformation with visible secondary thickening of the base. Conversely the cutting grown olive tree pictured (Image 7) is showing the classic signs of over staking resulting in 'sag' once ties were removed. These two pictures show all too well the differences as highlighted by this section.

Staking has become the default situation rather than as it should be used, on a needs basis. This has developed from the desire to grow plants faster to sell more in any given production period but at the detriment of trunk quality.

Nutrition and growth rates are critical with specific requirements being highly variable between plant types. Generic nutrition regimes and poor understanding of specific nutritional requirements can also exacerbate the issue of secondary thickening



and over-staking due to vigorous growth rates often associated with nutrient imbalances particularly excess nitrogen.

Pruning

As with any cutting activities hygiene is crucial to ensure success with pruning activities and reduce the likelihood of disease transmission. All tools should be regularly cleaned, serviced and be free of debris.

Branches

Branching and branch placement is also critical in tree and shrub quality. Branches may develop different crotch angles some of which may be structurally weaker or create bark inclusions that ultimately weaken the trunk. These are also illustrated below so there is a clear understanding of what is acceptable and not. Quite often poor branch or trunk conformation will not fail until 5 or more years post planting when the tree is large and the loss of such a tree will put a significant cost and gap into a landscape.



Eucalyptus tereticornis on left (image 8) with open crotch angle and convex branch bark ridge while in the centre (Image 9) is a *Eucalyptus tereticornis* with a highly acute crotch angle and included bark, features that result in significantly weak trunk and branch attachments. The image on the right (Image 10) *Brachychiton sp.* Black Wall Range shows callus already forming in the acute crotch angle and cracking associated with pressure and movement, this trunk while small now, is destined to fail.

Smaller container grown trees often don't have that light competition or 'space' and may produce two or many co-dominant stems with poor trunk confirmation a result.

Obviously this can be a major issue with some tree types having prevalence for branch faults. This prevalence may be due to the growing environment not giving them enough stretch, as in forests or rainforests when a canopy hole is produced by a larger tree falling or being damaged. This acute branch growth while seemingly 'normal' is a symptom of paddock form ie open area growth form that has not been produced in 'normal' competitive successional environments. Examination of these trees will reveal that when exposed to serious stress they may fail like any other tree with poor branch conformation. Typically trees in Sapindaceae are prone to this acute crotch angle, however many grow without failing Cupaniopsis, Harpulia, Toechima, Diploglottis, Guoia and Lepiderema being some of the genera, with Cupaniopsis being a significant street tree of warm coastal and sub-coastal situations and an excellent tree adaptable to a diverse range of conditions. (Boorman pers comm. 2014)

Pruning activities should be carried out with knowledge of where

branch collars are and where to cut to ensure that trunk tissue isn't damaged in pruning activities and that a stub isn't left that is likely to promote disease ingress.

The images below demonstrate some of the key points identified with arrows.









Image 11 depicts trunk defect due to trunk wood exposure from incorrect pruning activities Of note is the callus tissue around edges but clear dead wood in the centre is already decaying.

Illustrated in Image 12 is a *Brachychiton* australis branch collar where the arrow indicates where to cut the branch.

In Image 13 the arrow indicates a branch abscission scar that is part of the trunk as seen in the previous picture, as a raised collar at the branch base that shrivels and drops out of the trunk post pruning.

A *Tabebuia argentia* branch, with no visible branch collar is depicted in image 14 showing the different expression of branch collars as compared to the *B. australis* above (images 12 & 13).

Branch removal should be perpendicular to the branch where it intersects the trunk on the top side so often a small stub will remain on the bottom side of the cut. This will heal over as a normal part of wound repair.

Pruning methods and amounts need to be stipulated to ensure trees are pruned correctly and not so that it detrimentally affects the canopy size, shape or trunk integrity.

Grafted trees also present some unique issues as graft unions may be unsightly or not be smooth or uniform for physical reasons such as poor graft technique or as a result of buds growing towards the sun and producing the classic hockey stick effect. If the bud is faced to the south in the southern hemisphere it will grow up straight to the north results in the hockey stick form. This simple process will alleviate the need for heavy straightening staking activities. Budded or grafted trees may produce side shoots from the bud or graft that without correct placement or care can produce undesirable results such as the 'hockey stick' style of growth seen on the right (Image 15). While on the left is a bud that has grown up and will fill in to produce a straight trunk (Image 16).

Conclusion

There are numerous documents and books available to provide growers with the technical information to produce excellent quality trees and shrubs without relying on excessive staking to obtain straight upright trunks. Nutrition, competition, container and growing environment are critical factors to ensure successful healthy plant production.

With timely technically proficient pruning activities branch and trunk damage can be minimised and unsightly wound scars reduced in size and impact.

Train and keep training, it is critical to maintain a continual improvement model for technical knowledge when producing any plant stock.





Additional Information

There are numerous different texts available on pruning and tree physiology but one which is highly recommended is;

Modern Arboriculture 1998 Alex L. Shigo (Sherwin Dodge Printers)

This book has numerous detailed drawings and descriptions for the large number of pruning options and well explained technical content relating to wound healing, disease management and tree physiology.

Shigo & Trees Associates has produced numerous educational books, brochures and DVDs including two soft cover books on pruning.

Compiled and edited by Chris O'Connor NGIA Technical and Policy Officer; banner photography by Anthony Tesselaar.



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Pesticide Application on Edibles

Pesticides are an essential tool in the control of pests in nursery production. However special consideration should be given to the use of pesticides on edible crops especially those with potential to be readily eaten. In this month's Nursery Paper Grant Dalwood (NGISA) and Chris O'Connor (NGIA) remind industry of some of the key considerations when it comes to pesticide application in edible crops.

Pesticide Application on Edibles

In light of the growing popularity of the 'grow your own' trend with home gardeners, recent years have seen an increasing demand for ready to eat consumable produce in the nursery retail sector . Examples include ready to eat herbs, advanced vegetables and advanced potted patio or dwarf fruit trees such as citrus or apples.

In conjunction with this trend, there have also been some realignments of Interstate Certifications Assurances (ICAs), so it is timely to remind growers of their need to be cognisant of the end users of their product, as well as the legal and moral obligations of providing a product which is safe for consumption and fit for purpose.

Maximum Residue Limits

Chemicals applied to crops will undergo change; they will break down over time through metabolic processes or environmental influences. What remains within the crop, either as the original chemical form or product of that form is known as a chemical residue.

Maximum Residue Limits or MRL's are the maximum concentration of a chemical residue legally permitted in agricultural produce, resulting from the registered use of an agricultural or veterinary chemical. The MRLs are set by the Australian Pesticides and Veterinary Medicine Authority (APVMA) and specific attention is given to produce intended as food stuffs.

Before any agricultural or veterinary chemicals are released for sale and/or use in Australia they are rigorously evaluated for registration by the APVMA. As part of this evaluation process MRLs are determined to ensure that the levels determined are not hazardous to human health either through chronic exposure or as an acute dose.

Once the MRL for the agricultural or veterinary chemical is set, these are then in the case of food products recommended to Food Standards Australia New Zealand (FSANZ) and incorporated into the Foods Standards Code. This code has been adopted by state and federal laws so the MRL becomes the maximum concentration of chemical legally permitted in or on a food or agricultural commodity as a result of the legal application of agricultural or veterinary chemicals.

It is important to note that these MRLs are not likely to be exceeded if the agricultural or veterinary chemicals are used as per the approved label instructions.

There are many facets which influence how agricultural chemicals perform in a crop situation and these are considered in the process of determining the MRLs and throughout the registration process.

From the APVMA some considerations include;

- how rapidly the chemical may be processed by either plant and/or animal tissues
- how rapidly the chemical may be degraded by soil and other environmental processes
- how frequently and at what intervals the chemical is used, taking into account the

potential for bio-accumulation

- how close to harvesting of plants the chemical is used (including withholding periods)
- the acceptable dietary exposure to low levels of chemicals in food
- how accurately the chemical and/or toxicologically significant metabolites can be measured in plant material
- any differences in MRLs and residue definitions between Australia and its major trading partners and those of the Codex Alimentarius Commission of the United Nations

The factors noted above constitute a wide array of possible influences upon the efficacy and likely impact of agricultural chemicals. The same chemical can behave very differently between plant species and between environmental conditions. It is for this reason that chemicals are registered for specific crops in specific situations along with specific application doses and withholding periods.

Product Labels and Minor Use Permits

The product label is the most important source of information in regards to the legal use and application of an agricultural chemical and is in itself is a legal document. It includes essential information on;

- active constituents of the chemical
- directions for use
- modes of action
- any specific restraints or restrictions on use
- withholding periods
- safety information



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In all situations and especially so with edible crops, the directions on the label must be followed including the rate of chemical used, the frequency of application and any specific instructions such as withholding periods or environmental parameters during application (e.g. do not apply if ambient air temperature exceeds 30°C).

Victoria differs from many jurisdictions in Australia in that it routinely allows off label use. Off label use applies to situations where a chemical is used in a way not specified by the label, for example using it to control a different pest or in a different crop situation. Some restrictions to off label use however do apply, these include;

- using a chemical at a higher rate than is listed on the label
- applying a chemical at a higher frequency than listed on the label
- not following specific label statements (i.e. DO NOT statements)

Outside of these situations a specific permit is required from the APVMA.



Growers and retailers need to manage withholding periods of pesticides, especially in those products such as advanced fruit trees which may be readily consumed.

The Victorian Department of Environment and Primary Industries (DEPI) advise that any person using chemicals in an off label manner accept responsibility for the efficacy of the chemical, any residues in the environment and produce and any health and safety issues. The Victorian DEPI also notes that with food crops, great care must be taken with off label use. Victorian DEPI advise that in cases where a chemical is not registered for use in a particular crop, that it is unlikely that a MRL is established and so any chemical residue in the end product would be unacceptable.

The assessment of agricultural chemicals is a costly venture, and so not all chemicals are registered in all possible crop situations. There is still however a need for growers to legally access and use chemicals to target specific pests in small crops, to access new chemistry and to manage pesticide resistance for pest control in emergency pest situations. In these circumstances Minor Use Permits or Emergency Permits are available.

Minor Use Permits are issued by the APVMA and are designed to allow growers legal access to use a chemical in a crop situation. In effect they become an extension of the information on the label. Like label directions, Minor Use Permits must be used in accordance with the described crop, pest and situation. For example many Minor Use Permits available for our industry are for ornamental crops and not food crops, so are not suitable for use on edibles. Minor Use Permits are also registered for a specific time frame so before using a chemical with a Minor Use Permit ensure that you have a valid permit within its expiration date.

Awareness of Withholding Periods

According to the APVMA "A withholding period (WHP) is the time period that is set at registration for a chemical, to guide users of the chemical as to when residues will be below the MRL. It is based on the rate at which the chemical breaks down on the crop/animal. It is the minimum length of time between treatment of a crop or animal, and the suitability of the harvested crop or the animal product for human consumption."

As noted earlier, different chemicals are processed by plants at different rates, and this processing or breaking down of the chemicals is influenced by many factors such as environmental conditions (temperature, rain, humidity) and the method of application (e.g. foliar application versus media drenching). So because of this variance it is important to pay particular attention to the directed withholding periods as stipulated by the label.

Awareness of withholding periods applies to both growers and retailers when dispatching product for sale. For retailers, any stock which falls within a withholding period must be removed from sale and not reintroduced until the completion of the withholding period. Retailers should also be aware of what chemical practices their suppliers (growers, brokers and trade marts) are using.

Compliance records

Businesses involved in any level of pesticide application should keep records of pesticide application. A main driver to record keeping is to demonstrate compliance with various Quality Assurance programs associated with food safety and production such as Freshcare or those programs required by large supermarkets and to meet Work Health and Safety requirements. Appropriate record keeping is also a requirement of the Nursery Industry Accreditation Scheme Australia (NIASA) program.

Records for spray applications can also be used for other benefits beyond just compliance such as;

- resistance management e.g. cycling modes of action
- aiding future decision making through better purchasing plans, budgeting and forecasting along with product performance reviews
- assistance in emergency situations
- assistance in determining the causes of any associated issues if they arise

Examples of records which should be kept include;

- equipment Calibration records,
- spray application records,
 - pesticide manifests

Detailed examples of these records are available on the NGIA website as part of the Nursery Industry Pesticide Management Diary and more information on your legal recording obligations are available from your state DPI's.



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Interstate Market Access Requirements

Biosecurity and domestic quarantine is of paramount importance to the Australian nursery industry. Supporting domestic quarantine are many Interstate Certification Assurances (ICAs) which require growers to treat stock prior to interstate shipment. Awareness of exactly what is required by these ICAs is essential to growers.

For example, in the case of movement of greenlife stock between SA and NT, there is an operational procedure in place (CA-10) that has recently highlighted a major concern for SA based nurseries that were sending potted edible herbs and vegetable plants to the NT. These issues were based on appropriateness of chemicals used for spraying consignments (before 9th May 2013) that had been prescribed under the Plant Movement NT (PMNT) arrangement.

Spinosad & Bifenthrin were originally prescribed for spraying edibles to combat Western Flower Thrips (WFT) and Scale insects entering the NT. However, Bifenthrin was identified as possessing properties that would impact the health of people who may have eaten the product within the withholding period once the product had arrived in the NT.

Through NGISA and the relevant government bodies the procedure was amended so that, vegetable and herb seedlings for transplanting must be treated with Bifenthrin as per Permit 9795 Version 7. This ensures that the residue of the chemical will be mitigated with the onset of time and the transplanting process.

The complimentary option for Vegetable and herb plants for growing on or pot culture is that they must be treated with white oil as per APVMA Permit 11815 Version 1. Plants that are deemed to be available for immediate consumption by humans are required to only be sprayed with a measured dose of white oil as per instruction in the APVMA Permit. This will ensure a reduction of risk to consumers but still manage the quarantine requirements of NT.

This demonstrates that growers must be aware of the intended use of their products once they have left dispatch and remain up to date with market access requirements for treatment of nursery stock.

Key Points for Keeping Residues Below the MRL

The following points may assist you in keeping residues below the MRL in your products.

- Use the right product is it registered for the pest, crop and situation?
- Be aware of the product configuration and end user – Will it be potentially eaten straight away e.g. advanced vegetables or will it need to be planted out/grown on e.g. vegetable seedlings?
- Comply with any withholding periods and schedule your production to factor this in
- Be mindful of how you apply the chemical
- Look at the concentration e.g. different application methods may have different concentrations e.g. spray versus drenching.
- Be mindful of spray drift e.g. from an ornamental crop to an edible crop
- Be aware of the rate of application this includes making sure that application equipment is calibrated i.e. delivers the right dose. Too much causes waste, costs money, causes possible phytotoxicity and elevated residues. Conversely, too little is not effective for the target pest.

- Be aware of where you have used pesticides in your production system.
 For example if pesticides are routinely incorporated into potting media this may pose a risk.
- Keep good records on your pesticide use. This will help to identify issues and will also be required from a compliance perspective.
- Ensure that any accidents are responded to appropriately e.g. if stock is inadvertently sprayed it is removed from sale.
- Consider using an Integrated Pest Management (IPM) System if you are not doing so already.

In addition to the above points, NGIA has recently released an updated Nursery Pesticide Application Best Practice Manual to assist nursery operators in identifying and understanding the range of pesticide application equipment available and the key issues related to the use of pesticides in the nursery environment. The APVMA and state DPI's also have a great deal of information specific to your jurisdiction and situation.



Advanced herbs are an example of one product which may be readily consumable by customer

The signal heading at the top of the main panel specifies	CAUTION				
such as toxicity, use, potential for abuse and safety).					
For agricultural, domestic and industrial poisons Schedules 5, 6 and 7 represent increasingly strict container and abelling requirements. Poisons listed in Schedule 7 are	READ SAFETY DIRECTIONS BEFORE OPENING OR USING JO BLOGGS 5000	A product name should distinguish itself from another product an describe the intended use of that product, such as XYZ Dicamba Herbicide.			
Iso subject to special regulatory controls on availability ind use.	SELECTIVE HERBICIDE	Active constituent/s and concentration appear below the product			
signal heading also indicates any restriction on vallability such as Prescription Animal Remedy, which is a chedule 4 veterinary chemical.	ACTIVE CONSTITUENT 500 g/L 2.4-06 presents as dimethylamine salt. SOLVENT 260 g/L hydrocarton liquid	name. This is useful information in an emergency. It can also be used to compare products with the same active constituent, but perhaps a different level or formulation type. If the solvent in the product is a scheduled chemical, it appears under the heading SOLVENT below the active constituent.			
f considering several chemicals, the signal heading can elp users choose the less toxic option.	For selective control of certain broadleaf weeds in various crops as per the directions for				
The signal heading includes cautionary statements egarding safety and storage such as 'KEEP OUT OF REACH >F CHILDREN', All veterinary chemical products have the phrase 'FOR ANIMAL TREATMENT ONLY' to differentiate them from agricultural chemicals and human medicines.	Je Bioggs Pty Lot Contents B0 Ryde St 20 L TINALE HSW 2000 DIRECTIONS FOR USE RESTRAINTS D0 NOT apply when rain is expected within 4 hours.	Claims for use statements show the purpose for which the chemical was registered unless already described by the product name. Restrictions on availability may also appear here with statements such as RESTRICTED CHEMICAL PRODUCT – ONLY TO BE SUPPLIED TO OR USED BY AN AUTHORISED PERSON.			
tode of action symbol. This letter or number indicates now the chemical works to help users manage chemical esistance by rotating chemical use through different nodes of action.	DO NOT apply to crops or weeds that are stressed by drought or cold, fronty conditions CROP WEDS RATE L/hu CRTTCAL COMMENTS Bartey, tables 1 and 2 Whoat undersown with	Directions for use include instructions on how, when and where the product is to be used. This includes crops/animals and/or situations on which the product can be used, the pests/diseases to be controlled, results expected, application rates, restraints an critical comments. It is an offence in Victoria to contravene restra statements (the D0 NOT statements).			
Imitations on use warn against using the product ontrary to label instructions unless authorised. In Victoria estricted use' chemicals must not be used off-label.	NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION WITHHOLDING PERIOD DO NOT GRAZE OR CUT FOR STOCK FOOD FOR 7 DAYS AFTER APPLICATION	The DO NOT statements in directions for use can be precautionary statements addressing safety issues such as 'DO NOT enter treated areas for three days after spraying'.			
One limitation on use is the withholding period (WHP) – the minimum interval between the last use of the chemical	GENERAL INSTRUCTIONS RESISTANT WEEDS WARNING Jo Bloggs 500 is a member of the phenoxy group of herbicides. Its mode of action is to etc.	General instructions include information for safe and effective use of the product. When a product presents a hazard to people, animals or plants it wi also carry precautionary statements such as 'DO NOT spray avainted and 'DO NOT allow spray to contact or drift onto plants you do not want killed'. Protection statements provide a warning to avoid off-target damage to crops, the environment or livestock. Bees are Tivestock' and are especially sensitive to some agricultural chemicals.			
An narvesting vision of subject of subject of animals. HPs aim to prevent unaccentable chemical residues in ur food, so contravening them is an offence. Note that ome chemicals have multiple WHPs as the use pattern on ach crop/animal can differ. The WHP is based on the rates fuse shown on the label.	PRECAUTION Don't nits chemical in therit tariks chemicae you might cause an explosive gas. PROTECTION OF WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT Do not allow chemical or used containers to contaminate streams or waterways. STORAGE & DISPOSAL				
he label might also list Export Staughter Intervals (ESI) which aim to protect our export trade. The ESI is the period hat should elanse between treatment of an animal with a	Seare in the closed original container is a cool, well ventilated area. D0 NOT store for preforingel promotils in direct samight. This container can be recycled if it is clean, dry, free of vioble residues and has the Dournesster logo vibble. Triple or pressure rises container for disposit. Dispose of riseate by adding it to the spray tank				
veterinary chemical or treated feed and slaughter for export.	SAFETY DIRECTIONS Will antiate eyes. When opening the container and properties the stray, wear face shield or goggles. Wash hands after use.	Safety directions detail the hazard, how to minimise it and recommended protective equipment. First aid			
nformation on storage and cleanup, mixing and pplication, equipment maintenance and avoiding sistance are shown here.	FIRST AID Contact Potrom Information Centre - 131 125 Additional Information Is tone HD05 available from the supplex APVMA Approval no: XXXX	statements (below the safety directions) explain what to do (and not do) if someone is exposed and list the Poisons Information Centre phone number.			
he label will also refer to the Material Safety Data Sheet hich provides more information on the chemical.	BATCHI A76932 DOW: OK0199	The APVMA/NRA approval number typically appears at the bottom of the rear panel on the main container, along with product number, pack size and date of initial registration. The NRA is the predecessor of the APVMA.			

pesticides to ensure MRL's are not exceeded.

Further Information

Australian Pesticides and Veterinary Medicines Authority www.apvma.gov.au

Victorian Department of Environment & Primary Industries - Off label chemical use in Victoria www.depi.vic.gov.au/agricultureand-food/farm-management/chemical-use/agricultural-chemical-use/off-label-use/off-label-chemical-use-in-victoria

Biosecurity South Australia Movement of Nursery Stock & Plant Material to the Northern Territory (PMNT) Operational Procedure www.pir.sa.gov.au/__data/assets/pdf_file/0007/43189/CA10_PMNT_PROCEDURE_15_5_2013.pdf

NGIA Nursery Pesticide Application Best Practice Manual www.ngia.com.au

For additional information, consult the following nursery papers which are all available electronically from www.ngia.com.au

Minor Use Pesticide Program. Issue Number 11. December 2012.

Compiled and edited by Chris O'Connor NGIA Technical and Policy Officer; banner photography by Anthony Tesselaar.



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The Importance of Suitable Sources of Irrigation Water to Nursery Businesses

Poor quality water can have potential impacts to plant health and product quality when used in the production, maintenance and detailing of plants for sale. A source of high quality irrigation water at an affordable price is critical to the successful production and maintenance of plants. Consideration should be given not only of the irrigation water applied directly to the plants, but also to the overall production and irrigation systems in place. In this month's Nursery Paper, NGINA Industry Development Officer, Michael Danelon seeks to raise awareness of the importance of identifying your water source and managing irrigation water, along with covering some simple testing parameters and information resources.

Irrigation Water Quality Evolves Subject to Input Sources

Water moves continually through a cycle of evaporation and transpiration (evapotranspiration), condensation, precipitation and runoff with the water then usually reaching the sea. In a nursery situation it is the exposure of water to nutrients, pesticides, soil and organic matter and how plants selectively remove elements/ compounds from it before leachate passes through the plants rootzone modifying the net water quality for either reuse or disposal.

Not unlike the water cycle, production nurseries and Garden Centres obtain water from a range of different sources due to their location and accessibility to water (influenced by legal-licencing requirements or climatic conditions) where water may be generated from rainfall or extracted from local sources (creek, river, aquifer) or provided by a water authority such as the town supply.

Greater attention needs to be paid to sustainable irrigation water quality in nurseries. Interpretive and remedial information to guide the owner/manager can be found in a few texts. Industry examples include "Managing Water in Plant Nurseries"⁽²⁾, "Nursery Industry Water Management Best Practice Guidelines"⁽³⁾ and the "Water Management Toolbox"⁽⁴⁾.

As more businesses recycle or reuse their drainage water, actively sampling, recording

and acting on analytical test results is an essential task, which will assist businesses in achieving good plant development in both the immediate and long term time frames.

Knowing the water quality limitations of your nursery is an essential first step in choosing an irrigation system and water management plan that best meets your water and plant health needs within budget constraints. Commence by undertaking a comprehensive study (at least over 12 months) of the water quality in your nursery to determine its limitations. These may include pH, Electrical Conductivity/salinity (EC) water turbidity, slime growth and iron content.

Irrigation water comes from a diverse range of sources

By far the most suitable water for high quality nursery irrigation is water from a town supply, which has been treated to remove suspended solids, colour, odour and pathogenic bacteria – however in many instances it is uneconomic and can be unreliable during droughts and water restrictions.

Irrigation water can be obtained from a range of different sources: surface (i.e. creek, river, dams, and rainwater harvesting), groundwater (spring/aquifers) and reticulated (treated sewage effluent) which may contain impurities and substances derived from the natural environment and the wastes of human activity. The geology and location of the aquifer of underground water supplies will often greatly influence its quality.

Town water supplies

Although generally free from suspended solids and treated to control plant pathogens, it is generally expensive and usually restricted during drought periods and likely to be a growing cost to utilise.

The pH of town water can often be too high for general plant production, > 7.5 and for disinfestation via hypochlorous acid formed from either sodium or calcium hypochlorite chlorination addition(5). It may also be too high when mixing certain pesticides where alkaline hydrolysis may occur.

Rivers and creeks

The quantity and type of impurities in streams, creeks and rivers can vary widely from the flowing watercourse depending on the size and condition of the surrounding catchment. In many locations there are conditions governing the accessibility, entitlements, allocations and trading of this water for extraction under commercial use. Every nursery needs to be

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aware of their legal requirements under the National Water Reform Process and Management of Water. For links to state legislations go to: http://www.water.gov. au/WaterAvailability/Watermanagement/ index.aspx?Menu=Level1 3 4

There is no certainty of the water quality generated from adjoining properties where you have no control over the exposure of the water to certain chemicals and physical environments. In catchments with urban or other agricultural activity, streams may contain large quantities of organic and suspended matter which can promote biological issues in storage or the irrigation system if not removed by appropriate management and filtration.

During flooding or heavy rain, water courses are likely to contain large quantities of suspended clay. If the stream has a lot of algae, this may result in masses of algae mixing with the clay and remaining in suspension (turbid). In low flow conditions chemical pollutants may become concentrated making the water quality unsuitable for irrigation.

Storages – fresh and/or recycled systems

The quality of water in storages is influenced by the physical, chemical and biological characteristics of that storage. These characteristics are a function of how and what the water was exposed to before entering the storage <u>so it is critical to review</u> the environment the water is subjected to within your nursery and surrounding areas.

Collecting water off an adjoining open bare earth paddock may deposit significant soil/ clay particles which can reduce the storage capacity through the deposition of soil particles. It may also introduce colloidal clay particles held in suspension fouling the irrigation system. The possible effectiveness of ultra violet water disinfestation is also impacted on, as this relies on water with a low total soluble solids (turbidity) reading (6).

The other issue to consider is, once a contaminant enters the storage it may be difficult or impossible to remove it – especially if it is a herbicide.

Storages where water becomes both organically and nutrient enriched (eutrophication) are subject to seasonal changes, leading to increasing domination by aquatic weeds. In increasing light levels of spring and summer, the upper layer of the water can be heated reducing oxygen supplies to the water storage below. The extent of the heating and insulation capacity will vary subject to the water depth and climatic conditions causing layers of water with different temperature and oxygen supplies (stratification) and potential suspended clay particles or floating organic matter near the surface.

Where a water storage becomes stratified, the unmixed bottom water layer in a eutrophic storage may contain dissolved iron and manganese. Bacterial activity on the bottom of the storage uses oxygen resulting in iron and manganese present being dissolved and the production of hydrogen sulphide, which is often noted through its rotten egg gas smell.

It is not uncommon to have pH readings in the top half metre of 9 to 10. For water disinfestation, chlorine dioxide may not be affected up to pH levels > 10(6) but the alkaline pH may be unsuitable for acid loving crops if the water and rootzone environment is not managed.

Algal blooms often occur in the warmer, mixed surface layer, of fertile storages, in early spring and late summer. This is particularly exacerbated when storages are relatively small and shallow as the water surface can heat up and cool down rapidly with changing climatic conditions.

Normally the best quality water is found near the mid-depth between the top and bottom layers. However, as pumping and evaporation lower the storage, there may be a need to pump both layers and deal with their



The potential effect of herbicides which inadvertently enter a water storage may take time to be seen in abnormal plant growth and longer to recover subject to the mode of action.



Consider how runoff generated within a nursery is dealt with. In this instance no clear drainage plan allows runoff to flow over roads and paths which is either lost due to evaporation and seepage or to collect sediment.





Crop pruning and surplus potting mix are not ideal additions to any water storage. Consider use of sediment traps and physical removal of plant pruning in the nursery.



Management of the recirculated water storage to restrict potential for weed growth is paramount to reducing organic matter and weed seeds which can deprive oxygen levels and facilitate production of hydrogen sulphide.

corresponding impurities (hydrogen sulphide and algal blooms) via improving the aeration of the water source.

Recycled drainage water – most pertinent within a storage

How well a nursery collects their drainage water and what is collected in it is critical to the long term composition of the irrigation water contained in storages. High levels of carbonates and nitrates can produce stonelike precipitants and encourage algae and organic slimes to form in the water storage and irrigation systems.

Without appropriate removal of organic matter from the drainage water (screens/ sediment traps) this can contribute to oxygen depletion of the water creating an environment for bacterial, fungal and viral plant pathogenic microorganisms.

Recycled water from production areas will contain some or all of the following:

- surplus soluble nutrients
- degraded products of nutrients
- floating pine bark, sawdust, shavings and peat moss from potting mixes
- pesticides and fungicides
- humic acid
- leached material

These could affect water quality by:

- changing the pH
- increasing the hardness salts (principally calcium)
- adding organic matter and

 development of biological organisms (bacteria, green algae, aquatic crustacean larvae, small aquatic organisms, nymphs and adult water fleas and mites.

The effects of changed water quality are:

- scale formation in pumps, filters, valves, sprinklers and drippers
- clogging irrigation equipment
- biological growth of bacterial slimes
- growth and transmission of plant pathogens
- cross inoculation of bacteria, fungus and virus that may affect nursery staff.

Bores, wells and spear points

Water obtained from bores, wells and spear points is usually low in organic matter but may be contain fine sands.

High concentrations of iron and manganese are often present and these can become troublesome if not treated to remove from the irrigation water. Some bores which are poorly oxygenated may contain hydrogen sulphide, which may have high concentrations of sulphates and carbonates leading to possible blockages of irrigation.

Treated Effluent

The use of effluent from sewerage treatment plants for nursery irrigation can provide a source of water; however it may cause severe operational problems with filters and emitters due to growth of microorganisms. The quality of water from effluent ponds varies greatly and at times the EC level may exceed limits of the plant material and potting mixes.

Water Testing

Good quality water for nursery production contains adequate but not excessive concentrations of inorganic ions and compounds in the correct ratios, while maintaining low levels of suspended solids and bacteria.

Whether fertigating or relying on fertilisers placed within or applied topically to the growing media, the nutritional program needs to be designed in conjunction with water analysis data and a long term focus.

It is difficult to establish how much each of the various substances in water contributes to the clogging of irrigation equipment. However, it can be generally stated that clogging problems due to the occurrence of impurities in irrigation water become more acute if the water is high in the following:

- Suspended particles of organic or inorganic matter
- Precipitate-forming elements, such as iron, manganese, calcium and magnesium
- Bacteria that secrete slime which causes the suspension to accumulate or which acts chemically and causes the accumulation of sulphides and insoluble compounds of heavy metals.

Plant growth and nutrient uptake will depend on the chemical cocktail that is available in the container, some of which will be supplied by the irrigation water.

Water testing criteria

Biological - bacteria and algae

Physical - turbidity, light penetration, colour and suspended solids

Chemical - pH, Electrical conductivity, nutrients (nitrogen, potassium and phosphorous, inorganic ions and compounds and organic ions and compounds.

The number of criteria to test is determined in part on the water source, the product being grown and need for disinfestation. If water is being recycled or liquid fertiliser is being used, more frequent chemical monitoring is required to maintain the correct nutrient balance and unclogged irrigation equipment.

An easy way to monitor basic water quality is to regularly measure the EC and pH on a monthly basis to look for trends and indications of possible chemical problems.

Assessing water quality criteria is necessary for any nursery that is or soon will be recycling or treating runoff water. For the others it is good practice to better understand the nursery's water quality.

Measuring EC is relatively easy and done using testing meters to determine the amount of dissolved salts present.

Plants vary in their salinity tolerance (type, age/stage of development, growing environment and growing media) so there is no definite reading which should be adhered to. Readers are directed to the NGIA Nursery Paper Water quality and nursery crop nutrition 2002/11(7).

pH is a measure of the water's acidity or alkalinity with the pH scale being logarithmic which means that water of pH 5 is ten times more acidic than water of pH 6. A reading of 7 is neutral, less than 7 is acid, and more is alkaline.

Most water used for nursery irrigation should be between 5.5 and 7. Water between these levels will:

- maintain nutrient balance
- prevent scale formation in irrigation equipment
- provide effective chemical disinfestation

pH is one factor to use when determining potential clogging hazard of water.

If pH is:

- less than 7 it is a MINOR HAZARD
- between 7 and 8 it is a MODERATE HAZARD
- over 8 it is a SEVERE HAZARD

The information above is a guide to raise the awareness of the importance of identifying your water source, some simple testing parameters and managing your irrigation water for long term benefits.

It should guide the reader to more specific information referenced below and encourage

industry participants to attend the industry specific "Waterwork" for containerised nurseries which are delivered by the State and Territory Nursery and Garden Industry Associations.

The water cycle is an evolving platform and the impact of how you manage the water cycle in your business today can influence the profitability tomorrow!

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- Water disinfestation Chloro-bromination and ozone systems get the thumbs up! NGIA Nursery Papers 1997 #8
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Drainage works do not need to elaborate, just effective in collecting runoff, retarding speed and removing sediments before directing to a water storage (courteous Engalls Nursery)



Portable pH and EC meters are a convenient way to monitor basic chemical properties of irrigation water in the field looking for changes in water quality.

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Growing media storage

With soilless growing media being integral to the success of greenlife and contributing to the sustainability of a business, regular monitoring and appropriate storage of media should be considered a critical component to your nursery's operation. In this month's Nursery Paper NGIV Industry Development Officer (IDO), David Reid outlines best practice storage requirements for both bulk and packaged soilless potting media.

Growing media storage

Preventing soilless growing media's contact with potentially pathogen-infested materials such as discarded media, drainage/untreated surface water, plants, contaminated surfaces, used tools, soil and dust should be considered essential. Not only do contaminants need to be excluded from media, but any additives to growing media require monitoring if storing media for extended periods.

Soilless growing media can change over time, with draw-down of certain nutrients or the decreased effectiveness of a wetting agent due to a degradation through microorganisms in the growing media consuming them. Furthermore, microbes in the growing media can also utilise the fertiliser charge, especially iron and nitrogen. Some studies have also found that crops planted in aged growing media get off to a slower start or are liable to suffer a reduced overall vigour. Extended storage periods may also contribute to a mix that lacks sufficient moisture, thus increasing the difficulty of wetting. Extended storage can also cause chemical changes, such as an increase in pH and/or a decrease in soluble salts and nitrogen levels.

These changes will occur at a higher rate during periods of higher temperatures than low.

While the soilless growing media a nursery uses may be of the highest quality, failure to adhere to some basic storage requirements, will see it transform into a vehicle that may spread contaminants through your nursery, carrying weed seeds, chemicals, insects or pathogens or will contribute to the degradation of its components and additives.

The following are a few guidelines for the proper storage of soilless growing media; bulk and packaged:

• Soilless growing media should preferably be stored in a dry, cool, low-light

environment. In an ideal situation, growing media would be stored undercover (not a poly or greenhouse), in a concrete bay or on some other clean, sealed surface (See Fig.1). Alternative storage methods that are easy to clean and disinfest can include metal or plastic bins, trailers, trolleys or in bags on a sealed surface or racks under cover.



Fig #1 – A concrete storage area is ideal, with a large concrete apron leading up to the bay(s). This nursery also employs the use of a dedicated bucket/shovel just for media, otherwise, they should be regularly disinfested. Clyde Plant Nursery



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Fig #4 - Diversion banks are another method to prevent water entering potting media storage

- Concrete meets the storage surface requirement of easy cleaning and is most suited to disinfestation between media deliveries. Wooden sleepers are difficult to decontaminate, however scrubbing the surface thoroughly with an appropriate disinfestant (see references below) will reduce the risk. Concrete too has tiny pores that may hold contaminated media; however sealing the storage area with a suitable sealing paint again will reduce the risk even more so.
- Bulk media bays should be graded to remove water and should be constructed to prevent water from flowing into it and any water that enters the storage area should drain away freely (See Fig.2). Storing media on a raised area of land (height 10-12cm) will

also prevent run-off water from entering the area (See Fig.3). Another option is to surround the media storage area with surface drains or diversion banks. If this cannot be easily achieved it may be necessary to surround the area with surface drains or diversion banks (See Fig.4).

- Exposure to heat and sunlight can accelerate degradation of nutrients and wetting agents in mixes. As most businesses do not have the capacity to store media indoors, bulk media stored outdoors for extended periods should be covered to prevent contamination and to protect it from sunlight and other contaminants (See Fig.5).
- When considering a potential media storage area at your facility it may be

worthwhile thinking in terms of 'dirty' or 'clean' areas when choosing its location and other sites where inputs (plant material, containers, etc.) are received. With regards to media, it should be located close to the nursery entrance to reduce external vehicular movement through or onto the 'clean' areas of your site. The area leading up the media storage bay should be covered or sealed with gravel to minimise the movement of dust and soil particles. The location of throw-out, green-waste and contaminated media storage areas should also be carefully thought out and clearly separated from your clean media area to prevent cross contamination.

Treated propagation media storage area/ systems need to be separated from untreated media storage area/systems to avoid cross contamination. Fortunately, studies have confirmed that the most common growing media materials such as peatmoss, perlite, vermiculite and properly composted pine barks prepared on clean surfaces, are often free of the most common pathogens occurring in propagating facilities, (Pythium spp., Rhizoctonia solani, Fusarium spp., Cylindrocladium scoparium, Phytophthora spp. and Botrytis cinerea). To keep them pathogen free best practice for storage should be followed. Source: NIASA

- When receiving media at your nursery designated employees should verify delivery specifications are met and ensure that potentially contaminated delivery vehicles do not enter the production 'clean' area. (Best practice procedures for receiving goods can be found in BioSecure documentation or from your state IDO)
- Packaged growing media should be kept shrink-wrapped, raised on pallets and covered appropriately until it is used. The elimination of direct sunlight, the provision of suitable circulation to prevent moisture build-up and the prevention of heat build-up should be the aim when storing media in this form.
- Media should not be stored under or near chemicals such as insecticides, herbicides, disinfectants or even fertilisers. This is the case for packaged product too, as dry or liquid chemicals





Fig #5 – If storing media for extended periods or if vegetation is overhead or close by, cover it. Dream-Time Wholesale Nursery

may permeate packaging and affect contents. The handling and use of chemicals, both within your business and external to it, should also be done clear of media storage areas to prevent contamination. See your state IDO for details on chemical storage best practice

- Growing media and allied products should also be stored away from seed and seed products such as livestock feed or forage and pasture seeds, again to prevent contamination.
- Rodent populations should be controlled to prevent contaminants (i.e. weed seeds and droppings).

- Vegetation should be cleared from around storage areas to prevent leaf litter and seed contamination. Weeds around storage areas should be removed as part of a regular weed-monitoring program
- The storage area should be regularly cleaned between deliveries. Quaternary ammonium compounds (4,000ppm for 1 hour) such as Phytoclean or sodium hypochlorite solutions (4,000ppm for 1hour) are both effective treatments for disinfection, along with high-pressure steam. See references below for further, detailed, disinfestation methods.
- When transferring media, the equipment used such as front-end loader buckets, barrows, mobile bins, trolleys or plastic containers need to be regularly cleaned and disinfested between use and/or should be dedicated to a specific task. Cleaning such tools should be done according to the previously mentioned specifications; scrubbing first or pressure cleaning and then using a suitable disinfectant (see references below). Such cleaning should be carried out on a sealed area with appropriate drainage into a sump or a drain, located so as to minimise risk of contamination of growing areas.



Fig #6 – If storing multiple loads, ensure that staff practice inventory rotation. Purtills Nursery

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- If you receive multiple loads or packaged product, ensure that inventory rotation is practiced. Different batches of media should be stored separately to avoid possible cross-contamination and to permit easy trace-back of any potential future growth issues (See Fig.6)
- Plug and propagation mixes should be used within the first six months of being manufactured. Peat-based media should be used within nine months of manufacturing date. Depending on the manufacturer and the specifics of the mix, bark based media should be used within 2-6 months. If the media does not contain controlled release fertilisers (CRF) it can be stored in large volumes and with heaps at heights of up to 2.5m in height, however it is important to keep the moisture levels at above 50% and to ensure the media is turned regularly to stop the product becoming anaerobic.
- Media stored for six months or longer should be tested to determine whether any chemical changes have occurred and to compensate for any changes as necessary. As mentioned earlier, wetting agents incorporated into the media may degrade over time, along with chemically altering the mix, such as a pH increase along with a decrease in soluble salt and nitrogen levels. It is advisable to test any product that has been stored for 6 months or longer to determine what changes have occurred and compensate for any change (see references below). Contact your supplier to gain an understanding of your media's 'best before' dates.
- The introduction of CRF, fungicides or other special additives brings with it extra elements to be aware of. Ideally bulk media should be turned over within

5 days if the product contains CRF and if the product is held for longer, by keeping it under approx. 60cm in height it will go some way to prevent the product heating up and causing the CRF to dump. Media containing a controlledrelease fertiliser can typically be safely stored for one to two weeks prior to use, however soluble salt levels should be checked during extended storage periods. CRFs are not characteristically uniform and their manufacturers have particular media storage guidelines when added. The CRF product label or the manufacturer's recommendations should be referred to for specific instructions on longevity and usage of CRF incorporated into potting mixes.

- Packaged media has a general limit of 6 months storage, however if it contains CRF in it should not be stored outside during the warmer months, as it will increase the release rate.
- It is not advised that growing media is reused, but if it is it should be disinfested in an appropriate manner and prior to disinfestation, media to be reused must be stored on a site well separated from storage sites of new or treated media ingredients (see NIASA documentation or the IDO in your state).

Whilst you may receive a specification sheet upon delivery of your media, it is advised that you keep detailed records of shipments for future reference and that you perform some perfunctory pH or electrical conductivity testing on your media testing upon receipt using the Australian Standard methods. NIASA accredited and growingmedia manufacturers keep samples and records from each batch shipped to help identify or rule out any potential media related issues if they were ever to arise. NIASA Accredited growing media manufacturers endeavour to supply a superior, closely monitored product, so if you have any questions about its quality, contact the manufacturer for assistance. Appropriate storage will maximise both the shelf life of the growing media and minimise the potential for crop difficulties associated with product aging and contaminants. In order to ensure satisfaction, consider these suggestions and implement similar precautionary measures to help maintain the quality of the products you receive.

Growing media manufacturers and component suppliers are required to:

- Adopt NIASA guidelines and adopt an internal audit system as described.
- Implement Australian Standard AS 3743 – 1996 and amendment 1 – 1998, 'Potting Mixes' as required.
- Implement Australian Standard AS 4454 – 1999, 'Composts, soil conditioners and mulches' for bark composting systems.
- Consent to independent site evaluations as described (external audits).
- Provide a manufacturer procedure statement.
- Provide a producer's product specification.
- Implement a satisfactory complaints resolution procedure.

Growing media storage basic rules:

- Dry
- Cool
- Clean
- Sealed surfaces
- Low-light environment (if holding for extended periods)

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A Systems Approach to Managing Pests, Diseases & Weeds **BioSecure** HACCP

On Monday 21 October 2013 the testing of BioSecure HACCP to meet interstate market access requirements began with a trial between Queensland and Victoria. The BioSecure HACCP trial ran through until 21 April 2014 overseen by Nursery & Garden Industry Queensland, Nursery & Garden Industry Victoria, as well as the biosecurity agencies of Queensland and Victoria. This world leading holistic on-farm biosecurity program delivers a structured on-farm pest, disease and weed management system that has shown it can be used to support interstate market access. In this month's Nursery Paper John McDonald, Industry Development Manager Queensland, gives an account of the trial and records grower feedback on the value of the program.

A Systems Approach to Managing Pests, Diseases & Weeds, BioSecure HACCP

Biosecurity is not just dealing with quarantine pests; it is the protection of a plant production system from the introduction of insects, diseases, weeds and other biological organisms that may adversely impact upon the cropping system. Producers (growers) are in constant battle to grow their crops with as little damage from plant pests as possible, achieving this through exclusion, eradication and/or management. With the integration of various strategies (e.g. protected structures, hygiene, use of beneficials, monitoring, chemical, etc) most producers get their crop(s) to market. However by structuring the entire process around standardised procedures, best management practice and skilled staff this integrated cropping system can benefit downstream from the farm gate through improved market access.

BioSecure HACCP is the industry specific biosecurity program designed to assist producers in their on-farm pest, disease and weed management through a systems approach supported by procedures and documentation. The program applies the 12 defining principles of Hazard Analysis Critical Control Point (HACCP) to the management of biosecurity risks at farm level (production nursery) providing a creditable risk identification and management process for growers. Having a clearly defined pest, disease and weed management system operating under best management practice guidelines, which is risk specific and supported by concise and accurate records, underpins the value of pest management and should be recognised by customers and regulators.

The trial was a national industry initiative supported by state, territory and national peak industry bodies as well as the biosecurity agencies across all Australian jurisdictions recognising the two businesses in both Queensland and Victoria which were



Pohlmans Nursery

testing on behalf of the industry. BioSecure HACCP is the first industry developed on-farm biosecurity program in Australia to be used as a legally approved market access instrument allowing the four production nurseries to trade with their clients during the trial phase. It is expected that at the completion of the trial audit report the other states and territories will phase in the adoption and recognition of BioSecure HACCP.

It has taken more than 5 years of interstate negotiations and industry program development to get to this point with industry R&D investment running at more than \$400 000 to date. Costs



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associated with interstate market access are constantly increasing with some businesses having annual bills above \$100 000. Added to the dynamic markets growers are operating within it is imperative that an interstate market access system is available which offers recognition of on-farm best management practice and grower skills, is flexible for growers, utilises technology and is cost effective.



Birdwood Nursery

The trial of BioSecure *HACCP* included two certified production nurseries from Queensland (Birdwood Nursery & Pohlmans Nursery) and two from Victoria (Mansfield's Propagation Nursery & Proteaflora Nursery) trading with their clients in the two respective states. Trial oversight was provided by the Project Control Board (PCB) that consisted of representatives from Plant Health Australia, Biosecurity Queensland, New South Wales Biosecurity, Victoria Plant Biosecurity & Product Integrity, Biosecurity South Australia and NGIA. Operational management was through NGIQ and NGIV with support from each biosecurity agency in the respective states (Qld & Vic) provided to ensure the trial met all legal requirements.

General Manager of Pohlmans Nursery Mr. Robert Pohlman said "Industry on-farm programs offer opportunities for self certification, under a biosecurity program like BioSecure *HACCP*, to assess plant stock and implement management programs to ensure crops are pest, disease and weed free and are maintained as per the intra and interstate movement and import regulations".

The BioSecure *HACCP* trial is based on the industry developed on-farm biosecurity program being tested to assess its ability to meet the interstate market access requirements for nursery stock of Queensland and Victoria. Each of the four production nurseries (two in each of two states) operated their interstate trade under robust on-farm plant pest, disease and weed management procedures. The on-farm BioSecure *HACCP* procedures are supported by pest specific **Entry Condition Compliance Procedures (ECCP's)** and, in an Australian first, a web based electronic biosecurity verification and certification system supervised by regulatory agencies in both jurisdictions. Each business first had to gain BioSecure *HACCP* Certification available to NIASA Best Management Practice (BMP) Accredited businesses because many of the NIASA BMP activities underpin good biosecurity practice. Through the implementation and adoption of the procedures and record keeping in the BioSecure *HACCP* manual the growers developed their biosecurity program and incorporated it into the overall cropping system. Key procedures implemented include:

Table 1. Examples of BioSecure HACCP Procedures

Disinfesting plant containers	Vehicle inspection	Crop monitoring
Growing media storage	Monitoring plant growth	Site surveillance
Growing media production	Cleaning & Disinfestation	Despatch inspection

Each procedure is aligned to a relevant record and completion, access for audits and secure record storage are mandatory requirements under the BioSecure *HACCP* program. Some records are only completed once (e.g. Approved supplier register) and updated if the situation changes whereas other records are at least weekly (e.g. crop monitoring at no more than 7 day intervals) and are used to drive internal decision making plus demonstrate that an activity has occurred. Table 2 gives some examples of required records:

Table 2. Examples of BioSecure HACCP Records

Approved supplier register	Register of Authorised Inspection Person	Visitor record
Materials import inspection	Materials despatch inspection	Vehicle inspection
Corrective action report	Register of Certification Signatory(s)	Crop monitoring



Proteaflora Nursery



Mr. Rob Furniss, Proteaflora Nursery Production Manager, has said of BioSecure *HACCP* "The great thing about the BioSecure *HACCP* program is that it is not just about the quality measure at the end of the line, rather it is a program that when implemented will ensure that quality is achieved at each stage of the process. By identifying the critical control points in our plant production and implementing management strategies to mitigate issues before they arise we have further developed our production and reporting processes. In turn this has strengthened our already successful continuous improvement program as it has provided focus and a





program that encapsulates all facets of quality control.

Throughout the trial and into May 2014 there have been a total of 79 BioSecure *HACCP* Biosecurity Certificates (BHBC) issued with 46 being from the two Queensland growers sending into Victoria and 33 from the two Victorian growers sending into Queensland. Each BHBC is an electronic document generated within each growers secure account in the web based biosecurity verification and certification system **(Audit Management System (AMS))** specific to BioSecure *HACCP* Certified producers. Staff underwent specific training to meet the BioSecure *HACCP* requirements to be an "Authorised Person" under the approved ECCP. Initially the training was a face to face workshop delivered by the state NGI however during the trial this material was converted (NGIA) into a web based eLearning course with assessable criteria built into it and automatic notification making the process easy to access, very flexible in delivery and cost effective.

The electronic BioSecure *HACCP* Audit Management System (AMS) allows the certified production nurseries to manage their biosecurity processes in an efficient and practical manner with

all relevant records being stored and retrieved electronically. The businesses complete paper based or electronic records such as monitoring, surveillance, inspection etc. during the normal course of activities across the production system. At nominated intervals (e.g. weekly, monthly, etc) the paper records are scanned and uploaded to the AMS. The AMS also provides the business with the capacity to store client details for automatic insertion into the BioSecure *HACCP* Biosecurity Certificate (BHBC) template which is the replacement to the government paper based plant health assurance certificate. The BHBC is saved automatically within the AMS and can be printed or emailed to clients or government regulators as required therefore avoiding the current national paper



Mansfield's Propagation Nursery

based system and the associated administration costs.

The benefits of an on-farm biosecurity program gaining legal status for interstate market access are multiple and across all stakeholders including government and industry alike. Producers benefit from a system developed for industry, by industry, that integrates all plant health issues into a farm management system that addresses both endemic and exotic plant pest threats and risk mitigation.

In April 2014 the national Sub-committee on Domestic Quarantine & Market Access (SDQMA) met in Brisbane to address a range of interstate market issues including BioSecure *HACCP*. On the 30th April, at the invitation of NGIQ and Robert Pohlman, the committee visited Pohlmans Nursery to gain firsthand experience on the application of an on-farm biosecurity program. Growing & Production Manager at Pohlmans Nursery, Mr. Chris Johnson, has been one of the leaders in the implementation of BioSecure *HACCP* across the production nursery and addressed the SDQMA informing them how he has found that even before using the system to trade interstate the program is delivering benefits on-farm.

Chris went on to explain to the SDQMA how the BioSecure *HACCP* system allows the business to proactively drill down and look at each step within the plant production process and critically assess how the crops in each of the five cropping systems are produced. Having access to documented BioSecure *HACCP* procedures



Sub-committee on Domestic Quarantine & Market Access at Pohlmans Nursery 2014

and integrating these into normal work instructions provides rigor around key activities such as crop monitoring, site surveillance, despatch inspections, etc. This enhances their effectiveness and traceability is provided through clear and concise record keeping.

Pohlmans Nursery has found strategic and organised pest and disease crop monitoring is delivering significant rewards to areas of the cropping system that traditionally face cyclic pest pressures that have historically required remedial pesticide management which is costly and labour intensive. The crop monitoring has seen pesticide applications drop by 90% as it becomes localised, target specific with less repetition due to low pest pressure. Crops are improving in quality, throw-out rates are reducing and turnover is increasing with one significant cropping system increasing turnover by more than 60% in 18 months. In summing up the BioSecure HACCP program Rob Furniss of Proteaflora Nursery said "The implementation program appears to be a lot of work, but in essence it is a set of checks and balances and verification of processes that are happening, or if not should be happening, as a part of any efficient production system. The verification is important, not just to be recognised by external auditors, but for my own confidence as a nursery manager to know that what we plan to do, we do it and we do it well. We hope that when the program moves past it's trial phase and is implemented nationally it will provide us with a system that will either improve or even increase market access, something

that as a national brand and international supplier is critical to our growth."

The trial of BioSecure HACCP has shown there are major cost savings in labour, cropping inputs and efficiency gains in administration that support the value of the program. Government benefits through a greater engagement by and with industry in managing biosecurity threats, improved efficiency in technology adoption and auditing, real time information access and traceability of produce. The trial has been an overwhelming success with the next phase developing a full report on the trial being tabled at the next national Sub-committee on Domestic Quarantine & Market Access (SDQMA) meeting leading to national adoption.

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Indoor Heat Stress Mitigation with Urban Vegetation and Tree Shading

In this month's Nursery Paper, Zhengen Ren, Dong Chen, Guy Barnett and Xiaoming Wang from CSIRO's Land and Water Research Flagship, report on levy funded research examining the potential that trees have to reduce the impact of heat waves on health and energy use.

Indoor Heat Stress Mitigation with Urban Vegetation and Tree Shading

SUMMARY

This study investigated the potential benefits of urban vegetation for regional greening and the provision of local tree shade around residential buildings to reduce the impact of heatwaves on occupant health and the energy required for cooling. It was undertaken by a research team from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and involved simulation of the thermal performance of a residential home under various urban greening and tree shade scenarios, using weather observations from the 2009 (Melbourne) and 2011 (Sydney) heatwaves. It was found that doubling the urban green coverage of the Central Business Districts (CBD) in Melbourne and Parramatta, together with proper tree shading around a residential home may reduce the total annual hours of 'severe' heat-related health risk by 14% and 44.6%, respectively. Whereas, covering 50% of the CBD building roof areas with green roofs as well as appropriate arrangement of tree shading around the house resulted in a reduction of the total annual hours of 'severe' heat-related health risk by 14.5% (Melbourne CBD) and 36.2% (Parramatta CBD). The impact on the energy required for space cooling, was similar between the locations for each of the scenarios investigated. The study confirms that urban vegetation and tree shading have a key role in managing impacts of heatwaves.

1. INTRODUCTION

With climate change, heatwaves in Australia are set to become more frequent and severe. Heatwaves, such as those that occurred in Melbourne in 2009 and Sydney in 2011, pose a significant and growing threat to public health as highlighted by the rise in heatrelated illness and deaths. For instance, the 2009 heatwave in Victoria caused 374 excess deaths for the week of 26 January to 1 February 2009 (DHS, 2012). More recently in Sydney, there were



significant increases in hospital admissions and ambulance callouts during the heatwave (30 January to 6 February 2011) and 814 deaths compared with an average of 682 deaths for the same time period across previous years (Schaffer et al., 2012).

Health risk during heatwaves not only depends on extreme weather, but also the heat sensitivity of the population and the thermal performance of the housing in which people will retreat for protection. As reported by Cadot et al. (2007), the majority of excess deaths attributed to the 2003 heatwave in Paris occurred in the home. Therefore one important strategy for reducing heatrelated health risks during heatwaves is to improve the thermal performance of residential buildings. Using computer modelling, Chen et al. (2014) assessed the potential impact of regional-scale urban vegetation schemes on the urban ambient environment of Melbourne and found that an increase in urban vegetation could reduce the average summer daily mean maximum temperature and as a consequence, the rate of heat-related excess mortality. At the building scale, it has long been recognised that proper arrangement of trees and shrubs around residential buildings can reduce indoor temperatures during summer (Meier, 1990).

In this study, we build on this work by using computer modelling to predict the combined effect of regional-scale urban vegetation schemes to reduce ambient air temperatures and local tree planting to provide direct shade to residential buildings. The effectiveness of these strategies was assessed using a measure of heat-related health risk index and the energy required for space cooling. The geographic focus was Melbourne and Parramatta CBDs using weather from the 2009 and 2011 heatwaves, respectively.



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Table 1 The main characteristics of the urban vegetation schemes investigated for Melbourne CBD

Urban Type	Vegetation coverage of entire land area (%)	Vegetation coverage fraction within vegetation area	Leaf Area Index	Green Roof Coverage of Building Roof Area (%)	Building Coverage over entire land area (%)	Building Height (m)	Irrigation
CBD	15	1.00	3	0	65	12.0	Yes
CBD(Double Vegetation)	33	1.00	3	0	62	12.0	Yes
CBD(50% Green Roof)	15	1.00	3 1.5 (GR)	50	65	12.0	Yes

Table 2 The main characteristics of the urban vegetation schemes investigated for Parramatta CBD

Urban Type	Vegetation coverage of entire land area (%)	Vegetation coverage fraction within vegetation area	Leaf Area Index	Green Roof Coverage of Building Roof Area (%)	Building Coverage over entire land area (%)	Building Height (m)	Irrigation
CBD	18	1.00	3	0	46	9.0	Yes
CBD(Double	36	1.00	3	0	46	9.0	Yes
Vegetation)							
CBD(50% Green	18	1.00	3	50	46	9.0	Yes
Roof)			1.5 (GR)				

2. METHDOLOGIES AND MODELLING RESULTS

2.1 Urban climate modelling and weather data preparation

An urban climate model UCM-TAPM (Thatcher and Hurley, 2012) was applied to predict the impact of different urban vegetation schemes on the local climate of Melbourne and Parramatta CBDs with regard to changes in mean monthly ambient temperature, mean monthly daily maximum temperature, mean monthly daily minimum temperature, and mean monthly relative humidity. Vegetation schemes that were investigated included doubling the CBD vegetation and covering 50% of the CBD buildings with green roofs. These were then compared with the existing CBD vegetation scheme. Tables 1 and 2 provide details of the urban vegetation schemes used for Melbourne and Parramatta, respectively.

To enable simulation of building thermal performance, hourly weather station data for Melbourne (1st July 2008 to 30th June 2009) and Parramatta (1st June 2010 to 31st May 2011) was modified to account for the simulated effects of the various urban vegetation schemes on the three mean monthly air temperatures and relative humidity. The methods for preparing the weather data for building simulation using the regional simulations from UCM-TAPM are described in Ren et al. (2014) and Chen et al. (2014).

2.2 Building thermal performance simulation

The space cooling energy requirement and thermal performance, including the indoor air temperature, relative humidity and Discomfort Index (DI), were estimated using the AccuRate software developed by CSIRO (Delsante, 2005). DI is a commonly used index for heat-related health risk (Epstein and Moran, 2006). For indoor conditions, it is calculated as the mean of the indoor dry-bulb and wet-bulb air temperatures. The risk of heat stress is considered to be 'moderate' for DI values in the range of 24–28°C and 'severe' for DI values above 28°C (Epstein and Moran, 2006). The higher the DI index the greater the heat-related health risk and potential for adverse health consequences for the occupants.

Simulations were performed on a typical residential house that was assumed to be of detached brick veneer construction and comprising four bedrooms. There was no insulation installed in the walls or ceilings as the aim was to represent older housing stock and to simulate the maximum exposure of building occupants to heat-related health risk. For the simulation of heat-related health risk, the house was assumed to operate without space heating and air-conditioning i.e. using natural ventilation and associated occupant behaviours. On the other hand, for the simulation of cooling energy requirement, the house was assumed to operate with space heating and air-conditioning, with common thermostat settings for the respective climate (i.e. Melbourne and Parramatta) and consistent occupant behaviours.

2.3 Analysis of indoor heat stress and space cooling load

Simulations were carried out for the CBD area of Melbourne from 1 July 2008 to 30 June 2009 and Parramatta from 1 June 2010 to 31 May 2011. The results are shown in Figures 1 and 2 for Melbourne and Parramatta, respectively. For tree shading, it was assumed that all the trees are 10m high and are planted along the northern and western walls with a distance of 3m between the trees and the building.

For the Melbourne CBD area (see Fig. 1), the total annual hours with DI above 28°C (severe heat stress threshold) for all the habitable spaces (four bedrooms, kitchen/family, dining/lounge, bathroom, laundry, entry hall, toilet, walk-in robe and ensuite) was predicted to be 311 for the existing CBD vegetation scheme with no tree shading. With tree shading alone, the energy required for space cooling (i.e. cooling load) and the total annual hours with DI above 28°C were both reduced by 6.8%. Doubling the CBD green coverage could reduce the total annual hours with DI above 28°C and the cooling load by 6.8% and 6%, respectively. Whereas 50% green roof coverage of the CBD area could reduce the total annual hours with the DI above 28°C by 7.4% and the cooling load by 7.9%. With a doubling of the CBD green cover and residential tree shading, the total annual hours with DI above 28°C and the cooling load are both reduced by 14%. Assuming a 50% green roof coverage of the CBD area combined with residential tree shading,



the total annual hours with DI above 28°C is reduced by 14.5% and cooling load by 15%. These latter scenarios show the benefit of multiple levels of green strategies.

For the Parramatta CBD area (see Fig. 2), the total annual hours with DI above 28°C for all the rooms was predicted to be 686 for the existing CBD vegetation scheme with no tree shading. With tree shading alone, the total annual hours with DI above 28°C is reduced by 10.6% and the cooling load by 5.5%. Doubling the CBD green coverage alone could reduce the total annual hours with DI above 28°C by 37.1% and the cooling load by 8.7%. 50% green roof coverage of the CBD area could result in a reduction of the total annual hours with DI above 28°C by 27.6% and the cooling load by 1.7%. If we consider both doubling the CBD green coverage and residential tree shading, the total annual hours with DI above 28°C may be reduced by 44.6% and the cooling load by 13.4%. With both 50% green roof coverage of the CBD area and residential tree shading, the total annual hours with DI above 28°C could decrease by as much as 36.2% and the cooling load reduced by 7.0%. The results indicate that increasing green cover and/or the proportion of green roofs in the Parramatta CBD may result in a larger reduction in heat-related health risk than similar strategies in the Melbourne CBD, while the impact on energy requirements for space cooling are similar between the two locations.





Hours with DI≥28°C

■ Hours with DI≥28°C

Cooling loads(MJ/m2.annual)

Cooling loads(MJ/m2.annual)

Fig. 2. Predicted total hours with DI above 28°C and cooling load of the house in Parramatta CBD from 1st June 2010 to 31 May 2011.

Fig. 1. Predicted total

hours with DI above 28°C

and cooling load of the house in Melbourne CBD from 1st July 2008 to 30

June 2009.



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3. CONCLUSIONS

The potential of urban vegetation and tree shading around residential buildings in reducing indoor heat-related health risk and the energy required for space cooling were investigated for Melbourne and Parramatta CBDs, using weather data from 2009 and 2011, respectively. The results show that in the Melbourne CBD area, 50% green roof coverage and proper tree arrangement may reduce the total annual hours of 'severe' heat-related health risk $(DI \ge 28^{\circ}C)$ and the energy required for space cooling by 14.5% and 15%, respectively. In the Parramatta CBD area, reductions in the total annual hours of 'severe' heat-related health risk (44.6%) and energy required for space cooling (13.4%) were greatest when doubling the CBD green coverage together with proper tree shading of the house. This study confirms urban vegetation and tree shade are both important elements in mitigating heat wave impacts.



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American Study Tour 5-16 July 2014

"One must travel, to learn. Every day, now, old Scriptural phrases that never possessed any significance for me before, take to themselves a meaning." Mark Twain 1869, The Innocents Abroad

In this month's Nursery Paper NGIA Policy & Technical Officer, Chris O'Connor reports on outcomes and some key highlights from the recent industry study tour to the United States.

American Study Tour 5-16 July 2014



The Cultivate 2014 trade show covered 7 acres

Nursery and Garden Industry Australia (NGIA) recently conducted a study tour of America focusing on Green Infrastructure, Nursery Business Operations and the Cultivate Trade Show.

The tour which was partially funded through the Nursery Industry levy project NY13700 saw 10 people from the industry tour Los Angeles & San Francisco in California and Columbus, Ohio from 5-16 July 2014.

Green Infrastructure

A key element of the tour was to investigate the American take on Green Infrastructure, the utilisation of it, who the champions are and how they are promoting the concept to key influencers.

Three key advocate organisations were met with, these were; Sacramento Tree Foundation, Friends of the Urban Forest and Tree People. Each of these organisations has extensive involvement in urban forestry and a history extending back more than 30 years, but each has taken a different path in the expression of their advocacy.

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Sacramento Tree Foundation has a close link to the Sacramento Municipal Utility District (SMUD) which provides trees to its customers for the purpose of shading homes. This program is backed by detailed instructions of where to plant trees for maximum benefit. The Sacramento Tree Foundation has undertaken a great amount of work in researching and lobbying government to increase and protect the Urban Forest.

Friends of the Urban Forest (FUF) have a more grass roots approach to campaign for the urban forest. Situated in San Francisco they provide trees to local residents through organised local tree planting days. Residents pay a fee for the tree, which is supplemented through grants. The tree is managed through a maintenance program for the first few years of its establishment. FUF has recently focused some of its energy towards campaigning for a San Francisco Urban Forest Plan.

Tree People likewise had a grass roots beginning but has since evolved into an sophisticated operation. Programs include public education, demonstrations of technology and urban forestry and managing tree planting through its citizen forester programs as well as advocacy and natural restoration programs.

A large focus of the American push towards green infrastructure has been due to the



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The study tour group in front of the floral Mickey Mouse at Disneyland

benefits seen in managing water, and that was clearly seen in the tours meetings with Kristy Morris form the Council for Watershed Health and Raphael Garcia from the San Francisco Public Utilities Commission. A key aspect in San Francisco is the fact that sewerage systems and storm water systems are combined, so during large storm water events sewerage overflows can occur. Increased urban forest coverage is being embraced as a means to mitigate the impacts of these rainfall events.

The tour also visited Disneyland in Anaheim for a behind the scenes tour with the parks horticultural team. The horticultural support for the operation was impressive with work commencing at 2am every day before the park opens. Horticultural Manager Rhonda Wood highlighted operational aspects including the difficulties they have in accessing some plants in the park, some of which are accessed by using the jungle boat ride. Director of Disneyland Resort Horticulture Adam Schwerner provided a presentation covering amongst other items the focus they have on managing Disneyland's urban forest, expansion of the plant palette and training & development of the parks horticulture team.

The tour also met with Graham Ray from Deeproot, who are the manufacturers of the Silvacell. Graham discussed with the group some of the challenges that occur when trying to incorporate trees into an urban environment. During this discussion Graham went through some of the processes he undertook to ensure engagement of all involved parties at the local government level. He also provided some great insights into the tools and techniques available to overcome some of the engineering challenges posed when trying to get trees into urban areas. Some of these are essential for our industry to be aware of in order to increase our market opportunities.

Nursery Operations

Form a nursery perspective the tour visited four production nursery facilities in California. The first was a large family owned business Boething Treeland Farms. The operation covers 800 hectares over 3 sites in California. Production includes over 1200 plant varieties and supply of product is predominately to the landscape trade. Transport is conducted in house and the business has a fleet of trucks to achieve this. The scale of the operation was considerable however it was observed that there was limited mechanisation. This prompted a discussion on how mechanisation was something that the business was actively seeking due to rising labour costs. By way of information the minimum wage in California increased from \$8/hour to \$9/ hour on the 1st of July 2014 so this was quite new during the tour. Within 18 months' time the minimum wage will rise again to \$10/hour, placing more pressure on nursery operators.

Armstrong Growers was the next operation the tour visited. The company has three production sites and owns 31 Armstrong branded Garden Centres, as well as owning the controlling share of Pike Nurseries in Atlanta which operates 16 Garden Centres. The company has a vertically integrated structure whereby the production nurseries supply approximately 45% of the stock in the operations garden centres. The rest of the production material is supplied by other growers. Armstrong Growers also supplies plant material to other garden centres and landscapers as well as large resort operations.

The business has a number of partnerships for example they act as an agent for Monrovia and allow for consolidated freight deliveries through cross docking. The site at San Juan Capistrano also features a new landscaper's drive through service.

One aspect that was of note was that Armstrong Growers is an employee owned company whereby employees own a share of the business through an Employee Stock Ownership Plan (ESOP). Each year more than \$2 million is put into the plan from the production business.

Altman Plants was the next nursery on the tour. The business established in 1975 encompasses some 880 acres across 3 states and supplies major chains such as Home Depot, Lowes and Walmart. The business produces a wide range of bedding plants, perennials, roses, and over 800,000 poinsettias. The site we visited at Vista covers 675 acres of production with 3 million square feet of greenhouse which is supported by 400 employees, 30 miles of roads and a 4 acre loading dock.

Drought has been a major issue for the Californians with the current drought being one of the severest recorded in the region. In keeping with this issue, General Manager Jim Hessler showed the tour the sites new dam and water recycling process. The total



Altman Plants Vista California operation cover 675 acres of production

capacity is 37 acre feet which equates to approximately 45 million litres of water. Jim noted that they had just upgraded their sprinkler systems after gaining a grant from the local water authority and had seen a resulting reduction in water use.

One of the most interesting aspects of the Altman operation is the use of robotics. The site has 8 HV-100 robots from Harvest Automation which are used to space out plants. The robots are transported to various locations on site on a customised trailer and are managed by a "robot wrangler" who manages the robots and ensures they are functioning. These are partnered with a trike forklift which has specialised tines which allow for the bulk movement of potted plants. According to Jim Hessler the staff have quickly accepted the robots which have each been individually named. It allows Jim to free up labour to focus on more value adding / productive tasks and in light of the rising cost of labour this is essential.

The final nursery operation the tour visited was Valley Crest Tree Company. The Valley Crest Tree Company is one division in Valley Crest Landscape Companies, a business which includes Landscape Design, Installation and Maintenance as well as Tree Care and Golf Course Maintenance. In an release on the 1st of July 2014, the business announced that it had completed a merger with its largest competitor The Brickman Group. This new business entity has over 20,000 employees and has estimated that its turn over for the 14/15 financial year will be in excess of \$2 billion dollars. To say that our tour was impressed by the scale, quality and professionalism of this operation is an understatement.

Our host at Valley Crest was Robert Crudup Jr. who is the president of the Valley Crest

Tree Company. Robert stressed the central importance of business and production processes in his business. He noted that he had no problems with competitors visiting the site and seeing his production practices, because he knows they do not have the business disciplines in place to execute and do it right. Robert noted that they may emulate his practices for a month or two but could not sustain it. Robert also emphasised the importance of quality, an example he cited was during the Global Financial Crisis, Valley Crest put \$5.7 million dollars of stock into the chipper because they were not able to be sold and their quality would suffer. This commitment to quality has also seen them work with key experts such as Ed Gillman and become contributors to quality standards. The business also has a number of ISA certified arborists on staff in a variety of roles including sales. This helps to solidify customer relationships and also helps Valley Crest to understand client needs.

The commitment to quality certainly pays dividends, Robert noted that his prices were at the premium end of the market but



Valley Crest Tree Company demonstration of modified pot in pot system including air pruning.

BUSINESS

the Valley Crest name and commitment to quality justifies this. Robert also noted how he undertook a lot of marketing upstream of the landscapers to those specifying the stock such as landscape architects. After seeing the quality of the stock and understanding the production process they are happy to partner with Valley Crest for their tree stock requirements.

Valley Crest Tree Company produces tree stock from 15 gallon pots through to large 72" timber boxes with their main market being 36" 48" and 60" boxes.

Dave Teuschler the Technical Services Manager walked the tour through their propagation process which is relatively new. The seed or cutting material is propagated directly into 65mm pioneer tube pots which are air pruned. They have found that by doing this they have limited root defects and have achieved great growth rates.

This tube stock is then potted up into 1 and then 5 gallon pioneer pots. These are again air pruned but are also placed into a modified pot in pot system using the solid walled pots. This limits the impact of wind desiccating the roots but provides the benefit of air pruning.

Production Manager Brad Bowers then gave a demonstration on formative pruning and their use of wire stakes instead of wooden stakes. The theory behind this is that the wire provides a high degree of flexibility to support the trees growth and development compared to the rigidity of a timber stake. The wire is also reusable and won't rot. Throughout the tour it was evident that savvy manufacturing principles were in place. The catch cry of "touch it one time" was heard numerous times and could be seen in the delivery of pots on site. Rather than having all pots in a central location the different size pots were located at the points where potting up was undertaken. This thinking is intrinsically linked to the ideal that each time a plant is touched it should provide some form of value add, for example potting up or pruning, rather than moving a plant.

Overall the Valley Crest Tree Company is an inspiring operation and one which the tour was privileged to have seen.

Cultivate 2014 Trade Show

The Cultivate trade show is an evolution of the previously well-known Ohio Short Course hosted by American Hort. The show which covers more than 7 acres provided the tour an excellent opportunity to see all that is new and exciting in the nursery production world. This ranged from new plant releases from the large breeders such as Proven Winners, Dummen group (Red Fox), Ball and Suntory through to new examples of mechanisation such as the Harvest Technologies HV-100 robots.

Cultivate also featured a number of education sessions and research extension sessions led by leading local academics. Some highlights of these sessions included;

- the use of Unmanned Aerial Vehicles (UAV's) or drones to obtain accurate inventory counts of nursery stock
- Using RFID to manage stock in a tree production nursery

- The use of remote sensor technology to manage irrigation applications. Research in this area also included the use of irrigation control to manage plant growth without the use of PGR's
- The use of LED light to provide supplemental lighting and to improve plug growth rates.

The preceding synopsis of the tour has just scratched the surface of the opportunities that were seen in America and the contrasts both good and bad to our own industry. The participants were all able to take something positive back to their respective businesses, so it was certainly a successful 10 days.

NGIA would like to extend our sincere thanks to our American hosts for their openness and warm hospitality during the tour. Thanks must also be extended to the tour participants for their enthusiasm, good humour and commitment to the tour and the industry.



The Harvest Industries HV-100 robot on display at Cultivate

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Barcodes – Beyond compliance

Barcodes are commonly used throughout the nursery industry to identify products in a retail setting, but what other opportunities do barcodes offer industry?

NGIA Policy and Technical Officer Chris O'Connor, takes a brief look at barcodes and the potential they have for the industry as well as what systems exist beyond barcodes.

Barcodes – Beyond compliance

The barcode has been in use in a retail setting for 40 years, having first been used on a packet of chewing gum in June 1974. Since this time the barcode has become integral in retail throughout the world and in fact the vast majority of retailers require suppliers to barcode their products.

But there are uses for barcodes beyond retail operations or complying with retailer's ranging requirements. In this nursery paper we will look at what growers can use barcodes for and how they can be used to identify improvement opportunities, increase profitability and assist in managing biosecurity responsibilities.

The GS1 System

One aspect which can be quite confusing is the broad range of terms and acronyms used in relation to barcodes. In the first part of this paper we will look at some of the various terms used with barcodes as well as some of the types of barcodes utilised as well as the wider context in which they are used. A barcode is essentially a visual depiction of data which is machine readable; in essence it is a data carrier. But not all barcodes are the same; in fact there are a number of different types of barcode symbology. Different barcode symbology's can carry different data types and are used in different applications. This point is essential as there is a difference between the barcode (visual representation) and the information that it carries.



Barcodes are a powerful tool which can be leveraged by both retailers and growers to reveal better data on a range of aspects, "streamline tasks such as ordering and increase profitability."



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Barcodes can be used as an aid to traceability, not only in the production phase but through the entire supply chain

So before focusing on barcodes we have to consider the information that they contain first as this will dictate how we use the barcode and what barcode will be needed.

For data to be useful it needs to be understood and for it to be understood by many individuals there needs to be a system or a standard. This is where GS1 comes into play. GS1 is an international not for profit association with members organisations in over 100 countries. The role of GS1 is to administers and improve the system of standards which deal with supply chain information. The standards which GS1 administers are built on three key areas of information management namely; identifying, capturing and sharing information.

Identify

For identification purposes the GS1 system uses a number of identification keys. The one which most growers and retailers would be familiar with is the Global Trade Item Number or GTIN. The GTIN is a unique number which provides a way to uniquely identify an item. This can then be used as a means of attributing information to a product such as pricing or production instructions and retrieving that information when used in conjunction with a database. The uniqueness of the GTIN becomes more important when the product moves out into the supply chain as products from multiple producers can be easily identified without duplication.

The GTIN's found in the nursery industry are 13 digit numbers which are comprised of 3 elements;

- A **GS1 company prefix** which is allocated to the company
- An **Item Reference number** allocated by the company
- And a **Check Digit** which is calculated from the previous digits. This is a security feature which assists in ensuring that the code is read properly by the machine.

GS1 also has a number of other identification keys such as;

- Global Location Numbers (GLN) used to identify a physical location for example a business location, a propagation house or a shelf in a warehouse.
- Global Returnable Asset Identifier (GRAI) used to identify and track returnable assets for example pallets, trolleys or nursery trays.
- Serial Shipping Container Code (SSCC) used to track items throughout the supply chain, for example it could be applied to a trolley of mixed plants or a single box

Capture

Next we need a way in which we can capture that information for it to be useful. To do this GS1 administers a wide range of standards for data capture and encoding with perhaps the most recognisable being barcodes. The two barcode symbology's most common to the nursery industry are the **EAN - 13** barcode and the **GS1 – 128** barcode.

The EAN - 13 barcode symbology is used at the point of sale and it is the one which growers and retailers would be familiar with. Most major retailers require products to be barcoded with an EAN-13 and having a barcode is an essential criterion for having a product ranged. Having this barcode means a retailer can capture information; efficiently tracking sales, placing orders and speeding up the checkout process.



The EAN -13 barcode does have its limitations, the data which it can carry is limited to a GTIN. In contrast the GS1-128 barcode can carry a lot more information.



An example of an EAN-13 barcode encoding a GTIN

The GS1 -128 barcode cannot be used at the point of sale but it is powerful. It can cater for all identification keys (GTIN, GLN, GRAI, SSCC etc.) as well as additional information such as Batch/Lot Number, Production Date, Product Net Weight in Kg to name a few.

It does this by using Application Identifiers (AI) which acts as an indicator of what the data is when scanning. This enables other companies to also understand what the data is as well. The AI itself is a short 2 - 4 digit prefix which defines the meaning and format of the data.



An example of a GS1-128 barcode with a GTIN and a batch number. Note the Application Identifiers in brackets.

Share

GS1 administers standards data synchronisation through its Global Data Synchronisation Network which allows trading partner's access to the same up to date information on their products such as pricing information. This ability to synchronise data leads to a better trading environment with improved accuracy, reduced costs and increased speed.

GS1 also administers standards for Electronic Data Interchange (EDI) which essentially allows companies to send and interpret business messages including invoices and purchase orders.

Opportunities

So now that we have undertaken a quick overview of barcoding what are the opportunities available for production nursery business? The first opportunity is through improved inventory management. Barcodes will facilitate the means to keep an accurate record of stock on the ground. This can be achieved in conjunction with the use of Global Location Numbers (GLN). Each location in the nursery can be given a location number. The locations will depend upon what level of detail is required by the business. As an example it could range from; Business – Site – Greenhouse - Bench.

At the operational level essentially as a product is moved into a location it is scanned in and as it leaves the location it is scanned out with both of these actions updating an inventory database. Apart from increasing recording accuracy this opens up the opportunity to have live inventory which is updated automatically as stock is moved. Live inventory will assist sales teams in knowing exactly what is available for sale without having to do a physical stock count. It also enables sales teams to sell to the last plant which in turn increases the profitability of the crop. This can be achieved through the facilitation of online stock availability which is accessible by your customers.

Live inventory can also be used to assist in identifying production quantity needs rapidly.

The next opportunity which barcoding offers production nurseries is through increased traceability. With increasing focus on biosecurity the ability to trace where your stock has come from and where it has gone to is becoming essential. For those businesses supplying the retail sector the ability to undertake a recall procedure is also becoming more important to limit risk and potential costs.

A business could use a GTIN to track product but this has its issues as there is no differentiation between product produced today, yesterday or even last year.

Traceability of product however can be enhanced through complimenting GTINs with a batch number. As noted previously this can be done using a GS1-128 barcode and an Application Identifier (AI). Incorporating batch numbers is a very useful tool as in the event of a recall one can limit the products being recalled to the batch rather than the entire product. The ability to trace product using GTIN's and batch numbers also enhances the opportunity to track what has been done to the product during production. For example accurate data on watering, agrochemical applications (fertilisers, pesticides, and plant growth regulators) can be applied to a product batch. Likewise weather conditions and even which staff was involved in specific operations with the batch can be attributed and correlated.

This leads to two potent outcomes; firstly accurate production costs can be attributed to the batch and secondly causality can be determined.

Accurate production costs mean that you have an increased awareness of what the plant costs to produce. This in turn will guide decision making processes such as; how much do you need to sell the plant for? Which plants will give the best dollar return for the work needed to produce them? When the best time to dispose of excess stock is? Is it ok to pot up a plant when there is no market for it?

Determining causality can be greatly assisted with increased traceability. If there has been a good crop what caused it? Likewise if there was a crop failure what was the root cause? Increasing the level of information associated with production will help show the causes of success or failure. This focus on data is much better than relying on memory or anecdotal evidence. The information gathered can be incorporated into future operations contributing towards ongoing improvement in production quality and speed along with improved profitability.

Each of the opportunities mentioned relate to the availability of better information and as commonly attributed to Peter Drucker "If you can't measure it you can't manage it". The higher quality of information you have the more informed your business decisions will be. However for this information to be accurate it must be used in the context of a well-designed system and a disciplined approach.

The future

In many respects the future is already here. In the past few years there has been a tremendous advance in the computing power and adaptability of both hardware and software. Computing has gone mobile and tablets and smart phones are able to


An example of an RFID tag which has been used in a nursery environment

be used in many roles and applications which have in part been facilitated by the introduction of cloud computing. Conversely the price of this technology has decreased considerably and what was once the domain of big business only is now certainly available to smaller operations.

There are some new data carriers which have gained in prominence over the last few years and offer an alternative to EAN-1 or GS1-128 Barcodes.

GS1- Databar

The GS1 Databar was introduced at the start of 2014 and is designed for use at the point of sale. It has 4 configurations which allow for the barcode to be stacked. This means that the barcode can be compressed in size allowing it to go onto smaller products. Specific configurations of the GS1-databar barcode are also able carry additional information such as batch numbers. This would be a boon for the nursery industry in managing traceability further through the supply chain.

In Australia it has been recently used on fruit for sale in supermarkets however at this stage it has not been adopted widely for use in the retail hardware sector.

RFID

Radio Frequency Identification (RFID) technology has been available for a number of years and is now becoming more cost effective. RFID essentially allows the identification of items without a line of sight. So rather than having to scan a barcode a tagged item just needs to pass within the range of a receiver antenna to be identified. RFID is used in many situations but most readers will be familiar with RFID tags through their roadway etags or through their use in clothing tags for theft prevention at retail stores.

RFID tags contain a small microchip which allows for the programing of information usually an Electronic Product Code (EPC) similar to a GTIN and an antenna. The antenna enables the tag to both transmit the information stored on the chip and access power for the chip. The power for the chip is received from the antennas electromagnetic energy.

RFID has a number of benefits in automating stock control and inventory processes in production nurseries and a number of nursery businesses are already utilising this technology. Barcoding has enormous potential for producers beyond compliance with retailer requirements. If you are not leveraging this technology to its full advantage you are missing out on opportunities to maximise profits and streamline your production.

Industry is working closely with GS1 Australia through the Hardware GS1 Action Group to ensure that industry has access to knowledge and is kept current with solutions to supply chain information management.

For more information on how you can better use barcodes in your business please contact GS1 www.gs1au.org or if you would like to engage a consultant from GS1 to assist your business in leveraging your GS1 membership please visit http://www. gs1au.org/services/professional_services/

Further Information

Dr. Tom Fernandez, Michigan State University *17909 Using RFID for Inventory Tracking in Container and Field Nursery Operations*, ASHS Conference Jul 2014 available from; http://ashs.confex.com/ashs/2014/webprogram/Paper17909.html

Nursery Paper Issue 10 Nov 2009 Supply Chain Management holds the key to the viability of nursery enterprises available from www.ngia.com.au

GS1 System: The Global Language of Business available from http://www.gs1au.org/assets/documents/info/brochures/GS1_System_Brochure_all.pdf

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Street tree diversity and canopy quality influences urban microclimate and pedestrian thermal comfort.

In this month's Nursery Paper Ruzana Sanusi and Stephen Livesley from the University of Melbourne report on some ley funded research investigating the impact of street tree diversity and corresponding canopy quality have on pedestrian thermal comfort.

Street tree diversity and canopy quality influences urban microclimate and pedestrian thermal comfort.

Summary

This study investigated the microclimate benefits of street trees with different canopy qualities in Melbourne, Australia. It also extends these microclimate measures to estimate the impact of tree canopy quality upon pedestrian thermal comfort below. This study is collaboration between The University of Melbourne and NGIA. We measured under three street tree species that are commonly planted in Melbourne and other cities in the southern Australian states: Platanus x acerifolia (London Plane); Ulmus procera (European Elm) and Eucalyptus camaldulensis (River gum). It was found that the higher the canopy quality, as indicated by plant canopy index, the cooler the midday microclimate conditions under that canopy in summer. Pedestrian thermal discomfort could be almost 20% better under canopies of high quality, as indicated by a reduction in physiological equivalent temperature (PET) from 43°C to <35°C. The changes in canopy quality largely influenced the amount of solar radiation transmitted below the canopy, and therefore pavement heat gain and pedestrian thermal comfort. These canopy shade benefits are dependent both on the tree species and the canopy quality of that tree. Below Eucalyptus camaldulensis canopies, PET conditions remained 'very hot' for pedestrians because of the smaller possible plant canopy index commonly associated with eucalypt canopy architecture and leaf orientation (pendulosity). This study suggests that both tree species and tree canopy quality are important factors to be considered for future urban tree selection and management.

1. Introduction

Effective management of trees in urban areas is important as the different tree species planted are diverse in themselves as well in the age, the health, the different architectural forms, canopy densities and leaf characteristics. Depending upon the urban landscape context, the users of that space, the exposure levels etc.,

it is important to identify the function of each tree species in the local landscape with regards to the benefits those trees can provide local residents. The urban forest, in its entirety, can contribute to reducing the urban heat island, but individual trees and street tree plantings can contribute to changing the urban microclimatic at the micro-scale; i.e. the street scale,. Many recent studies have highlighted the importance of urban trees for microclimate modification, a key benefit to the local urban residents and street pedestrians (Shashua-Bar et al., 2009, Georgi and Zafiriadis, 2006). Changes in microclimate can greatly benefit pedestrian in the urban landscape by improving the human thermal comfort (Shashua-Bar *et al.*, 2011).

However for a single tree species, tree canopy characteristics, such as size, density, leaf clumping, are can vary according to management, environmental growth factors (soil volume, water, nutrients) and tree health (pests, pathogens). Canopies of different quality within a single species will provide different microclimatic benefits and ultimately may have different influence on the pedestrian thermal comfort. Obviously, canopies differ in quality amongst different tree species, so when comparing different tree species it is especially important to compare them across the range of canopy qualities that can be expected and found within an urban streetscape. This study investigated the midday microclimate benefits of three common, yet contrasting, urban tree species: Platanus x acerifolia (London Plane); Ulmus procera (European Elm) and Eucalyptus camaldulensis (River gum). A range of canopy qualities were selected for each tree species to provide an opportunity to investigate canopy quality influence on microclimate and pedestrian thermal comfort from a 'within species' and 'interspecies' perspective.

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2. Methods applied

2.1 Canopy quality measurement

This study has been conducted in Melbourne, Australia in one to two storey residential streets with pedestrian pavements. Three street tree species used in this study were Platanus x acerifolia, Ulmus procera and Eucalyptus camaldulensis. A range of trees (n=9) with different canopy qualities was selected for each species. To determine the canopy quality for each tree, cover photography method from MacFarlene et al. (2007) was used to estimate a Plant Canopy Index (PCI) that includes an area estimate of both leaves and branches.

2.2 Microclimate measurement and pedestrian thermal comfort estimation

The microclimate parameters measured for this study were air temperature, relative humidity, wind speed, solar radiation and mean radiant temperature

(T_{mrt}). Mobile climate stations (1.1 m above ground) were used to measure microclimate condition below tree canopy for a range of canopy qualities during mid-day period (Figure 1). All the measurements were made on three days during summer. All the climate stations were positioned below the tree canopy while control measurements were made away from the tree canopy and building shades.

All these measured microclimate variables were then used as an input to the estimation the pedestrian thermal comfort by calculating the Physiological Equivalent Temperature (PET)

using RayMan software

(Matzakaris et al., 2007).



Figure 1: Portable weather station was used for microclimate measurements

3. Results and discussion

The control measurements that were made in the open area were allocated a zero PCI value. The lower the PCI value indicates lower canopy quality for each tree. Figure 2 shows some examples of the tree canopies and their PCI value for each species. PCI for *Platanus x acerifolia* ranged from 0.641 to 5.079, *Ulmus procera* from 2.132 to 6.141 and *Eucalyptus camaldulensis* from 1.308 to 2.747. From the PCI range we could see that *Eucalyptus camaldulensis* had smaller range. The characteristic of the species such as inherent clumped canopy, thin open canopy and pendulous leaf characteristics explained why the species had lower PCI range. On the other



PCI: 5.079



PCI: 5.602



PCI: 2.738

Figure 2: Three street tree species of Platanus x acerifolia (Top), Ulmus Procera (Middle) and Eucalyptus camaldulensis (Bottom) with varying canopy quality measured as Plant Canopy Index (PCI). PCI value of 0 is for open space as control.





hand, *Platanus x acerifolia* is a large broadleaf tree with rounded to pyramidal canopy and *Ulmus procera* a small broadleaf tree with a dense and rounded canopy.

At the microclimatic scale, this study shows that different PCI values influence the microclimate below the tree canopy. Figure 3 shows that solar radiation below canopy for all three species was significantly reduced as the PCI increased. As high PCI relatively has denser canopy, theoretically there were less gaps exist within a given canopy. Therefore less solar radiation was transmitted below the canopy. However, at PCI values > 4 for *Platanus x acerifolia* and Ulmus procera, reduction in solar radiation transmittance was relatively small (Figure 3). The benefit of having lower solar radiation below a tree canopy is that greater shading and cooler ground surface temperatures can be achieved (Brown and Gillespie, 2005), Both of the shading and cooling benefits drive the reduction in T_{mrt} and therefore enhanced pedestrian thermal comfort (Shashua-Bar et al., 2011). Furthermore, Tmrt significantly correlates with PET (Figure 4) indicating that it highly determines pedestrian thermal comfort (Matzakaris et al., 1999).

PET decreased as PCI increased for all three tree species. As Platanus x acerifolia and Ulmus procera have larger range of PCI, it shows that higher canopy quality can helps in reducing thermal stress. For Platanus x acerifolia the difference in PET between PCI 0.64 and PCI 5.1 was 7.2°C that demonstrated the pedestrian thermal comfort changed from 'slightly warm' to 'very hot'. However *Eucalyptus camaldulensis* that has a smaller range of PCI value due to its canopy architecture and leaf characteristics, PET demonstrates that below the tree canopy it remained 'very hot' for pedestrians. The increase in PET below the canopies as the solar radiation increased for all three tree species was the same as indicated by the similar slope in Figure 4. However, the PET value beneath a Eucalyptus camaldulensis canopy at any given 'abovecanopy' solar radiation load, will be \sim 3°C greater as compared to the other two species (Figure 4), whereas, despite the differences between Platanus and Ulmus their thermal benefits are comparable for a given solar radiation load.



Figure 3: Plant Canopy Index (PCI) and average solar radiation and Physiological Equivalent Temperature (PET) for three street tree species. These results are the average of three day measurements during summer 2014 in Melbourne, Australia.

This further indicates that reduction of solar radiation in cities is highly important to maintain pedestrian thermal comfort. Noteworthy, better cooling capacity from trees may reduces the chances of urban residents to get heat related illness such as heat stroke and heat stress during summertime which at certain high heat intensity level may lead to mortality.

4. Conclusions

The influence of different canopy quality from street trees was investigated in Melbourne, Australia to look at its effect on street microclimate especially for pedestrian thermal comfort estimation by using human thermal index, PET. In this study, it was clearly found that higher canopy quality (PCI) had modified the microclimatic condition below tree canopy in summer. Through these studies, reduction of solar radiation with higher canopy quality also highlights the importance of shading benefits that relatively cooling the surfaces below the canopy and improves PET. Noteworthy, selection of tree species that can provide better canopy quality or managing existing trees for better canopy quality is therefore needed during hot and dry summers as the reduction of heat load at street level is important for pedestrian thermal comfort. These findings can further assist the planners and managers for future species selection and the street tree canopy management in urban forest for the benefits of urban residents.

Figure 4: Relationship between mean radiant temperature (T_{mrt}) and solar radiation with Physiological Equivalent Temperature (PET) for three street tree species. This result is the average of all three days of measurement during summer 2014 in Melbourne, Australia.

Figure 4



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Design Issues and Beneficial Outcomes from Greening a Childcare Outdoor Space for Babies and Toddlers.

In this month's Nursery Paper Anne-Marie Morrissey, Caroline Scott and Llewellyn Wishart from Deakin University report on levy funded research focusing on the benefits of greenspace in childcare centres.

Design Issues and Beneficial Outcomes from Greening a Childcare Outdoor Space for Babies and Toddlers.

Introduction

The first five years of children's lives are crucial for their later life outcomes. Many young children spend significant amounts of their waking time in childcare and outdoor environments in these programs will be important influences on children's wellbeing, learning, and development. There is growing research evidence that well-designed, naturalised or green outdoor spaces benefit young children including: increasing the level and quality of physical movement (Cosco, Moore & Islam, 2010; Fjortoft, 2001; Greenfield, 2004); enhanced opportunities for play, increasing the sophistication of children's social and play skills (Herrington, 2007; Nedovic & Morrissey, 2013); providing a sense of calm and wellbeing (including for children with ADHD) (Nedovic & Morrissey, 2013; Wells & Evans, 2003); enhancing children's ability to concentrate (Waters & Maynard, 2010); and promoting children's understanding and appreciation of the natural world (Nedovic & Morrissey, 2013; Waters & Maynard, 2010).

Despite the growing evidence of the benefits of providing children with access to the natural world, it can be observed that many childcare centres have 'denatured' their outdoor spaces, and are providing the children in their care with limited experiences of green environments. This trend appears to be exacerbated by concerns to avoid litigation, leading to the elimination of 'risky' elements such as trees, rocks, etc. and their replacement by artificial soft-fall surfaces, plastic and low-challenge fixtures. The recent long-term drought has also encouraged management in some centres to remove vegetation, and install artificial surfaces. In addition, many childcare centres' lack of shade-providing vegetation such as trees, can mean that concerns about sun-exposure limits the times that children can spend engaging in healthy activity outdoors. This can increase the risk that children end up having too little exposure to sunlight, leading to conditions such as Vitamin D deficiency and depression (McCurdy, Winterbottom, Mehta & Roberts, 2010).

Perhaps the most important factors in this trend to increasingly artificial outdoor environments in childcare centres are a lack of

awareness and appreciation of the value of green environments for children, and practical challenges faced by centres in establishing and maintaining green spaces. Despite the growing research on the value of naturalised outdoor spaces, there is only limited evidence on exactly how young children engage with green elements in childcare spaces. Research in Australian contexts is particularly limited, and there is a need for the acquisition of specialised knowledge in this area, that can form a basis for the development of viable and practical horticultural and landscaping 'models' and solutions for outdoor spaces in childcare centres. Without this specialised knowledge base, and the appreciation of the benefits of green spaces, it is difficult for childcare centre management and staff, and landscape designers and architects, to envisage and create outdoor garden spaces that maximise children's beneficial engagement with a green environment, while also being sustainable within the constraints of a childcare context.



Looking to the north end of the yard pre-greening



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The north end of the yard post-greening

With funding from the NGIA and the Centre for Research in Educational Futures and Innovation at Deakin University, and in partnership with Fleming's Nursery, researchers from Deakin University investigated the effects on children's play and physical activity of greening an outdoor space for babies and toddlers (called 'The Babies Yard'), in an urban childcare centre run by a notfor-profit organisation.

The Research Project

The focus of the research was on observing children's physical and play activity and interactions with the environment pre- and postgreening. Physical and sensory interactions with their environment are crucial for babies and toddlers. At this age, children learn through their senses, activity and movement. This means that the opportunities provided for them in their physical environment, and the opportunities to move around in and act upon that environment, are critical factors in their development and learning. The researchers used 'behaviour mapping' (Cosco, Moore & Islam, 2010) and tracking of individual children's activity in the space, to record the different types of play and physical movements that children engaged in, where these occurred, and how children used the different environmental features.



The herb garden

The researchers used Gibson's concept of affordances to help interpret their observations of children's responses to the space before and after greening. This concept is a way of conceptualizing environmental features (natural and man-made) in terms of the opportunities they provide for meaningful activities and experiences (Heft, 1988). Gibson views affordances as sitting between the environment and the observer, and affordances can hold a different meaning and potential for each individual based on factors such as knowledge, experience, strength, size, skills and preferences (Sandseter, 2009). In the same environment, children may perceive different affordances than adults would. Being able to understand what affordances children perceive in an environment is important, not only for reasons of avoiding potential hazards, but also as a basis for providing children with environments that offer a range of opportunities for positive experiences and interesting activities that promote wellbeing, learning and development.

The researchers were also interested in exploring the perspectives of Fleming's staff on the processes and requirements of designing a space for babies and toddlers in a childcare context. To this end, the designer/project manager at Flemings was interviewed on her perspectives on the project, including design goals, challenges and experiences of consultation and collaboration with researchers, staff and management.

The Space

Before Greening

The space had been inherited from the previous owners, a commercial chain of childcare providers. It was dark and dreary, with a wind tunnel effect, and the only natural elements a few struggling pot plants. The outlook from inside was dominated by a view of a grey concrete wall. A number of observers described the space as 'like a prison yard' or 'a concrete cage'. Play resources consisted of brightly-coloured plastic, defined-use toys and equipment, often brought out from inside.

The Greening Process

The process of greening the Babies' Yard was described by Fleming's designer and project manager as 'daunting'. Challenges included: the pre-dominance of concrete, including the possibility that it covered the whole space under the artificial surface; the lack of sunlight with a substantial area under a roofed veranda; the need to include an emergency exit wide enough for a cot to be pushed through, and the numerous building and safety regulations and requirements that had to be met.

Extensive consultations were held between Fleming's and the childcare centre staff and management about how they worked in the outdoor space and their ideas for what could happen in the new greened space. The designer remarked that this was an important element of the design process, and that the eventual design would have looked very different without it. The researchers gave input on their preliminary observations of how children were using the space, as well as discussing existing research evidence on effective design and features for natural play spaces for babies and toddlers.

The eventual design had a number of objectives including:

• To introduce plantings and other natural elements into the space







A child's eye view looking towards the south end post-greening

- To encourage greater use of the whole space such as by introducing points of interest at the ends of the space, and allowing pathways for activities such as riding bikes and running
- To include elements of challenge appropriate for toddlers while also accounting for the needs of the babies
- To respond where possible to staff suggestions and requests
- To expand the view from inside so as to bring in light and allow glimpses of greenery, sky, the weather, etc.

After Greening

Visually, the effect of Fleming's greening of the space was dramatic and the photographs show that the space now afforded children sensory experiences of trees, plants, sky, and natural materials such as sand, hay, stones, logs, and wooden features such as edgings and a bridge. The removal of a paling fence allowed sunlight to flood in, not only brightening the space and allowing plants to grow, but also introducing the play of sunlight and shade in contrast to the monotone of grey light that had dominated previously. The removal of the fence also allowed light and views of natural features from inside.

The new greened space also provided new opportunities for play and physical movement. Analysis of the behaviour mapping and child tracking data showed higher levels of physical activity, more movement across the space, and a greater range of types of movement after the greening. In particular, movements of walking and crawling up and down an incline, sliding, stepping, and balancing were not observed until after the 'greening' of space. Children were also now observed to be actively ranging across the space.

Balancing, Stepping & Inclines

Several new features in the greened space appeared to support this increase in level and variety of physical activity. Child engagement in balancing and stepping are interesting examples. While prior to greening, the space contained a plastic balance beam (see photo 5), balancing was not observed in this phase. After greening, children were observed spontaneously engaging in balancing activity as they used a wooden edging that crossed the space, (see photos 2, 3 & 4), usually as they were on the way to somewhere else. In some places there were steps in the edging and the children appeared to enjoy this feature, expressing delight and concentration when attempting to step up or down (see photo 5). Interestingly the

researchers have observed this in other projects, where features such as edging, steps and slopes, embedded in an outdoor 'play landscape', have afforded children opportunities to engage in a range of physical movements not available in flat level spaces.

The wooden bridge was also a feature of the greening. The bridge appeared to provide opportunities for children to negotiate what was a steep incline for toddlers who had only recently learnt to walk, and the children appeared to relish the challenge, crossing the bridge over and over again. Photo 6 illustrates how children had to concentrate on placing their feet to negotiate the steep slope.

Engagement with Nature

Post greening, children also engaged more often with natural materials. Despite the availability of a sand tub pre-greening, observations showed the post-greening sand pit was used twice as often as the sand tub. A possible explanation for this might be due to the sandpit being more accessible for the children; they could climb up to it via the edging or garden bed and sit in the sand, whereas the sand tub had been raised off the ground (to at least child chest height) and children had to stand around and reach in to access it. The implication of this may be that the children found the sand pit more accessible, and a more comfortable and inviting place to sit and play.

The children were interested in engaging with nature, and often expressed surprise and delight at the way in which natural



The plastic balance beam post-greening and wooden edging post-greening



Children walking over the wooden bridge post-greening

affordances interacted with their senses in new and exciting ways. The stones set in concrete at the ends of the bridge afforded interesting feelings and sounds as children rode or pushed the bike wheels over them and as they walked over them (see photo 6). Children were observed stopping and squatting down to further investigate the stones with their hands. Loose parts such as leaves, bark and flowers were picked and thrown, sprinkled, squashed or sniffed in a way that the static, hard, plastic manipulatives in the pre-greening yard could not be. The designer and project manager remarked that: "We wanted the kids to interact with the plants. Our plant selection was about choosing things that were robust enough to handle kids pulling bits off and tasting them...". In some instances, children were observed peacefully observing a bee flying around the plants or branches swaying in the breeze, indicating that children were benefiting from the restorative nature of the green space in a way unavailable pre-greening.

Conclusions

In summary, the greening of the Babies Yard led to a significant increase in the level and variety of children's physical activity. It also provided them with an environment that offered new challenges in their play, and positive experiences of the natural world. Visually the transformation was dramatic, providing children and staff with an attractive sunlit garden in which to spend their days, as opposed to the previous grey concrete 'yard'. The findings showed that natural elements and carefully designed features provide affordances for young children that support their learning, development and wellbeing.

When asked if she had any advice for her colleagues in horticulture and landscaping on designing outdoor spaces for children, the designer responded:

I think I'd say take a step back from what is currently out there as a traditional play space and start exploring some of the more natural ways you can achieve the same thing. You know a climbing frame doesn't have to be a plastic structure. It could be rocks, it could be hay bales, it could be logs. There's so many different things that it could be and I think it's about encouraging children to be creative. Don't provide them with a set activity, provide them with components that could be any number of activities depending on the child.

Further Information

This research has been funded by HAL using the Nursery Industry levy and matched funds from the Australian Government and by the Centre for Research in Educational Futures and Innovation at Deakin University. Generous 'in kind' support was provided by Fleming's Nursery. The research was conducted by the Greening Early Childhood Spaces Faculty Research Group in the School of Education at Deakin University including the authors and other group members Liz Rouse and Julianne Moss.

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Efficacy of Organic Amendments Used in Plant Production

In this month's Nursery Paper, consultant and Honorary Fellow at Melbourne Universities School of Land and Environment, Dr Sally Stewart-Wade reports on a comprehensive literature review undertaken for NGIA on the science behind whether organic amendments are useful in containerized plant production.

What are organic amendments and what are they good for?

Organic amendments are a broad collection of products sourced from naturally occurring organic materials that can be added to growing media to improve plant growth. It is claimed that, amongst other benefits, they can provide nutrients to plants; stimulate growth and enhance flowering; control diseases and pests; and increase beneficial microbes. But there has been relatively little scientific scrutiny of these claims, particularly in containerized plant production.

While some can improve plant growth, the effects of organic amendments have been generally inconsistent. An organic amendment that improves plant production at one location, may not do so in other regions with different plant materials and cultural conditions, and they may even have negative effects. They need to be compatible with the containerized production system. Synchronizing nutrient release from organic amendments with plant demand is a major challenge. Also, organic amendments can vary depending on season and source, and this can change the characteristics of the growing media. With the nursery, garden and horticultural production industries demanding a consistent, vigorous finished plant on a tight timetable, such variability must not interfere with the uniform rate of growth, plant nutrition or its form and aesthetics.

Some organic amendments can suppress soil-borne diseases; however, inconsistent results have hampered their widespread recommended use. Bonanomi et al. reviewed 2423 studies from 250 papers and found that organic amendments suppressed disease/pathogen populations in 45% of studies, had no effect in 35% of studies and increased disease/pathogen populations in 20% of studies. Furthermore, organic amendments were highly suppressive in only 12% of studies. Compost and organic wastes were most suppressive, each giving effective disease control in more than 50% of studies. The suppressive ability was pathogenspecific, i.e. an organic amendment that suppressed one pathogen, was ineffective or conducive to another. Noble and Coventry found that composts suppressed damping-off, root rots and wilts, and that this effect generally increased with application rate, with a minimum of 20% required, but suppression levels were variable. Factors such as the base substrate (e.g. peat), the feedstock, and the degree of compost decomposition (maturity) may influence suppression, and they recommended that biocontrol agent-fortified compost offer the best commercial opportunity (at about half the cost of a single fungicide drench).

A review examining 28 liquid organic amendments applied to field crops and pasture found no evidence that any of them improved crop yield. Though there was no reference to containerized studies, the author concluded that, when applied as recommended, there were inadequate amounts of nutrients, organic material or plant growth promoting compounds to enhance plant growth; though they may do so if applied at much higher rates. Perhaps this would be the case in containerized production.

Types of Organic Amendments

Locally sourced products that are waste products from other processes and industries would be ideal organic amendments. It is important to get the proportions right17 to deliver plants of equivalent quality and productivity as conventional production methods, though there may be potential trade-offs, such as higher disease incidence. Amendments need to be optimized for individual production systems.

Composts

Compost is produced from the breakdown of organic matter (plant or animal) by microorganisms under aerobic conditions. The starter feedstock; production methods; level of maturity/stability; and the resulting chemical, physical and biological features of compost all affect its ability to improve plant growth and/or suppress disease and make it impossible to draw general conclusions about the positive or negative effects of compost. For example, the suppression of *Verticillium* wilt of eggplant varied among eleven compost amendments, with five composts suppressing disease, three having no effect, and three enhancing disease! Amending



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with compost, which is generally cheaper than other growth substrates, could make production more cost effective, as long as plant quality was not compromised. If the compost also suppressed disease, unsterilized media could be used and fungicide use could be reduced; and due to slow release of nutrients, fertilizer inputs could be reduced, further decreasing production costs.

Plant Residues

The most promising plant residues for compost production are cotton waste, grape marc, green wastes and spent mushroom waste. Media amended with cotton waste compost at 20-50% generally improved plant growth, though the effect was speciesdependent. With Australia's large cotton industry generating ample cotton waste, there is plenty of opportunity to use this inexpensive feedstock. Grape marc, the solid remains of the grape after pressing, is a low cost, widely available, wine-making byproduct. Plant species responded variably to different grape marc compost rates, which may be due to different grape cultivars and processing methods, and different composting conditions, but this amendment showed promise. Green waste compost can be produced from any wood and vegetable residues but the composition affects the compost's properties and efficacy. Generally amended at 25-50%, improvement of plant growth is species specific and suppression of disease is disease specific. Soluble salt levels, nitrogen drawdown rate, pH, ammonium concentration, and slumpage need to be monitored. Council collections of green waste provide plentiful feedstock, but the challenge is to produce a reliable, consistent product from such variable material. Spent mushroom compost is the composted organic substrate discarded after mushroom production is complete. Improving plant growth over a range of species, it is essential to optimize the rate to balance improved growth and disease suppression with acceptable levels of soluble salts, pH and media shrinkage. With mushroom growers and production nurseries often in close proximity, the regular turnover of spent mushroom compost could be put to good use.

Animal Manures

While animal manure composts have long been used in the field, their use in container production is less studied. Cattle dung and swine waste composts have improved growth and suppressed disease in some species, and the feedstocks are readily available and inexpensive.

Municipal and Industrial Waste Materials

The most promising municipal and industrial waste materials for compost production are municipal solid waste, sewage sludge and paper mill waste. Municipal solid waste (MSW) compost, made from the organic part of residential kitchen and domestic garden waste, amended at up to 50% has improved the growth of numerous plant species. Levels of soluble salts, pH, heavy metals, organic pollutants, pathogens, sharps (glass, metal, plastic) and odours, as well as the effects of the variable feedstock, need to be monitored. Different plant species can respond differently, so MSW compost should be tested in individual production systems. Australia currently has numerous facilities for the production of MSW compost and continuous feedstock. The cost of commercially produced MSW compost is ~\$35-41/m³ plus transport costs (2006 prices). Sewage sludge compost (made from raw or treated sewage sludge) is rich in plant nutrientsbut the treatment procedure and particle size can influence efficacy. Levels of soluble salts and heavy

metals, and manganese binding needs to be monitored, and the response of different species checked. The average cost of dry biosolids is \$34 per tonne (2012 prices). Paper mill waste compost, made from the solid waste from effluent treatment from paper mill operations, has shown promise as an amendment but further work on more species is needed. Levels of heavy metals and organic contaminants need to be monitored.

Compost Teas

Compost tea is made by fermenting or 'brewing' compost in water, with or without aeration. Aerated compost tea ferments for only 12-24 hours, usually using an expensive 'brewers'. Nonaerated compost tea usually ferments for 7-14 days, and is cheap to produce. Compost tea contains soluble nutrients and a variety of microorganisms, and aeration seems unnecessary. The effect of compost tea on plant growth and disease suppression depends on the compost feedstock/production; the tea production conditions, such as the ratio of compost to water, duration, temperature and pH; application decisions such as the dilution ratio, application rate, equipment, tank mixing with other inputs, timing, frequency, storage and adjuvants; and the environmental conditions during application and use. It is important to tailor compost tea products to specific production systems.

Meat Blood and Bone Meals

Products derived from animal slaughterhouse wastes are widely used in field applications, but reports of their use in containerized production are scarce. They contain useful nutrients to stimulate plant growth.

Fish Emulsions

Fish emulsions, prepared by modifying the excess liquid from processed fish, provide nutrients for plant growth and act as a nutrient base for plant growth promoting rhizobacteria. Treatment of basil plants with fish emulsion resulted in undesirable flavours, so it is likely that application to edible crops is not acceptable; but there is scope for application to ornamental species and different species should be tested. Emulsions sourced from different fish species should be tested. The cost (adjusted to current prices) is approximately \$16-\$26/L.

Seaweed Extracts

Seaweeds allegedly enhance germination, root growth, chlorophyll synthesis, general plant vigour, biomass and yield; reduce transplant shock; increase nutrient uptake and plant nutritional quality; induce early flowering and fruit ripening, fruit production and improve marketable qualities of fruit; suppress disease; increase pest resistance; and improve tolerance to salinity and frost. Some effects have been reported only anecdotally by commercial organizations and their value in field production has been questioned. Also, negative results are rarely reported, which creates a bias towards drawing the conclusion from the published scientific literature that they are effective. A liquid seaweed extract, marketed as Maxicrop in numerous formulations, has shown some positive effects on plant growth and pest/pathogen suppression in some studies, but no effect in others. The efficacy of all Maxicrop products was questioned in a legal case in New Zealand. After hearing evidence from more than 40 scientists, the High Court ruled that Maxicrop products did not promote plant growth and provided insufficient nutrients and low levels of plant hormones whose practical significance was doubtful. The judgement was that Maxicrop (all formulations) 'cannot and does not work', supported by a lack of efficacy in more than 140 field trials. No glasshouse trials were specifically discussed, so there remains the possibility that Maxicrop may have some effect in certain situations. However, there is some evidence that some seaweed extracts improve growth of some plant species in containerized production, probably due to plant growth regulators. Rates; and application method, timing and frequency need to be optimized; and any seasonal differences monitored. The cost (adjusted to current prices) is approximately \$11-\$32/L.

Bioinoculants

Bioinoculants, particularly mycorrhizal fungi and plant growth promoting bacteria and fungi, can improve plant growth and suppress disease, but the plant response is species-specific. More work is needed on the effect of applying only a single species or consortia; single, dual or multiple applications; and the timing, method and rate of application. The cost (adjusted to current prices) is approximately \$11-\$80/L.

Biochar

The potential of biochar, charcoal that remains when biomass is heated rapidly without oxygen (pyrolysis), for horticultural field crops has been reviewed recently, and it may be useful in containerized production. Biochar may improve the physical and chemical structure of growing media; provide nutrients; increase fertilizer use efficiency; enhance root growth; and suppress certain diseases. It may also bring environmental, social and economic benefits to growers in terms of carbon trading. But it may decrease efficacy of some pesticides, immobilize nutrients, increase heavy metal content, become water repellent, and promote certain diseases. There have been few studies using biochar in containerized production, and further research is warranted on response of different plant species, different feedstocks and production conditions. However, with the cost of biochar presently at ~\$2000-2500/tonne, its use is likely to be uneconomic.

Vermicomposts

Vermicomposts, formed by the breakdown of organic residues by earthworms, have excellent structure, porosity, aeration and drainage properties; good moisture holding capacity; and contain nutrients in plant-friendly form, but vary depending on the feedstock. Vermicompost at 10-40% improved plant growth. Vermicomposts produced from animal manures need to be monitored for pH and soluble salt levels, and human pathogens. The cost of vermicomposts is highly variable depending on the feedstock, but they are (adjusted to current prices)3 approximately \$265-\$1050/t. Similarly, vermicompost liquid extracts (including tea) vary depending on the feedstock, so should be optimized for individual production systems.

Humic Substances

Commercial humic products are most commonly sourced from brown coals. The effect of humic products on plant growth is variable, so both the source and the rate of humic products should be assessed carefully and optimized for individual production systems.

Uncomposted Plant Parts

The most promising uncomposted plant parts are coir fibre/ dust, and pine tree substrate. Coir dust, already widely used in Australia mainly as a replacement for peat due to its excellent physical properties, needs to be monitored for high electrical conductivity, low cation exchange capacity and nitrogen immobilization. Pine tree substrates, though readily available from extensive pine plantations, need to be monitored for phytotoxicity, nitrogen immobilization, shrinkage, and irrigation and nutritional management strategies. In general, plant-based organic amendments should be mixed with growing media at least two weeks before sowing to prevent phytotoxicity and growth inhibition.

Amino Acids and Organic Acids

While there are many products that are based on amino acids and organic acids sold as liquid fertilizers, there are few scientific reports on their effect on plant growth, and even fewer in containerized production, so no recommendations can be given.

Conclusion

While a variety of organic amendments are available to enhance plant growth in containerized production, further research is required to evaluate their efficacy and optimal application rate for a wide range of crops in containerized production for which there is currently very limited information. Further research is needed to determine the optimal base level nutritional benchmarks for all nursery crops so that organic amendments can be identified that can supply, or partly supply, these nutrients. In addition, matching nutrient charting and responsive fertilizer applications to nutrient release from organic amendments to determine the precise application timing of organic amendment products for optimal efficacy is highly desirable. Investigation of the use of blends and sequential application of organic amendments matched to crop requirements for optimal plant production, and studies on the shelf life of organic amendments under normal storage conditions would be useful. This would allow the development of NIASA Best Practice Guidelines for the use of organic amendments in containerized production, promoting consistent quality management within the industry. This would ensure that nursery operators are best equipped to add only useful organic amendments and maximize their production systems.

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The full review is available online at www.ngia.com.au in addition to an expanded online version of this nursery paper incorporating a full reference list.



Table 1. Organic amendments used in containerized production, their features (verified by scientific publications), estimated costs adapted from 3, application rate, potential drawbacks and practical relevance.

Organic Amendment	Feature (verified by scientific	Approximate	Application Rate	Potential Drawbacks	Practical Relevance ^a
Composts	Good nutrient source to plants Stimulates plant growth Suppresses disease Increases beneficial microbial biomass Increases flower and/or fruit set Increases root formation in cuttings Increases yield Improves media structure	Pelletised products: \$105-\$525/t Non-pelletised products: \$7- \$840/t	20-50% v/v but varies for different composts and plant species	Can have detrimental effects on physical and chemical properties of media e.g. animal manures, green waste, MSW, spent mushroom, sewage sludge Can have variability in properties between batches e.g. green waste, MSW, sewage sludge Potential human health issues from pathogens and/or sharps e.g. animal manures, MSW Potential plant health issues e.g. MSW Unpleasant odours e.g. MSW Heavy metals/Organic contaminants e.g. MSW, sewage sludge, paper mill sludge Inconsistent efficacy Effect can be species-specific	Ease: Variable, generally easy- moderate Costs: Minimal
Compost Teas	Stimulates plant growth Suppresses disease	Cost of compost: \$7- \$840/t; Then depends on aeration: Non-aerated: negligible Aerated: \$250-\$2000	A 1:1 to a 1:9 dilution, apply equivalent to 50 L/ha every 14 days; but requires optimization	 Potential human health issues from pathogens e.g. particularly nutrient-amended Inconsistent efficacy Need to be made fresh Effect can be species-specific 	Ease: Variable, generally easy- moderate Costs: Minimal- moderate
Meat, Blood and Bone Meal	Good nutrient source to plants Stimulates plant growth	Liquids: \$11- \$32/L Solids: \$840- \$1260/t	Liquids: unknown Solids: 1-5% v/v	 Unpleasant odours Potential human health issues from pathogens? (BSE overseas) 	Ease: Easy Costs: Minimal
Fish Emulsions	Good nutrient source to plants Stimulates plant growth	\$16-\$26/L	0.5-2% v/v	Unpleasant odours	Ease: Easy
Seaweed Extracts	Stimulates plant growth (hormones)	\$11-\$32/L	0.4-2% v/v (20%	Potential human health issues from	Ease: Easy
	Suppresses disease Increases beneficial microbial biomass		v/v for some species)	pathogens e.g. composted seaweed Inconsistent efficacy	Costs: Minimal
	Increases flower and/or fruit set Increases root formation in cuttings Increases yield Reduces transplant shock Improves media structure				
Bioinoculants	Stimulates plant growth Suppresses disease Increases beneficial microbial biomass Increases flower and/or fruit set Increases yield Reduces transplant shock	\$11-\$80/L	Varies; Liquid: 30-60 mL/ 7.6 L container Solid (experimental) - colonized host plant roots, spores, mycelia, substrate): e.g. 2 g/hole of 50 spore/g inocula)	 Effect may be neutral or negative Effect can be species-specific 	Ease: Easy-moderate Costs: Minimal
Biochar	Moderate nutrient source to plants Stimulates plant growth Suppresses disease Increases beneficial microbial biomass Increases tolerance to water stress Improves media structure	\$2500/t	1-10% v/v	May decrease the efficacy of some pesticides May negatively affect the availability of nutrients May release bound toxicants such as heavy metals If allowed to dry out, can become water repellent Expensive due to lack of large scale production facilities	Ease: Difficult Costs: Minimal
Vermicomposts	Good nutrient source to plants Stimulates plant growth Suppresses disease Suppresses pests Increases beneficial microbial biomass Increases flower and/or fruit set Increases root formation in cuttings Increases yield Improves media structure	Liquids: \$1- \$21/L Solids: \$265- \$1050/t	Liquids: A 1-10% solution, applied as drench or spray equivalent to 150-200 mL/25 cm pot every 7 days; but requires optimization Solids: 10-40% v/v but varies for different vermicomposts	Can have detrimental effects on physical and chemical properties of media e.g. animal manures	Ease: Variable, generally easy- moderate Costs: Minimal- moderate

Practical relevance concerns issues such as Ease (Ease of sourcing product/materials/equipment) and Costs (Costs to retrofit and/or apply the product)

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NURSERY PAPERS

November 2015 Issue no.10

National Plant Health and Biosecurity Project delivers benefits for Australian production nurseries

In this month's nursery paper Dr Andrew Manners and Dr Lindy Coates of the Queensland Department of Agriculture & Fisheries provide an update on a levy funded project which has delivered some excellent support for the industries capacity in the areas of plant health and biosecurity.

National Plant Health and Biosecurity Project delivers benefits for Australian production nurseries

Pests and diseases, both endemic and exotic, represent a major threat to the health, productivity and profitability of Australian nursery production businesses, as well as the industries they support. The nursery industry is particularly vulnerable compared to other horticultural and forestry industries, mainly due to the great diversity of plant species (> 10 000 cultivars) involved, and the multitude of pathogens and pests associated with these hosts. Furthermore, the extensive domestic and international movement of nursery stock through commercial trade creates significant plant health and biosecurity challenges. As nursery production businesses face pest and disease issues on a daily basis, it is imperative that industry has access to the support needed to both manage their current pest and disease

problems and protect against potential new pest and disease incursions.

The Nursery Production Plant Health & Biosecurity Project has been a four year (2011-2015) funding partnership between the Australian nursery industry, Queensland Department of Agriculture & Fisheries, and Horticulture Innovation Australia (HIA). The aim of the project has been to provide support to the nursery industry in a number of areas, including the identification and management of plant diseases and pests through professional diagnostics, skill enhancement of industry through training workshops and the development of various resources for on-farm biosecurity management. Over the life of the project, a range of outputs have been delivered in the four key areas of diagnostics, training,



Ongoing capacity development in areas around plant health and biosecurity is essential for the nursery industry

information and industry support. These outputs are summarised in this article, while full details will be provided in the HIA Final Report for Project NY11001, which will be available in 2016 from HIA.

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Diagnostics

Horticulture

Innovation

Australia

Pest and disease diagnostics have been conducted for the nursery industry under the umbrella of Grow Help Australia, a national diagnostic service operating out of Queensland Department of Agriculture & Fisheries. As part of the project, NIASA accredited businesses from around Australia have been entitled to three complimentary diagnostic samples and one complimentary soil test (Phytophthora) per year. The project also provided discounted diagnostics to all Australian nursery businesses, irrespective of status, membership or affiliation.

Table 1 summarises pest and disease diagnostics conducted by the project team over the period November 2011 – August 2015. The total number of nursery, NIASA and virus indexing samples processed through Grow Help Australia increased significantly over the life of the project. The project team handled a total of 316 different plant hosts and 180 different plant pathogens over this period (data not shown). Fungi and viruses were the predominant pathogens reported, with Fusarium, Pythium, Colletotrichum and Rhizoctonia species being the most common fungal pathogens isolated from samples.



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Table 1: Summary of samples processed through Grow Help Australia¹ over the life of the Plant Health & Biosecurity Project

Year	Total no. of Grow Help samples ²	Total no. of nursery samples ³	Total no. of NIASA samples	Total no. of virus indexing samples
2011 (Nov/Dec only)	16	6	1	-
2012	122	61	31	-
2013	245	92	54	-
2014	450	177 ⁴	71	2,310
2015 (Jan – Aug only)	300	136	63	3,165
TOTAL	1,133	472	220	5,475

1 https://www.daf.qld.gov.au/plants/health-pests-diseases/plant-pest-diagnostic-services/grow-help

2 Excludes virus indexing samples, includes non-nursery (e.g. field grown fruit and vegetable crops, forestry species) and nursery samples.
 3 Includes NIASA samples.

4 This equates to receiving about 3-4 nursery samples every week.



Phytophthora lupin baits indicating that the sample above is healthy and the sample below infected.



Healthy Azalea (left) and growing tip with broad mites (right)

Training

A series of training workshops on the recognition of key pest and pathogen groups affecting production nurseries, as well as integrated pest management strategies, were conducted in each state/ territory. In most cases, one workshop per year was delivered in each state/territory. Attendance numbers and feedback from workshop participants are summarised in **Table 2**.

Table 2: Attendance numbers and participant feedback for workshops conductedbetween 2011 and 2015 for the Plant Health & Biosecurity Project.

State/Territory	No. of workshops	Total no. of participants	Average no. of participants per workshop	Mean overall benefit (1-5 scale) ¹
WA	4	105	26.0	4.4
SA	4	122	30.5	4.4
VIC	4	136	34.0	4.4
TAS	3	62	20.7	4.7
NSW/ACT	4	118	29.5	4.6
QLD	8 ²	235	29.4	4.6
NT	4	75	18.8	4.5
TOTAL	31	853	27.5	4.5

1 Workshop participants evaluated overall benefit of each workshop using a 1-5 scale where 1=poor and 5=excellent. Results averaged over all workshops conducted in each state.

2 Three of the eight QLD workshops were additional workshops funded directly by NGIQ, and one of the eight workshops was conducted as part of the NGIA National Conference at the Gold Coast in 2012.

Information

Factsheets

A series of 24 factsheets on common nursery pests and pathogens, as well as key biosecurity threats, were produced over the life of the project **(Table 3)**. These are available from the NGIA website¹. However, the last six factsheets listed in Table 3 will be made available in early 2016.



Title of factsheet

Alternaria diseases in production nurseries Asiatic citrus psyllid – a biosecurity threat Bacterial diseases in production nurseries Bacterial leaf scorch - a nursery industry biosecurity threat (Pierce's disease) Fire blight: a biosecurity threat to the Australian nursery industry Fusarium: a formidable nursery pathogen Glassy winged sharpshooter – a nursery industry biosecurity threat Huanglongbing - a nursery industry biosecurity threat Managing green peach aphid in production nurseries Managing silverleaf whitefly in production nurseries Managing two-spotted mite in production nurseries Managing Western flower thrips in production nurseries Phytophthora diseases - problematic in the nursery and beyond Phytopthora ramorum: a biosecurity threat to the Australian nursery industry Protect your nursery from virus diseases Pythium species: a constant threat to nursery production Rhizoctonia: a variable and versatile nursery pathogen The biology and management of Colletotrichum diseases in production nurseries Scale insects – a hard problem that can be managed Mealy bugs – a pest of a different scale Cycad blue butterfly – a pretty name for an ugly problem Root and leaf nematodes - microscopic worms with major consequences Powdery mildew – a myriad of nursery pathogens Downy mildew - early management is critical



Leaf spot caused by the fungus, *Pseudocercospora*, on leatherleaf fern.

1 Available at: https://www.ngia.com.au/Category?Action=View&Category_id=682

Nursery papers

Four nursery papers were produced on pest and disease management during the project (Table 4). These are available from the NGIA website¹.

Table 4: Nursery papers produced over the life of the Plant Health & Biosecurity Project

Title of nursery paper	Issue
Cylindrocladium diseases of nursery plants	September 2012, Issue no. 8
Management of fungus gnats in nursery production	June 2013, Issue no. 5
Accurately diagnosing weeds, pests and diseases affecting nursery crops	February 2014, Issue no. 1
National plant health and biosecurity project delivers benefits for Australian	November 2015, issue no .10
production nurseries	

1 Available at: http://www.ngia.com.au/Section?Action=View&Section_id=46

Pest management plans

Detailed pest management plans were produced for three key pest groups (fungus gnats, whiteflies and mites) as well as for soilborne diseases of nursery crops (**Table 5**). These are available from the NGIA website¹.

Table 5: Pest management plans produced over the life of the Plant Health & Biosecurity Project

Title of pest management planFungus gnat pest management plan for production nurseriesIntegrated pest management plan for whiteflies in production nurseriesSoilborne root pathogens in production nurseriesMite pest management plan for production nurseries

1 Available at: https://www.ngia.com.au/Category?Action=View&Category_id=689

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Close-up of glasshouse whitefly on avocado. The upper most individual has not emerged as an adult, the other individuals have already emerged.

Pest ID tool

Approximately 50 pest and disease descriptions as well as hundreds of high quality images were provided for the Nursery Industry's Pest ID tool¹ over the course of the project **(Table 6)**. This webbased information package is designed to assist nursery producers in identifying and managing pests, diseases, disorders and weeds. It also includes information on beneficial insects as biocontrol treatments. The Pest ID tool can be used on any device that has web-browsing capabilities.

Table 6: Pest and pathogen descriptions and images² provided for the nurseryindustry's electronic pest ID tool

Year 1	Year 2	Year 3	Year 4
Phytophthora	Phoma	Azalea leaf gall	American serpentine leaf miner
Pythium	Frangipani rust	Camellia leaf gall	Bean aphid
Rhizoctonia	Pelargonium rust	Ash whitefly	Poinsettia thrips
Cylindrocladium	Gliocladium	Southern red mite	Serpentine leaf miner
Fusarium	Bipolaris	Black vine beetle	Pierce's spider mite
Colletotrichum	Cycad blue butterfly	Vegetable leaf miner	False codling moth
Alternaria	Impatiens necrotic spot virus	Root knot nematodes	Tomato/potato psyllid
Botrytis	Cucumber mosaic virus	Honey fungus	Summer fruit tortix
Chalara	Tomato yellow leaf curl virus	Bacterial wilt	Colorado potato beetle
Powdery mildew	Tomato mosaic virus	Cypress canker	Western plant bug
		Apple scab	Bacterial canker
		Red-shouldered leaf	Dutch elm disease
		beetle	Zebra chip
		Hibiscus beetle	Fire blight
		Garden weevil	Phytophthora blight

Available at: https://pestid.com.au/. State-based NGI members receive 40% discount
 Many additional images without associated descriptions were also provided.

Industry support

Pest contingency plans

Four pest specific contingency plans were developed during the course of the project **(Table 7)**. These provide background information on pest biology and available control measures to assist production nurseries with preparedness for an incursion into Australia, as well as guidelines and options for steps to be undertaken and considered when developing a Response Plan. Copies of these plans can be obtained by contacting NGIA. Huanglongbing and fire blight contingency plans are also currently available on the Plant Health Australia website. Table 7: Pest specific contingency plans developed for thenursery industry as part of the Plant Health & BiosecurityProject

Title of pest contingency planThreat specific contingency plan for huanglongbing and its vectors1Threat specific contingency plan for fire blight2Threat specific contingency plan for giant African snailThreat specific contingency plan for Dutch elm disease

1 Currently available at:

http://www.planthealthaustralia.com.au/wp-content/uploads/2014/11/Huanglongbing-CP-NG-2013.pdf 2 Currently available at: http://www.planthealthaustralia.com.au/wp-content/uploads/2014/11/Fire-blight-CP-2014.pdf

EPPRD (Emergency Plant Pest Response Deed) support

The project team has also provided technical support to industry in relation to 18 EPP (emergency plant pest) incursions over the life of the project, particularly in relation to supplying information on pest biology, host range and management.

Project Team

Department of Agriculture & Fisheries (DAF) Queensland: Andrew Manners, Lindy Coates, Tony Cooke, John Duff, Jan Dean, Ken Pegg and Leif Forsberg (November 2011 – September 2013).

NGIQ: John McDonald; NGIA: Anthony Kachenko, Chris O'Connor (August 2014 - present)

Further information on this project is available from Lindy.Coates@daf.qld.gov.au

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Compiled and edited by Chris O'Connor NGIA Technical and Policy Officer; banner photography by Anthony Tesselaar.



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Waste management and disposal in the nursery industry

In this month's Nursery Paper David Hunt from Environmental and Horticultural Research Consultants, reports on levy funded work investigating waste management and disposal in the nursery industry.

Waste management and disposal in the nursery industry

Waste management and disposal have always been a part of business processes for Australian production nurseries. In recent times, the types of waste have changed and disposal costs have continued to increase. A greater use of product packaging has led to an increase in the amount of plastic and cardboard requiring disposal. The increasing cost to process these surplus resources, in addition to a community preference for resource recovery instead of landfill disposal, has led production nurseries to consider new ways to reduce waste management costs while also embracing environmental sustainability.

Waste comes in many forms and includes any material, effluent, surplus substance or item that does not function or is no longer required for production. It also encompasses the inefficient or inappropriate use of raw materials and resources or any actions that hinder production. Because of this broad definition, several waste analysts suggest that many businesses usually under-estimate the true cost of waste disposal, and in most circumstances the actual cost can be ten times more than shown in accounting records. The only way to determine the true cost of managing and disposing of waste is to ascertain where and why waste is generated. This will help to identify any alternative disposal methods and determine the best option to reduce costs.

Nursery & Garden Industry Australia (NGIA) commissioned a waste assessment project to identify the wastes generated by a production nursery and how changes in the waste disposal industry can be used to reduce costs for production nurseries. Responses to an online survey provided information about the type and quantity of waste being generated and the current disposal methods being used. A review of resource recovery principles, waste assessment procedures and waste companies were used to develop waste assessment guidelines to help managers identify the best waste disposal methods for their business.

Survey of production nurseries

In total 34 businesses provided waste management and disposal information for analysis. A detailed waste assessment was conducted at one large production nursery to provide a list of wastes and issues associated with production. The information from survey respondents varied in terms of yearly turnover, number of employees and the number of crops produced. Waste disposal costs were below one per cent of yearly turnover, ranging from \$250 to \$31,200 per year with staff hours allocated to waste management ranging from 1 to 40 hours per week.

Waste materials generated	Tonnes	% of total
Waste materials generated	per year	waste
General waste	535.93	39.345
Greenwaste and used media	408.64	29.999
Packaging card, paper and office paper	193.16	14.181
Plastic Containers	73.08	5.365
Pallets	66.04	4.848
Metals	25.04	1.838
Plastic wrap and packaging	22.50	1.652
Greenhouse film	10.83	0.795
Miscellaneous	7.90	0.580
Builders plastic and weed mat	7.31	0.537
General recycling	4.50	0.330
Batteries	1.77	0.130
Rubber, including tyres	1.66	0.122
E-waste (office and production)	1.34	0.098
Oil	0.72	0.053
Chemicals and fertiliser	0.47	0.035
Timber	0.42	0.031
Faulty equipment	0.25	0.019
Glass	0.22	0.016
Irrigation pipe	0.14	0.010
Irrigation fittings	0.11	0.008
Shadecloth	0.11	0.008
Total waste generated	1362.1	

Table 1: List of waste types and quantities generated by 34 nursery production businesses



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The total estimated quantity of waste generated by the 34 surveyed businesses was 1362 tonnes per year. This potentially represents two per cent of the industry, suggesting that a minimum of 68,000 tonnes of waste is generated by the nursery and garden industry each year. There are five main waste categories: general waste (40%), greenwaste and used growing media (30%), cardboard and paper recycling (14%), plastics, including pots, packaging and pallet wrap (7%), and pallets (5%). The remaining 4 per cent is comprised of a variety of other production wastes and general recycling. This ranking, shown in Table 1, was relatively consistent across all surveyed businesses, with each nursery generating slightly different waste types and quantities due to differences in production methods, input resources used and crop type.

Although there is a large quantity of greenwaste generated, only 21 per cent is sent to a commercial processing facility for mulching or composting. Fifteen per cent is still being sent to landfill via a general waste service and the remaining 64 per cent is dumped or composted onsite but no longer used for production. Eighty two per cent of survey respondents stated they recycle cardboard and paper, and sixty four per cent recycle plastic growing containers but less than 52 per cent recycle other plastics (chemical and fertiliser drums, packaging, pallet wrap and strapping). Several survey respondents stated they have halved their general waste disposal costs by recycling as many materials as possible. Several respondents expressed frustration associated with not being able to recycle certain wastes and the increasing quantity of plastic packaging that goes to general waste. A large proportion of recyclable materials are still being disposed as general waste, primarily due to the limited recycling infrastructure and services outside of city centres.

Waste management options and disposal costs

To reduce waste disposal costs in a production nursery requires an understanding of the types of waste generated, how much is generated, why it's generated and how often it is generated. However another factor that should also be considered is the collection value of a waste material. The collection value will help to determine if separating and recycling a waste is more beneficial than general waste disposal. The collection value is dependent on several influencing factors such as, the type, quantity and frequency of waste generated, the contamination level, the price and demand for recycled materials, and the transport distance from point of collection to the processing facility. Large quantities of clean waste material that can be sold-on has a higher collection value and is more likely to be picked up than small quantities of mixed waste.

The first step to determining the most cost effective disposal option for your business is to carry out a waste assessment. An assessment can also help to identify any inefficient production processes which are generating more waste than expected or an increase in waste at one production area. Once the assessment has been completed and waste details are known, the next step is to determine the best option available to reduce waste disposal costs in the business. The waste minimisation hierarchy can be used to assist the decision process (*Figure 1*).

Avoiding or reducing waste is a better option than diverting waste as the initial costs are not incurred and the resources are not used. This involves reviewing production processes and purchasing



Figure 1: The waste minimisation hierarchy.



practices to increase resource use efficiency and reduce waste generation. For example, a change in suppliers or an increase in production may have increased the volume of packaging needing disposal. In this case purchasing products in bulk to reduce the volume of packaging or reviewing the production process can improve resource use efficiency.

Reusing an item in its original form for the same purpose more than once will help to reduce costs and resource use. Simply washing or sterilising reusable items can be considerably cheaper when the combined purchase and disposal costs are considered. One large production nursery has embraced the reuse principle by installing a steaming system to sterilise growing containers and production equipment. A second hand diesel steam generator and cargo container was installed with a new control unit at a cost of \$39,400. The system is run overnight for 12 hours to ensure all items are sterilised. The system has the potential to save more than \$30,000 in growing containers, provide for a continuous supply of clean production equipment and will pay for itself in the second year of use.

Recycling involves the collecting and processing of an item to recover the raw material to remake the original item or a new item. For example, an increased volume of clean packaging could warrant separation from general waste for recycling. Collecting a sufficient quantity of clean packaging such as cardboard or plastic to increase the collection value can reduce disposal costs. If a large quantity is generated some collection companies may provide a compactor to assist in onsite collection. An added advantage of separating these materials from general waste could be to reduce your general waste disposal requirements allowing for a cheaper service. Recovery involves the partial recovery of the base material or partial recovery of the energy expended in the material during production. For example, burning greenwaste or rubbish to power an electrical generator. This is less cost effective as only the energy component of the material is recovered but has provided a supplemental fuel source for one production nursery.



Figure 2: Rejected plants and greenwaste dumped in onsite landfill

Disposal is the loss of all raw material and energy that has been expended in the item during production. It has a higher environmental cost due to the contamination and gas emissions given off during decay in landfill sites.

Which option is available to you will depend on the waste service in your area and the collection value of your waste materials. At the moment, the best option for a production nursery to reduce its waste disposal costs is to offer a waste collection company clean, sorted waste material that can be easily sold on. The larger the quantity that can be supplied, the greater the chance of having the material collected for free. Some companies will offer free use of collection bins or compactors if the collection value of the waste materials is high.



Figure 3: An increase in plastic packaging on inputs increasing disposal costs.

Due to the large variety and different volumes of wastes generated in a production nursery and the limited recycling services across Australia, it may not be possible to find a solution or service for all materials in all locations. However, recycling services are constantly growing and will be available in most areas for a cost. Remember, it is possible to reduce overall waste disposal costs by using separate general waste and recycling services or donating recyclables to an environmental or community group. Also consider other businesses in the local area. Is there a neighbouring business that could use your discarded packaging or a landscaping business that might want your greenwaste for compost? Is there a neighbouring business that generates a similar waste that might agree to a binshare arrangement, so you can increase the collection value of the combined waste materials?



Figure 4: Containers being prepared for steaming or recycling.



Finding the best service for your needs may take some time and work, but using search services like the business recycling website (http://businessrecycling.com.au/info/), the recycling near you website (http://recyclingnearyou.com.au/) and other search services can help. Alternatively, contact any waste collection company and ask if they accept the material you want recycled. If they can't help you, ask if they can suggest a company that can.

No matter how the production waste in a nursery is currently being managed, it is certain that disposal costs will continue to increase. It is prudent business practice to implement waste minimisation and recycling practices to turn waste into a tradable commodity. For a sustainable future, the nursery industry needs to purchase products made from recycled materials and encourage the ongoing development of waste recycling services to change the way wastes are viewed.

Figure 5: Disused or damaged equipment wanting to be recycled.

Further information:

The project has developed several documents to help managers with the waste assessment process. These can be obtained from your local Nursery & Garden Industry representative and include - Nursery waste assessment form; Waste management cost calculation worksheet; Steps to reduce waste management and disposal costs.

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NURSERY PAPERS

April 2015 Issue no.3

The importance of the greenhouse environment to the successful growing and merchandising of plants

Plants have optimum requirements for successful growth and development and minimizing the environment for pest and diseases. The goal of growers and plant managers should be to improve production and the health of the plants for long term success. To achieve this, a multitude knowledge and management skills are required to fulfil markets and the consumer expectations for healthy plants.

Ultimately, optimal management of the total environment can equate to long terms profits and customer satisfaction for potential repeat business.

In this month's Nursery Paper, NGINA Industry Development Officer, Michael Danelon seeks to raise awareness of the importance of identifying and managing your greenhouse environment to the successful production and merchandising of plants and minimising the environment for plant pest and disease.

The importance of the greenhouse environment to the successful growing and merchandising of plants

The plant environment

Progressive growers seek to improve production by determining the optimum conditions for plant growth and providing these in the production facilities of the business. Those merchandising plants would be aware of the importance to manage the environment to maintain the optimal condition of the plants once they are received by the supplier, ie need for high light levels for seedlings and bedding plants or reduced humidity levels for plants subject to foliar diseases.

Plant production commences with some form of propagation, e.g. seed/ germination, division, striking of cuttings, layering, tissue culture etc. The growing on of a newly produced plant, e.g. seedling, tubestock, tissue culture into a larger container will differ to the environment in the propagation phase as will a larger more mature plant will again differ in its environmental conditions to the prior phase of growth and development.

The greenhouse environment

Growers need to consider the options available to them and provide a suitable greenhouse environment whilst managing the technology available but at a cost effective solution. Merchandisers need to strike a balance between a suitable environment for the plants they are

managing and a comfortable environment for the buyer/shopper. Note - throughout this nursery paper, reference to greenhouse also implies glasshouse.

The challenge for growers and managers are:

- Which equipment and strategies should be used to achieve best crops from the greenhouse and environment the local climatic conditions
- What level of investment should be used in the greenhouse to achieve the best long term benefit with the least outlay and operational cost.

The key driver here is that the plant will be the product of the environment it has been subjected to. Growing and merchandising plants with different environmental requirements in the same conditions and management will ultimately mean a compromise and loss in quality and performance of the plants in the immediate and long term.

An example here is to consider the needs of a propagation greenhouse (temperature and relative humidity control and suitable light levels) to that of a display greenhouse for a retail garden centre which protects buyers and plants from rain and direct heat from sunlight.

The greenhouse

An examination of the greenhouse and climate is required to determine the potential and actual plant environment. Readers are directed to the NGIA Nursery Paper "Greenhouse Design" 2005, February Issue 1 (1) for more detail regarding the type of greenhouse technology, structure, cladding and features referred to as low, medium and high technology greenhouses. The Governing factors of the greenhouse design relating to performance and the greenhouse environment are:

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- size (height and surface/area)
- shape (gable roof, sawtooth, arched) style (covering and ventilation - sides and or roof, multispan)
- location (orientation, exterior shading, potential internal shading and slope).

The increasing trend in the nursery industry is to invest in high technology greenhouses (1) with computerised automation and the ability to manipulate the greenhouse environment to suit the plant requirements through ventilation, heating, cooling, internal screens, modification of light levels, irrigation and rolling benches to optimise the whole of the greenhouse.

Low technology greenhouses have limitations in their ability to modify the greenhouse environment for optimum production limiting their suitability



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for propagation where a higher level of management of the environmental conditions is required.

Not all greenhouses and plant situations can justify large investments to manipulate the greenhouse environment so planning is critical to get the best long term outcome for the grower and plant merchandiser.

In the greenhouse, the way irrigation is delivered (overhead – fogging/mist/ droplets/drippers/hand watering, subirrigation – capillary, ebb and flow/flood floor) and moves within and out of the greenhouse, plant density, light levels and air movement within and out of the greenhouse will influence the plant environment.

Critical greenhouse factors

Within the greenhouse the key factors to

influence how the plant will perform are:
Light (visible light, photosynthetically active radiation [PAR] and thermal radiation)



In the right climatic conditions, a simple low technology greenhouse can be used for propagation needs (bottom heat, relative humidity and light) until external factors limits its effectiveness.

- Air and root temperature (human comfort is different to the plant)
- Relative humidity (driving transpiration and disease potential)
- Concentrations of oxygen/carbon
 dioxide for fundamental plant process.

Understanding the greenhouse and plant environment requires measurement and monitoring to be conducted. Basic measurement of temperature and at least on an annual basis assessment of the light quality within the greenhouse to determine if the greenhouse cladding either requires cleaning (glass) or replacement due to deterioration of the material through aging.

All too often a greenhouse roof covering if it fails from weather rather than optimised before light levels supplied to the plants are compromised.

With this information of the greenhouse conditions, adjustments to the greenhouse can be implemented which provide the basis of producing healthy and profitable crops.

Light – essential but be aware of too much of a good thing

Light is electromagnetic radiation within a certain portion of the electromagnetic spectrum. Humans refer to visible light (light) as electromagnetic radiation within a certain portion of the electromagnetic spectrum having a wavelength of 380 to 770 nanometers between the infrared and ultraviolet wavelength. For plants, the PAR is known to be 400 to 700 nanometers (²) with claimed peak of 435 to 675 nanometers. The main source of light on Earth is the sun. Sunlight provides the energy that green plants use for photosynthesis. With the invention of electricity, electric lighting and advances in technology, artificial lighting has been used in greenhouse for many decades to either supplement or replace sunlight.

Manipulation of the colour spectrum (red, orange, yellow, green, blue, indigo, violet (ROYGBIV) have been claimed to allow photomorphogenesis (light mediated development) with new technology crop covers to improve stem length and produce larger leaves and phototropism (growth toward the light source) claimed to increase shoot tops and length of plant stems.

The quality and amount of light (photoperiod) and darkness is a critical factor for plants and needs to be considered for the type of plant. An example here is the mechanism for flower induction of Chrysanthemum by the duration of darkness required or elevated light duration to maintain vegetative growth.

Light is received as quanta/photons with photosynthetic photon flux density measured as watts per square metre (w/ m²). On a bright sunny day peak light levels will be around 1000 w/m² (³) and around 125 w/m² in an overcast day, whilst in comparison a bright winter day will be around 500 w/m² and an overcast day around 75 w/m².

The type of greenhouse covering (glass/ polyethylene) will influence the type and amount of light which enters the



A specific greenhouse for orchid production which allows control over the light and temperatures through external and internal screening and forced ventilation for air exchange and cooling.





Modern greenhouses can perform well in hot summer conditions, provided ventilation (roof and sidewall) supports air exchange and the crop management applied meets the plant needs - NIASA accredited Howlong Nursery.



A modern greenhouse with high side walls, roof ventilation, internal screens and the ability to deliver good light levels for plant growth - NIASA accredited Alstonville Palms, NSW

structure. Glass is known to have the highest transmission around 90% whilst polyethylene cladding manufacturers claim up to 87% transmission with a diffused light offering a softer more appealing light for plant growth.

The orientation of the greenhouse (north/ south or east west), the type of structure (height and roof type) and cladding will influence how much light enters the greenhouse. Always design the greenhouse for the worst case climatic conditions to provide sufficient natural light for successful production.

It is critical to optimize light levels in greenhouses for seedlings – particularly where the temperature threshold for growth has been achieved to avoid soft and "leggy" seedlings. Seedlings require exposure to the leaf layers and surface area of the growing media to optimize photosynthetic activity.

In propagation greenhouses which strike cuttings, light is important for photosynthesis (at least , however too much light without sufficient ventilation can cause temperatures to rise well beyond 25 degrees celcius (°C) and above the optimum basal rootzone temperatures of 22-24°C to exacerbate moisture loss of unrooted cuttings causing plant stress before roots are initiated and produced. The Cutting needs to be encouraged to put its limited energy into producing roots rather than more leaves so leaf temperature should a little lower than the root zone temperature - this is easier to do in winter, but not in summer in most parts of Australia. Mature plants have higher surface leaf area index and can intercept light more easily than seedlings. However, it is only the upper leaves which are exposed to the light with lower leaves potentially receiving 50% and the bottom leaves of larger trees and shrubs being 10% of the available light - yes it is critical to look at plant density to avoid losing lower light. It is also important to consider the needs of outdoor plants, those that grow in the rainforest understory and indoor plants.

Do not just assume a 30% shade cloth material equates to a reduction of 30% of the sunlight. Without an actual measurement of the light/photon you are potentially compromising crop health and productivity. Also consider the colour of the shade cloth/crop cover whereby darker materials are more able to absorb and retain the thermal radiation in comparison to white coverings which can deflect heat.

The plant response is the critical element within the greenhouse and the light saturation or that above the plant needs where a surplus can lead to higher greenhouse temperatures. Excess sunlight causes leaves to heat up potentially increasing water demand. Surfaces absorb the thermal energy (pots, benches, floors, steel) and are released as convection to heat the greenhouse environment. As the air heats up and if plants cannot transpire



Internal screens used to reduce light and thermal energy (day) to modify the greenhouse environment and retracted at night for heat retention. NIASA accredited Alstonville Palms NSW.

the relative humidity may drop and induce stress.

Air and root temperature

Without good ventilation of the greenhouse (<2m high sidewalls and little to no roof ventilation) in high sunlight levels and ambient temperatures, the greenhouse can well exceed the outside temperatures to reduce plant growth or cause stress to the point damage occurs.

Irrigation can be used for evaporative cooling in certain situations, however it is important to provide passive ventilation and aiming to prevent the rise in temperature rather than dealing with high temperatures where the crop is. Irrigation is also used for plant cooling by transpiration, however if relative humidity is too high the ability of the plant to transpire may be compromised to allow for cooling.

External shading is an option if it can be removed when sunlight is limited or pulled across the greenhouse to reduce the thermal radiation when sunlight it adequate for crop needs. Some businesses apply a coating on the roof to reduce light levels, however this will compromise light when overcast conditions exist.

Subtle changes in the temperature are ideal to allow a more stable environment for the plants and not disrupt water uptake and transpiration. In addition, a rapid change in temperature changes the relative humidity (see below) and hence concentration of water within the air.

Relative humidity

Relative humidity is the ratio of the partial pressure of water vapour to the equilibrium vapour pressure of water at the same temperature. The relative humidity depends on temperature and the pressure of the system and is expressed as a percentage measure of the water vapour held in the air at a set temperature.

Plants will have an optimum relative humidity depending on the stage of development (propagation, transplant and mature) climate, and plant type, ie tropical, subtropical, temperature where they have adapted to certain climate zones. Too high a relative humidity can result in reduced transpiration and poor water with reduced nutrient uptake and plant cooling. For cutting propagation a general guide is 70 to 85% relative humidity to reduce transpiration loss from leaves which cannot be replaced until roots are present of cuttings. Similar applies to early stages for germination until roots are able to access water in the rootzone of the container.

To help manage relative humidity, air movement within the greenhouse and the consistency of the air movement is critical. Natural ventilation (typically through cross flow side ventilation and/or up to 25% of floor area as ventilation) with or without forced air ventilation may be required to have air movement within the greenhouse and throughout the plants. Subtle movement of air is the aim with 2 to 4km/ hr to avoid condensation and a mixing of the greenhouse atmosphere.

Timing of irrigation can influence the immediate and short term relative humidity by charging the greenhouse with water which can add to the water vapour pressure. In general, aim to limit the amount of free water in the greenhouse when relative is >70% (unless propagation) and temperatures are declining toward the end of the day as relative humidity will increase as the temperature drops unless artificial heat (pipe heating) is supplied to dry the air whereas using natural or liquefied petroleum gas will produce water vapour as a byproduct.

Greenhouse drainage is critical to allow water movement and a residual bank of moisture which can elevate the water vapour. Having both floor drainage and drainage on benches to displace water out of the greenhouse are encouraged to allow a greater level of control.

To raise relative humidity, crude systems such as wetting the floor, plants and greenhouse surfaces have been used. For optimal control computer systems which deliver fog with relative humidity sensors reflective of the crop environment are recommended.

It is generally easier to increase relative humidity, however it can be difficult to remove if the ambient conditions have high relative humidity and high temperatures. Think about progressively opening the greenhouse in stages to help lower rising temperatures and maintain humidity as ambient temperatures rise and closing the greenhouse progressively as ambient temperatures decline at the end of the day to help manage relative humidity levels to limit disease pressure and improve water uptake.

Concentrations of oxygen and carbon dioxide

Carbon dioxide is an essential plant food found within the earth's atmosphere. With evidence of global warming, so to is there evidence of increasing levels of carbon dioxide in the atmosphere. The background level of carbon dioxide in 2015 has been measured at 400 parts per million (ppm) (4) whereas in the 1970's this was in the range of 330-340ppm.

In a well-sealed greenhouse fully occupied with plants where air exchange is restricted, the limiting factor to plant growth may be the carbon dioxide level. It is important to allow air exchange to introduce fresh supplies of carbon dioxide whilst allow potential manipulation of the temperature and relative humidity.

What can you do?

The information above endeavours to provide guidance and raise awareness of the importance of identifying plant needs and offering some simple tips for long term benefits to the grower and plant manager.

Assessing the existing performance of the greenhouse to suit your needs via a suitably well qualified greenhouse expert is often the first step. Air flow, peak temperatures, relative humidity and fit for purpose will drive any changes within your budget allow greater outlay subject to the plants and potential returns.

It should guide the reader to more specific information and encourage industry participants to review their management.

References and further reading

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May 2015 Issue no.4

Plant photosynthetic growth and photomorphogenesis under LED light

In this month's Nursery Paper Industry Development Officer David Reid shines a light on LED use in production nurseries.

Plant photosynthetic growth and photomorphogenesis under LED light

Light is undeniably one of the most influential, complex and particularly challenging factors to control in plant development.

To meet the demands of peak sales a majority of production will occur in late winter to early spring, however natural light levels or the photosynthetic daily light integral (DLI) is understandably low at this time of year. Fortunately, the level required to produce quality material can be supplemented with additional lighting. The use of artificial light is technology worth exploration in Australian nurseries, in order to increase production and quality. This is supported by recent studies suggesting that growers can benefit from supplementary lighting such as light emitting diodes (LEDs), high-pressure sodium lights (HPS) and numerous other alternatives.

DLI or the Daily Light Integral is the number of light particles or photons received during one day in the photosynthetically active radiation (PAR) region of 400-700nm, over an area of 1 square metre. The DLI has a significant effect on growth habit, flower number, shoot growth, root development and stem thickness and as a rule, quality usually increases as DLI increases. In addition to the DLI, plants also react to quality, intensity, duration and the direction of light. DLI is measured in mol/m²/day. The DLI needed to grow high-quality plants should hover around a 10-12mol/m²/day target. Shade crops are generally exceptions with African violets and Phalaenopsis orchids preferring a DLI of 4-6 mol/m²/day.

LEDs in particular, whilst still a relatively new technology, have the potential to offer greater efficiencies, longer lifetimes and wavelength specificity, over conventional lighting sources. They somatic embryo induction are just some characteristics found to be governed by specific wavelengths. It is this ability to select a specific wavelength for a targeted plant response that illustrates LEDs potential application in horticulture's future.

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Plants and the electromagnetic spectrum

The effect of light on plant responses is illustrated in many aspects of their growth and development. Light energy initiates photosynthesis, when chlorophyll and carotenoid pigments absorb specific light wavelengths, utilising CO² and H²O, and then converting it to chemical energy for metabolism and growth. Gene expression manipulation in plants is initiated by light intensity and quality, which in turn prompts a cascade of particular photoreceptors which control varied plant responses.

People see the visible part of the electromagnetic spectrum as white light; however plant photoreceptors are excited by specific colours (wavelengths) in the spectrum (See fig 1). Phytochromes for example are sensitive to the ratio of red and far-red-absorbing light and act as an environ-mental sensor to measure day length and control several aspects of seedling phenology, such as seed germination and bud set.. The part of the electromagnetic spectrum that is considered to enable the highest photosynthetic rates is the PAR between 400-700nm (nanometers) and is generally considered to be found in two bands; red and blue wavelengths.

Plants respond to visible light by two general mechanisms that are

keyed to specific wavelengths: photosynthesis that has a higher-

energy requirement and photomor-phogenesis that has a lower-

are also appropriate for different horticultural sectors, such as tissue

culture, cut flower, plug and tube production and other protected cropping situations. Tissue culture in particular has seen the largest uptake of LEDs.

LEDs should be investigated, as current research has found they can give growers greater control over various anatomical, morphological and physiological characteristics. Greater uniformity, reduced production time, healthier rooted cuttings, increased control over rhizogenesis, axillary shoot formation, shoot elongation, leaf anatomy, colour variability and

Fig 1. Electromagnetic Spectrum



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Fig 2. LED schematic



energy requirement. Plants using wavelengths outside of PAR are generally undergoing photomorphogenesis, which is light regulated changes in development, biochemistry, morphology and cell structure and function e.g.: far-red light is critical for the flowering of many plants.

Photosynthetic growth rates are able to increase with supplementary lighting within the 400-70nm range, but only up to a particular point and this can also vary between species. You will find that shade-loving plants reach their maximum photosynthetic rate significantly earlier than shade intolerant plants.

LED lights

The only way to increase the DLI in a protected cropping situation is to use supplemental lighting. Light sources such as, high-pressure sodium (HPS), metal-halide, incandescent and fluorescent lamps have been available for use in plant production for decades, however, these lights will only increase photosynthetic rates to a point. Traditional lighting systems are inefficient in delivery as they contain unnecessary wavelengths located outside the PAR spectrum.

LEDs are a solid-state device that is more closely related to a computer chip than a light bulb (see Fig 2). During an LEDs operation, electricity will pass through a junction made of a particular semi-conductor material found in the device, with the semiconductor materials' properties determining the lights' wavelength (or colour). LEDs can have peak emission wavelengths from UV-C (~250 nm) to infrared (~1000 nm) and it is the first light source to have the capability of spectral control, allowing wavelengths to be matched to plant photoreceptors.

The units themselves are approx 0.2-.05mm in size, can be set up in linear arrays or standard fixtures and are protected in a casing (see Fig 3). Compared to conventional light sources, LED lighting systems have several unique advantages.

• Long operating lifetimes, - LEDs last up to 2-3 times longer than fluorescent and 50 times longer than a typical

incandescent lamp. A key difference to traditional lighting alternatives is that LEDs do not burn out, although intensity will reduce over time. It is recommended that once they reduce to 70% of original strength they should be replaced, with typical lifetimes ranging from 25,000 to 100,000 hours.

- Wavelength specificity As LEDs can produce light in such specific wavelengths, they will generate only the most useful wavelengths (colours) in the visible spectrum for each targeted species and can even be combined to create 'white light'.
- Minimal heat radiance As LEDs generate a minimal level of radiant heat they can be positioned deep within the canopy to reach leaves that would ordinarily be sheltered, without burning (See Fig 4).
- Energy efficient Energy efficiency is usually calculated as useful output divided by energy input. When compared to a traditional supplementary lighting, LEDs exceed any competitors and continue to increase their efficiency with every new generation. LED efficiency, in general, is projected to increase considerably, for example it is predicted, that the photosynthetic efficacy of red LEDs will be double HPS lamps by the year 2020 (Pinho et al. 2012).
- Versatile Small LED size allows flexible design of the lighting unit and as they are solid-state devices, LEDs are easily integrated into digital control systems (Morrow, 2008). This facilitates complex lighting programs that control for intensity or spectral composition over the course of photoperiod or during plant developmental stages (Yeh & Chung, 2009).
- Safer to use in a nursery -. There is no fragile glass cover to break, no extreme temperatures and they contain no hazardous materials, such as mercury.

Disadvantages

- A potential disadvantage to using LEDs as a light source is the relative financial viability when compared to traditional lighting methods, although there is an argument for cost neutrality when you consider the electricity savings. However with advancement in LED technology and growth in demand, the cost of LEDs will decrease.
- LEDs are limited in the light coverage they can provide; the light intensity will rapidly decrease as the distance to the plants increases and placing the lights lower to compensate may interfere with irrigation. Before switching to LEDs, be sure that light coverage is adequate and confirmed with a light meter at crop level.
- When used as a sole source for photosynthetic, photomorphogenic and/or photoperiod lighting, LEDs must be chosen and installed carefully to obtain desired plant responses. Developing the ideal mix of LED light wavelengths can be difficult and success may only be achieved after extensive trials.

Despite these obstacles, with improvements being made all the time with regards to efficiencies and decreasing costs, growers should be aware of future developments with this technology.



Plant reactions to LED lighting

Light reaching plant surfaces can evoke different

photomorphogenetic and photosynthetic responses and can vary amongst different plant species. These responses are of practical importance to production technologies, since LEDs wavelengths can be tailored, enabling growers to control plant growth, development and nutritional quality.

- Photosynthetic rates HPS and metal halide lamps, have been used in protected environments to supplement natural light however, due to the significant energy required to power a growth house full of lamps, supplementary lighting can be impractical. With the advent of LEDs a change can now be considered. As not all wavelengths are equally effective for pho¬tosynthesis, artificial lighting should be high in the PAR wavelengths bands; blue (460 nm) and red (680 nm) wavelengths.
- Increasing photoperiod When day length becomes shorter, photoperiodic lighting might be more appropriate than photosynthetic lighting. A variety of different lighting arrangements have been effective in keeping plants actively growing when natural day length is limited. Light levels only need to be low in order for daylight extension, with most artificial lighting methods generating enough light to be effective because they all emit light in the red wavelength. Research trials have determined photoperiodic lighting intensity should be at least "8 μmol/s/m2 and should be increased to 16 μmol/s/m2 when the crop has a greater light requirement" (Landis, et.al. 2013).

Increasing the germination rate or the growth rate of a plant and potentially increasing crop turns, is not the only characteristic of a plant that affects salability. In addition to photosynthetic rate, flowering, leaf and flower colour, habit, shape, taste, smell and root development all help to improve plant quality.

Red wavelength effects (640- 690nm)

Red light is generally the base component in the lighting spectrum and has proven sufficient to be the sole lighting source for normal plant growth and photosynthesis. Low intensity LEDs emitting red wavelengths are as useful as traditional supplementary lighting will use less energy and last longer

- Biomass yield increased on particular vegetable crops when the wavelength of red LED emitted light increased from 660 to 690 nm (Goins et. al., 2001)
- 660 nm LED light, applied as sole light source in the controlled environment, stimulated anthocyanin accumulation in red leaf cabbages and 640 nm LEDs resulted in enhanced lutein and glucosinolate sinigrin accumulation (Mizuno et al. 2011)
- Germination in three species of Pinus was positively affected by application of red wavelengths (Merkle et al. 2005)
- The elongation of stem and internode length of Chrysanthemum (Kim et al. 2004) and grape (Puspa et al. 2008) were greatest under red LED light.

• 658 nm red light in combination with cool white fluorescent lamps resulted in 6% higher phenolics concentration in baby leaf lettuce (Li & Kubota, 2009).

Combination red & blue

Plant photoreceptors are most efficient in the blue and red area of the spectrum, and combinations of red and blue LED lights have been proven to have the greatest impact on plant growth compared to a monochromatic system.

- Increase fresh and dry weights of Lilium (Lian et al. 2002), banana (Duong et al. 2003), strawberry (Nhut et al. 2003) and Chrysanthemum plantlets (Kim et al. 2004c).
- Promote shoot organogenesis in Anthurium, by exposure to higher percentages of red than blue illumination, however, the number of shoots was more when exposed to higher percentages of blue than red LEDs (Budiarto, 2010).
- End of production lighting with red and blue LEDs increases purple pigmentation of red leaf lettuce and Pennisetum 'Rubrum' (Randall & Lopez, 2014)

There is no clear relationship between red and blue light ratios when manipulating plant growth and photomorphogenesis, with some studies showing growth to be higher under 10 % blue LEDs, with others increasing under 30% blue LEDs in a blue and red combination (Nhut & Nam, 2010).

Green light (505- 535 nm)

- Enhances vegetative biomass accumulation and affects chlorophyll and carotenoid synthesis, improving leaf colour.
- Promotes lettuce growth (Kim et al. 2004)
- Affects nutritional quality of different baby leaf lettuce varieties (Samuolien et al. 2012, Li & Kubota 2009).



Fig 3. LED interlighting Source: Phillips Australia

Blue light - (450- 470 nm)

Blue light is critical to morphological development, par¬ticularly with regard to shoot strength and branching and is particularly favourable for growth, especially in leafy greens.

- Important for phototropism and chlorophyll formation (Blaauw & Blaauw-Jansen, 1970; cited in Massa, 2008)
- Promtes stomatal opening and inhibits stem and leaf cell elongation (Schwartz & Zeiger, 1984; cited in Massa, 2008);
- Inhibits seedling growth on emergence from a growing media (Thomas & Dickinson, 1979).
- Controls factors such as circadian rhythms and de-etiolation in plants (Devlin et al., 2007).
- Increases stem length in marigold (Heo et al. (2002)
- Inhibits Chrysanthemum in vitro culture plantlet extension and increases dry matter content and photosynthetic pigments (Kurilcik et al. 2008).
- Stimulates antioxidant status in green vegetables, increasing polyphenol (Johkan et al. 2010), vitamin C (Li et al. 2012), carotenoid (Lefsrud et al. 2008, Li and Kubota 2009) and anthocyanin contents (Stutte et al. 2009)
- Increases photosynthetic capacity and plant biomass in tomato, cucumber plants and pepper (Samuoliene et al. 2012c).
- Decreases elongation growth) and leaf area expansion in tomato and cucumber transplants (Nanya et al. 2012.

Far red light (720, 740nm)

- Results in tomato hypocotyl elongation (Brown et al. 1995, Kubota et al. 2012);
- Stimulates flowering of long-day plants (Deitzer et al., 1979, Downs, 1956; cited in Massa, 2008)
- Promotes internode elongation (Morgan & Smith, 1979; cited in Massa, 2008).
- Can be necessary for normal photomorphogenetic processes in plants (Kubota et al. 2012).

Pest & disease management

Another potential trend in LED usage is the possibility to reduce disease, pest and pathogen loads in particular crops (Massa et al. 2008). The thought of managing pest and disease with reduced chemicals is an attractive one, however, the initial studies point to it being cultivar or species specific.

 Massa (2008) showed that certain wavelengths could be used to minimise or even eliminate fungal proliferation. This study also suggested that LEDs could interfere with insects attempting to navigate to host species and reproduce. This was proven by (Vanninen et al. 2012) who showed that wavelength effects on insect phototactic behavior interfered with the ability of pests to successfully locate host plants

- The changes that some wavelengths could have on primary or secondary plant metabolites (defence mechanisms) could interrupt disease development and interactions with pests (Vänninen et al. 2012).
- Cucumber plants, grown under red LED light were more resistant to powdery mildew. (Shuerger & Brown, 1997).
- Blue-light on some species limited the efficacy of gray mold (*Botrytis cinerea*), most likely closely associated with the increase of antioxidant capacity as well as the development of compact morphology (Kook et al. 2013).

At present the majority of studies with LED lighting were performed in controlled environment growth chambers, where the primary environmental parameters can be controlled independently of external influences. This does not necessarily indicate that the same results will occur in a protected cropping situation (Pinho et al. 2007).

Conclusion

Research into LED lighting for supplementary or as the sole light source has been advancing for decades, however there are still many unanswered questions. What particular wavelength is required for what species; will a crop do better with a combination or a monochromatic approach; is there a critical time in a plants growth to apply supplementary lighting? The answers to these questions could be as numerous as there are plant species.

Furthermore, the interactions between light and plant photosynthesis and photomorphogenesis are complex and still being slowly unraveled at a molecular level, however, with the ability to focus on individual or combination of wavelengths, the attention that LEDs attract is warranted. The accumulation of evidence showing their ability to enhance desired features in plants' appearance, productivity or other responses will see a greater uptake of LED technology, but only after extensive successful (and unsuccessful) trials.

Thank you to Matt Mansfield @ Mansfields Propagation Nursery and Tony Bundock @ Powerplants for images and advice.



Fig 4. LEDs maximising space with multilayering Source: Phillips Australia

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NURSERY PAPERS

June 2015 Issue no.5

The use of gas in nursery management

In this month's Nursery Paper NGISA CEO, Grant Dalwood, reviews the use of gas within nursery production.

The use of gas in nursery management

The various types of environments encountered within the nursery sector vary greatly from full sun outdoor to climatically controlled indoor environments. Subsequently the need to control all types of factors within the range of applications will also vary. Gasses in various forms have been used for many years to control, treat and fumigate all types of problems occurring. This paper is aimed at updating knowledge within the industry and perhaps opening aspects of control that have been over looked for many years and due to new pest and insect incursions.

Gas is one of the four fundamental states of matter (the others being solid, liquid, and plasma). What distinguishes a gas from liquids and solids is the vast separation of the individual gas particles. This separation usually makes a colourless gas invisible to the human observer.

Because most gases are difficult to observe directly, they are described through the use of four characteristics: pressure, volume, number of particles and temperature. Pressure and temperature influence the particles within a certain volume. Gas particles spread apart or diffuse in order to homogeneously distribute themselves throughout any container.

Natural gas

Natural Gas in Australia is well known as an efficient form of energy with widespread availability. The two main types of distribution of gas for use as a nursery energy system are tank (including bottle) and mains supply. As many nursery production facilities are in peri urban areas often a continuous permanent mains supply is not available and subsequently tanks are required to store the liquefied natural gas product that is used. It is always advisable to thoroughly research and compare the various costing differentials between the energy resources available in your local area. The costs of running tank fed

Nursery & Garden Industry

machinery can be very high if controls are not put into place at setup.

All gas tanks require a licence from the local authority in order to store product on site as well as ensuring sufficient segregation from other structures. Registration of a tank is reliably conducted through the supplier and recharging of bottles and tanks is generally conducted through the supplier as well.

With ever changing cost structures and tariff rates the Nursery industry operator needs to regularly look at their onsite needs. This may result in the usage of a number of forms of energy sources such as electricity, gas, wind and solar, as the availability and costs of these sources develop and the needs of the business operator change. For example the use of electrically powered under bench heater cables may become inefficient and subsequently obsolete if gas can be efficiently used to heat water that can be channelled to a number of parts of a facility effectively to do the same job. The use of Methyl Bromide gas as a soil fumigant was widespread in Australia for many years and has now been systematically abolished under the 2005 Montreal Protocol, due to its effects on the critical ozone layer of the earth's atmosphere. Alternatives to this very effective but environmentally damaging gas have been developed but many do not have the same breadth of efficacy, i.e. they are effective on some but not all vectors that Methyl Bromide controls, as it is a soil steriliser as well as a controller of insects including nematodes.

Australian Standards for potting media, composts and soils have influenced the quality of media in the industry and subsequently the need for media sterilisation is minimal. Indeed in Nursery best practice, one area that still utilises Methyl Bromide is for Strawberry runner production.

There is scope within the NIASA program to recycle potting media as long as it is sterilised, this process if required is



A sulphur diffuser hung at the correct height and aided with fan dispersal over a gerbera crop

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A sulphur diffuser hung at an incorrect height and aided with fan dispersal but destroying the plastic covering above as it is too close.

often carried out by the use of steam generated by various forms of energy. Steam sterilisation is extremely effective and relatively safe given good quality units and a regular maintenance program. Work, Health and Safety considerations along with good training are mandatory when using all types of steam sterilisers. The age of steam sterilisers certainly can impact upon their safety and effectiveness. Likewise all due care must be taken with properly conducted in accordance with state regulations.

Sulphur dispersers are a commonly used method of control for a range of greenhouse or glass house problems. These units consist of sulphur powder contained in an aluminium pot under an electrical element enclosed within a stainless steel cover. The sulphur vaporisers to create a gas vapour that spreads with the aid of fans to protect crops from fungal diseases such as Mildew, Botrytis and Black Spot. The usage of these effective and efficient diffusers is widespread within a number of scenarios as fungal spores cannot spread in the sulphurous atmosphere. The units also inhibit the spread of greenhouse pests such as spider mite.

One of the problems with these dispersers is the need to ensure that the consistent heat generated (temperature regulation at about 150 degrees Celsius) by the diffuser does not burn the sulphur and produce oxides but creates a vapour that is dispersed over the crop and throughout the growing house. Also the location of the vapouriser in relation to the height of the crop is often a variable due to overhead watering causing water to settle in the sulphur pan and altering the effectiveness of the diffusion. Aligned to this is when diffusers are put too close to the plastic cover of a poly tunnel then burning of the plastic lining occurs and a rapid breaking down of the poly skin. Coverage of sulphur units is regulated by airflow distribution and through the natural funnel effect created by the shape of the lower pan. Each diffuser is capable of treating at least 100m² depending on the size of the house, severity of fungal problems and airflow.



A Co2 Generator – often attached to fluting for better distribution through a house (Source - Ontario MAFR)

Micro climates within various growing structures can vary, the levels of light, temperature, water, air movement, humidity and air quality are all factors that affect plant growth. One of the factors that can be controlled by augmenting gases and has been used for a number of years within the industry across the globe is the addition of Carbon Dioxide (CO2). The theory behind the process is that the CO2 when raised from ambient sea level (app 340ppm) to a level of around 1000 to 1300 ppm in the airspace of a growing house will aid photosynthesis. Photosynthesis is a process which uses light energy to convert CO2 and water into sugars. Many crops have shown that for any given level of increasing the CO2 level to 1,000 ppm plus will increase the photosynthesis by about 50% over ambient CO2 levels. Light levels are also an

important factor in the equation of adding CO2 to ambient air, to achieve best results the addition of CO2 is only effective during light hours. Growers could regard CO2 as a nutrient similar to fertilisers and water. Another factor to consider in the design of a growing house is that it is important not to let the ambient level of CO2 in the air drop below the 340ppm level as this will have a detrimental effect. It is therefore essential to have good natural air flow within enclosed structures.

Measuring equipment for CO2 levels are readily available to incorporate into a basic recording program for nursery production systems. There are a number of providers who can assist in developing a recording system for greenhouse growing and they should be consulted in any system investment.

Fogging systems can vary depending on the volume, number of particles, pressure and temperature involved in the process of dispersal of a liquid through the fogger nozzles. They are an often forgotten aid in creating not only a better growing atmosphere but also the effective method of dispersal of an array of materials in order to achieve a desired result. A limitation of fogging will be the final particle size that can be squeezed through the nozzle at pressure. This very process means that the liquids being used to carry the supplements being dispersed will need to have no impurities that will clog up nozzles. Water treatment will often be required as well as storage and collection through a dedicated line system devoid of contaminants.

Fogging systems and misting systems are often confused with each other as they are substantially the same, the difference being in the size of the droplet they produce. Misting systems typically operate between



Portable fogging machines can be utilised with various propellants to disperse fungicides and insecticides in green houses





An effective inline fogging system to control humidity in a propagation area with misters (hanging) at Native Plant Wholesale Nsry (BioSecure HACCP)

100psi and 250psi, with droplet sizes of around 200 microns in size. High pressure fogging on the other hand, produce a droplet around 10 microns, (i.e. 10-20 times smaller than a misting system). Droplets from a high pressure fogging system are so fine that they are able to remain suspended in the air until they evaporate. Increased droplet size leads to poor evaporation, reduced greenhouse cooling effectiveness and increased wetness in the greenhouse .This wetness can cause increased disease, crop damage and pose a safety risk to greenhouse staff. Permanently installed



Bottle gas refilling station at Bio Gro SA (Biosecure HACCP)

foggers require high quality pipes and fittings to accept the pressure and give solid performance over many years, so don't scrimp on the setup costs.

In essence high pressure fogging, which operates at over 700psi, gives optimal greenhouse cooling and temperature control. Droplets flash evaporate, eliminating the chance for excess wetness to occur, as this process is happening in the area where the heat is, the cool air travels down to the crop level, to be replaced by the hot air rising. The convection air currents ensure even temperature distribution throughout the crop without the need for fans to stir and distribute the cooler air, thus saving energy. Because droplets fully evaporate high pressure fogging is often referred to as dry fog. One of the advantages of high pressure fogging is that it can be applied directly where the hot air is located.

Ideally humidity should be between 50% and 70% for optimum growing conditions, however much higher levels are achievable if required, such as in propagation areas.



A steam sterilising unit at Great Southern IT – WA (NIASA Accredited)
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When heat levels rise, humidity levels drop, the plants under stress face double trouble, and it can be a deadly combination. High pressure fogging can provide almost immediate humidification, overcoming a potential huge loss in greenhouse stock. Accurate humidity and temperature control is essential throughout the stages of production, media should be moist, but without wetness. System Design Considerations must ensure that humidity levels do not drop below 30%. If more humidity is needed, the greenhouse's ventilation system can be turned off. Determining how often foggers should be on, as well as the amount of time between fogging events, depends on the desired level of relative humidity. In general, systems used to increase humidity run for a very short amount of time, with the duration of fogging ideally lasting 1 to 3 seconds. Fogging systems, be they portable or permanent are reducing in cost and they can be utilised in other very effective ways also to distribute fungicides and pesticides.

Dust is also a problem that can be controlled by high pressure fogging. The small droplets, produced make it effective in encapsulating dust particles, and bring these to ground without causing wetness.

Liquefied gases are a very important method for control in the pest and food industry where complete extermination of pests, rodents and insects are essential. Perhaps we can learn from them within the nursery sector and in alliance with our existing IPM (Integrated Pest Management) programs gas generated products could be used to augment the ever increasing resistance within nurseries of common flying insects that cause great product value decrease. One of the great beauties of the product is that when sprayed selectively it can be used outside directly onto crops on a calm day to eradicate many insects that are resistant, inside use is extremely effective for sheds and houses of all sizes.

Although seasonally variable, within any nursery there is often a need to control

Further Information

flying insects at the growing point as well as the despatch point.

Liquefied gas based pesticides can be used in this situation and are readily available, clean and easy to use. They are available in a range of options which can ensure effective control in a short space of time and with limited safety risk if used correctly. The chosen gas product will disperse over a large volume through a simple hand held gun attached to small easily mobile cylinders; application is simple and fast and can be carried out in some cases with people in a close proximity or with a vacancy period for other products. Like all pesticides, always read the product specifications and Safety Data Sheets (SDS). and one of the beauties of this type of product is it is regularly used in Food processing and storage warehouses, Domestic and commercial premises, hotels, restaurants and hospitals, Mushroom farms, Dairy product processing, Food storage and cut flowers throughout the world already so is well tried and tested.





Another use of gas is demonstrated in the use of a compressed air bench lifter to assist with the rotation of stock in a glass house (Jong's Nursery South Australia)

Nursery paper 2001 Vol 5 Water fogging and misting systems are they a risk to human health? Ontario Ministry of Agriculture Food and Rural Affairs Carbon Dioxide In Greenhouses Available online at http://www.omafra.gov.on.ca/english/crops/facts/00-077.htm

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Nursery Production Pest Monitoring, Inspection and Surveillance Methodology

In 2013 NGIA commissioned a project to investigate statistically valid systems and protocols for on-farm monitoring, inspection and surveillance for pests of biosecurity concern within production nurseries. The project, completed in 2014, has investigated national and international information and systems and has developed recommended monitoring, inspection and surveillance protocols that have the highest probability of success. NGIQ Industry Development Manager John McDonald provides details in this Nursery Paper on the key project outcomes for use within production nurseries.

Nursery Production Pest Monitoring, Inspection and Surveillance Methodology

What is the key issue?

Despite numerous monitoring, inspection and surveillance protocols and systems developed both in Australia and abroad that provide guidance on implementing these programs, few investigate and provide an evaluation of the efficacy of what is proposed in a quantitative sense. This is understandable due to the complex and varied nature of the problem based on the thousands of cultivars grown across varied cropping systems (e.g. seedlings, small containers, advanced trees, etc.) and the exposure to a vast array of plant pests and diseases.

Nursery production is both unique and diverse, as are the numerous pests and diseases that can impact on the quality and economic return gained from the thousands of plant cultivars produced. Production can also be both intensive and extensive ranging from the production of plugs and seedlings to advanced tree stock and in-ground plant production. In Australia, quantitative sampling systems that do exist fall primarily within the realm of inspection, treatment and certification for intra and interstate movement of plants that are hosts of specific and regulated plant pests and diseases. For example, approved inspection protocols for the movement of plants known to be hosts of melon thrips between infested and non-infested jurisdictions.

For visibly detectable pests and disease symptoms, the development, approval and agreement on inspection systems directed at meeting interstate movement regulations is generally consistent with systems used by national quarantine authorities. These systems are applied to host material to provide assurance that imported plant products are free of pests and diseases of concern to Australia. The team undertaking this nursery project have ensured the protocols recommend are quantitative in nature as this form of analysis is the basis for on-farm structured and knowledge based decision making that will deliver the best return on investment.





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For the purpose of this Nursery Paper, **'monitoring'** means the regular ongoing examination of a population of plants (e.g. crop monitoring) to determine changes in presence, incidence and or prevalence of pest populations. This can include ongoing physical examination of the plant and/or other methods such as trapping or regular diagnostic testing. 'Inspection' means the visual examination of a plant or group of plants to determine if a pest or disease symptom is present at one point in time e.g. consignment despatch inspection. **'Surveillance'** means the process of looking for potential plant pests across the whole production site, excluding the crop, such as areas of native or exotic vegetation, waterways, drainage lines and water storage areas, car parks, waste disposal areas, etc.

Why monitor, inspect and survey for plant pests?

There are three primary reasons why producers may monitor, inspect and survey for pests:

- To estimate pest population density, in order to make optimal pest management decisions, such as when to manage and what management measures to use (e.g. release beneficial's or treat with a pesticide). This includes decision making regarding management for optimal productivity and control for optimal quality for the market
- To provide assurance that general biosecurity obligations have been addressed and/or to facilitate market access for freedom of pests of quarantine concern
- To detect high risk exotic biosecurity pests (Emergency Plant Pests – EPP's) in order to respond effectively in accordance with legal reporting and industry obligations aimed at eradication

Visual monitoring, inspection and surveillance

Visual observation is a fundamental inspection, monitoring & surveillance method that should be used as a minimum and in combination with other detection methods, such as trapping or testing. In other words, other monitoring methods should always be supplemented/supported by visual inspection for pests, weeds and disease symptoms in a structured detection program. Whole crop visual scanning may be undertaken initially to observe and map areas of uneven plant growth, colour/damage or obvious disorders such as wilting, etc. Individual plant observation is then

conducted to explain any differences observed, that is take a sample and inspect/test to determine the causal agent. Finally if no obvious issues are observed at the time of crop scanning random sampling and inspection is undertaken to detect infestations not apparent through initial whole crop observation. Many to most insect species can be visually detected on the external surfaces of plants including stems, foliage, buds/ flowers, and plant roots. Smaller invertebrate species may require magnification with a hand lens or microscope such as eriophyid mites. Disease symptoms, and some pathogen life stages (e.g. rust spore pustules), may be distinctive and after sampling may require sensitive testing, such as ELISA and/or PCR, or laboratory based isolation and culturing of the pathogen to provide confirmation of a specific infestation.

The sensitivity of visual inspection for identifying infestations can be poor if it is done carelessly, is rushed or by someone without experience. Approaching this task methodically (a structured and planned procedure) can increase its sensitivity (effectiveness) greatly. Methodical improvements can be made at different scales including the whole crop, individual plants, and parts of individual plants such as flowers and buds, leaves, stems and roots. Experience and plant protection knowledge will lead to improved sensitivity, but often even experienced staff could improve their detection sensitivity if they are methodical.

The approach for examining plants depends on the pests being sought. It may involve dislodging and capturing insect pests by beating onto trays, or inspecting insects more carefully in their feeding location if they are firmly attached or fly away readily, or inspecting leaves for symptoms, or taking leaf samples for analysis, or examining the roots for pests or symptoms.

Table 1. Inspection type and population to sample

Inspection type	Population of plants
Import inspection	All plants of the same species/type that are imported as a consignment.
Despatch inspection	All plants of the same species/type that make up a consignment.
Monitoring inspection	A lot or batch of the same species/type that may include plants grown on one or more blocks or benched areas within the same general location.
Sentinel plants	A lot or batch of the same species/type that may include plants grown on one or more blocks or benched areas within the same general location.
Sticky traps	All traps.
Site surveillance	The entire property, broken up into logical and manageable sub- areas.

Import and despatch inspection

For import and despatch plant inspection the report recommends that a default 50% sensitivity of detection be used. It is believed that this default sensitivity of detection is likely an underestimate of the true sensitivity of detection of pests (including their symptoms) plus it equates with the existing national quarantine protocol of 'inspect 600 units' irrespective of population size.

For import and despatch plant inspections the report has recommended that, at a minimum, an inspection be conducted to detect pest infestation, prevalence, at a maximum of 1% within the imported/despatched consignment. Therefore a maximum of 600 units will be sampled for import and despatch inspections with a minimum of 520 units sampled in smaller consignments. Table 2 contains the minimum sampling rates applicable to import/





despatch inspections.

Number of plants	Minimum number required to be inspected	Inspection rate
1 to 500	All	All
500 to 600	All	All
601 to 700	All	All
701 to 800	All	All
801 to 900	All	All
901 to 1000	520	61% (2 in 3 plants)
1001 to 1200	530	56% (3 in 5 plants)
1201 to 1700	550	48% (1 in 2 plants)
1701 to 2400	565	34% (2 in 5 plants)
2401 to 3000	570	25% (1 in 4 plants)
3001- 3600	575	20% (1 in 5 plants)
3601 - 4500	580	13% (1 in 9 plants)
4501 - 10,000	590	6% (1 in 16 plants)
>10,000	600	Calculate the percentage based on consignment total

Table 2. Import & despatch inspection sampling rateMonitoring inspections

The report recommends when conducting a monitoring program across a production nursery for multiple pests and diseases (as is typically the case) the lowest actual estimated sensitivity of detection across all pests being surveyed should be used as the default – assuming an acceptable level of training is provided in the identification of pests and disease symptoms. For inspection regimes to be used within the scope of a monitoring program the report recommends an inspection cycle be undertaken to achieve a maximum design **prevalence of 5%** at the end of the cycle.

Designing a survey where we use the lowest realistic estimate of sensitivity is a conservative, risk-averse, approach. In this case the estimate of the likely lowest estimate of sensitivity of detection of target pests is 70%. The estimated sensitivity for the detection of common insects and disease symptoms are listed in Table 3 below plus results comparing end point inspection (1 inspection) and crop

monitoring (12 crop monitoring activities).

The information in Table 3 is generated via a statistical modelling program which demonstrates that through the use of a methodical (structured) crop monitoring program over 12 weeks inspecting 35 plants per monitoring activity, out of a population of 10 000, the sensitivity is equal to an end point despatch inspection of 421 plants. The above example reflects the current national and state end point inspection protocol of 600 units for inspections.

Further analysis of the above data shows that after 1 inspection (aphids) the maximum prevalence of target pests if not detected initially, is 0.70% however after 12 weekly inspections the maximum pest prevalence, if not detected over the 12 inspections, is 0.05%. When the monitoring and end point inspections are combined the maximum number of potentially infested plants is 2 or 0.02%, well below our target prevalence figures of 1% for inspections and 5% for monitoring.

Monitoring frequency

Survey frequency for monitoring purposes should be governed by the life cycle of the target pest and for practicality. For example, pests with short life cycles that can grow and expand populations rapidly should be inspected more frequently because if they are missed during one inspection, and there is a long lag time until the next inspection, a significant amount of damage could have been done to the crop. However, surveying too frequently (e.g. daily) is costly, impractical and potentially unnecessary if a structured system is employed.

For practical purposes the report recommends **weekly monitoring** by allocating a set day during the week which is easily scheduled and should be considered as a routine task with results recorded. Inspecting every 7 days also fits into the shortest lifecycle periods under ideal circumstances by problem pests in most cropping systems.

Monitoring sample unit

When surveying (inspecting) the crop a systematic approach to selecting sample units from the population for inspection is essential. If the survey program (crop monitoring) will run over a period of time (i.e. the nursery stock will be in the production nursery for many weeks and monitoring will take place weekly) the starting point for each weekly inspection should vary. For example, on the first monitoring week every 10th unit may be sampled starting from the 3rd plant in row 1, and on the second monitoring week every 10th unit may be sampled starting from the 5th plant in row 1, and so on. This ensures the same plants are not monitored

Table 3. Likely maximum prevalence of infested plants when the survey population is 10 000 plants and 600 plants are inspected at 95% confidence using estimated sensitivity of detection.

Pest/symptom	Estimated Method Sensitivity (Visual Inspection)	Maximum prevalence of infested plants if not detected after 1 inspection	Number of plants inspected to achieve 1% prevalence result with 1 inspection	Number of plants inspected to achieve 1% prevalence result with 12 crop monitoring activities
Aphids	70.00%	0.70%	421	35 plants/population
Caterpillars	90.00%	0.55%	328	27 plants/population
Mites	70.00%	0.70%	421	35 plants/population
Scales	80.00%	0.62%	369	31 plants/population
Whiteflies	80.00%	0.62%	369	31 plants/population
Botrytis symptoms	90.00%	0.55%	328	27 plants/population
Downy Mildew	90.00%	0.55%	328	27 plants/population
Phytophthora	90.00%	0.55%	328	27 plants/population
Weeds	99.00%	0.50%	298	25 plants/population
Rust symptoms	90.00%	0.55%	328	27 plants/population

Note: Survey interval is one week – 12 surveys = 12 x weekly monitoring activities

across each week and underpins the detection system sensitivity. The report has determined for crop monitoring within a production nursery the most statistically valid rate based on the recommended sensitivity and prevalence parameters is to inspect 30 plants within the monitored population. If 30 or less plants are in the monitored population, inspect all plants. Table 4 gives indicative numbers of plants to sample based on various crop populations.

Population and proportion to be examined		Number Popu to and sample prop to a example		ılation Number to portion sample pe mined		Population and proportion to be examined		Number to sample
10	A11	A11	10 0	30.00%	1 in 3	100 0	3.00%	1 in 33
20	A11	A11	20 0	15.00%	1 in 6	200 0	1.50%	1 in 66
30	A11	A11	30 0	10.00%	1 in 10	300 0	1.00%	1 in 100
40	75.0%	3 in 4	40 0	7.50%	1 in 13	400 0	0.75%	1 in 133
50	60.0%	3 in 5	50 0	6.00%	1 in 16	500 0	0.60%	1 in 166
60	50.0%	1 in 2	60 0	5.00%	1 in 20	600 0	0.50%	1 in 200
70	42.9%	3 in 7	70 0	4.29%	1 in 23	700 0	0.43%	1 in 233
80	37.5%	2 in 5	80 0	3.75%	1 in 26	800 0	0.38%	1 in 266
90	33.3%	1 in 3	90 0	3.33%	1 in 30	900 0	0.33%	1 in 300

Table 4. An indicative proportion of plants/rows to sample

in a monitoring activity

The above recommended sampling numbers/frequencies are the minimum values recommended by the report. If sampling numbers/frequencies are increased, where more plants are inspected and/or inspection frequency is increased, then the greater the sensitivity of the process resulting in higher crop quality at the end of the cropping cycle and/or earlier detection of possible problem pests which will reduce the cost of corrective action. Through the use of on-farm skill sets in pest, disease and weed identification and the use of knowledge support tools, such as pest identification resources (see www.pestid.com.au), production nurseries can reduce the risk associated with pest infestations through inspection, monitoring and surveillance of the crop and production system.





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How efficacious are chlorine, chlorine dioxide and ultraviolet radiation as disinfectants against waterborne pathogens in irrigation water?

In this month's Nursery paper NSW Industry Development Officer Michael Danelon reviews some recently conducted levy funded research investigating the efficacy of some popular water disinfestation methods.

How efficacious are chlorine, chlorine dioxide and ultraviolet radiation as disinfectants against waterborne pathogens in irrigation water?

Abstract

A number of disinfection treatments are available to reduce the risk of certain plant diseases in various water sources used for irrigation. Limited published studies have compared the efficacy of disinfection treatments specific to the nursery and garden industry (NGI) on a range of various life stages (propagules) of plant pathogen species and their sensitivity in different water qualities.

This nursery paper aims to summarise a levy funded study conducted by NSW Department of Primary Industries to address industry concerns about gaps in the knowledge about the efficacy of disinfection of irrigation water treatments used by the Australian Nursery Industry. Propagules of eight significant plant pathogens were exposed to chlorine (sodium hypochlorite), chlorine dioxide and ultraviolet radiation (UV-C) disinfestation treatments at a range of application rates and exposure times in deionized water and dam water.

Introduction

Plant pathogens found in irrigation water may originate from a number of sources. These source include natural occurrences in water storage reservoirs (rain water surface fed dam, creek or river), or in surrounding soil or plants, with pathogens then being washed into the nursery runoff and drainage water storage following rainfall and irrigation events. Alternatively

pathogens may be introduced to the production system via externally-sourced infected propagation material, growing media or materials or workers, visitors and equipment brought onto the production site.

The reuse or recycling of nursery runoff water as an irrigation source may potentially provide a vector for pathogens. This can elevate inoculum pressure and the risk associated with infection; disease incidence and production losses. Hence effective disinfection of recycled water for irrigation is beneficial as a phytosanitary

measure to reduce the risk of plant disease development.

Jump to page

Under the Nursery Production Farm Management System (NPFMS), all water used for irrigation from either surface supplies and nursery runoff must be disinfested with an approved treatment method as outlined in the current Nursery Industry Accreditation Scheme Australia (NIASA) Best Management Practice (BMP) Guidelines.

When considering the required effectiveness of disinfestation treatment



Chlorine dioxide generator



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of water, the log reduction of colony forming units (CFU) of the viable (potential to be infectious) pathogen propagules present prior to, and post exposure to the disinfestation technique, ie typically >99% (log 2) reduction or >99.9% (log 3) reduction post treatment is the industry measurement.

Chlorine as either sodium hypochlorite or calcium hypochlorite is commonly used to treat irrigation water, as it is easy to apply and relatively persistent. Residual concentrations can be monitored to ensure suitable germicidal dose whilst being relatively inexpensive to install. When chlorine is introduced to water, (subject to the pH), it reacts to form free chlorine species of hypochlorous acid (HOCl) pH<7 and hypochlorite (OCl-) ions pH >7 which oxidise organic materials and pathogens if present in the water. The more organic matter present in the water, the greater the rate of deactivation of free chlorine species and lower residual.

Chlorine dioxide (ClO_2) also acts by oxidising organic matter and pathogens. Chlorine dioxide exists as a dissolved gas in water and has a greater oxidising strength than hypochlorite salts. It is claimed to be at least 1.2 times more effective than sodium hypochlorite as a disinfectant. Chlorine dioxide is affected by the presence of organic matter in water, but it is effective across a wider pH range (4-10) and has the potential to offer residual post disinfestation treatment like chlorine. Ultraviolet radiation (UV) is applied at a wavelength of 254 nm (UV-C) at a certain germicidal dose to disinfect pathogens in irrigation water. Energy discharged from the UV light reacts with the DNA and RNA of surrounding microorganisms present. This essentially eliminates the ability of vulnerable fungi, bacteria and viruses to be infectious. Effective disinfection depends on duration and intensity of UV exposure to water flow and water UV transmission (UVT) and presence of organic matter. Turbidity is measured as nephelometric turbidity units (NTU) with <2 NTU considered optimum.

The most widely used measure of water quality in relation to UV-C efficacy is UVT. Water with a UVT <50% may be disinfested with UV radiation, however, the dose needed increases greatly as UVT falls. Where plant pathogens are harboured inside organic matter or mucilage suspended in water, they may be protected from exposure to the UV and other disinfectants, highlighting the advantage of filtration prior to treatment with disinfectants.

Materials and Methods

The efficacy of the three disinfectant treatments (refer Table 1) were tested against the 22 pathogen propagules according to application/dosage rates and exposure times listed in Tables 2 and 3.

Deionised water (laboratory control – pH 6.5 and 0.32 NTU) and dam water (field)

were used in the experiments. The pH of the dam water ranged between 7.8 and 8.0 which are considered suboptimal for chlorine (HOCI) disinfestation. The turbidity of the dam water ranged between 20 and 87 NTU, with a pH between 7.8 and 8.0 at the different sampling times. Dam water was diluted with deionised water to achieve 50% UVT prior to use in the UV tests, whilst the dam water used in the chlorine and chlorine dioxide tests had a turbidity of 20 NTU and was not adjusted to 50% UVT.

To determine the effectiveness of exposure to each disinfestation treatment on propagule survival, the propagule suspension was sampled at required times (Table 2) or post UV treatment (Table 3). Propagules were then cultured and the number of viable propagules (CFU) determined by comparing the number of growing colonies from treated samples with those in the untreated (control) samples.

Results

The disinfestation efficacy (>99% kill of CFU) of the three disinfection treatments tested varied between pathogens and propagules types with application rate/dosage, time and water quality characteristics (pH and turbidity, likely organic matter load) – refer Tables 2 and 3.

Of the disinfection treatments tested in this study, chlorine dioxide applied at 5ppm for 10 minutes (residual 2.7 ppm) was the only effective disinfectant in dam water against all pathogen propagules in this study. In



Fliltering water pre treatment is essential



New UV generator bening installed





deionised water, chlorine dioxide applied at 5ppm for 4 minutes was required for effective disinfestation of all pathogen propagules.

Chlorine applied at 5ppm for 30 minutes (residual 4.6 ppm) was the only effective disinfectant in deionised water against all pathogen propagules in this study. Chlorine was ineffective against all pathogen propagules in dam water.

In this study, residual chlorine dioxide rates were only measured after the 10 minute treatment rates, whilst chlorine residuals were only measured after 30 minute treatments – refer Appendix II of the full report.

UV was effective against all pathogen propagules except *Calnectria pauciramosa (Cylindrocladium spp.)* chlamydospores in deionised water. In dam water, UV was ineffective against all propagules of: Alternaria alternata, Calnectria pauciramosa and Fusarium oxysporum but effective against all pathogen propagules. **Discussion**

Water quality is one of the factors affecting the efficacy of water disinfection treatments and longer exposure times or higher exposure rates/dosage were generally required to kill propagules in dam water compared with deionised water, however in some instances the highest rates were ineffective against certain pathogens and propagules – refer Table 2 and 3.

These results highlight the importance of ensuring the disinfection treatment and

"dosage" selected is suitable for the water quality available and the importance of achieving a minimum residual chlorine and chlorine dioxide concentration for complete exposure for the contact time where these treatments are applied.

Therefore, both pH and turbidity may have affected the efficacy of the chlorine treatments tested, and turbidity of the dam water reduced the efficacy of the UV treatment for some propagules, such that higher rates or exposure times were required to kill many of the pathogen propagules, when compared with those required for deionised water.

Table 1. Exposure times and residual application rates for the disinfection treatments tested

Treatment	Time (min)	DOSAGE Rate/Concentration	
Chlorine (sodium hypochlorite)	0, 10, 20 , 30	0, 1, 2 , 5 ppm	
Chlorine dioxide	0, 4, 8 , 10	0, 1, 3 , 5 ppm	
UV-C transmission (254 nm)	-	0, 113 , 250 mJ/cm ²	

Table 2. Calculated minimum application rate and residual rate (where measured) and exposure time required to kill >99% CFU of propagules tested following exposure to chlorine and chlorine dioxide. A '--' indicates that propagules were not killed at the rates tested.

Pathogen	Propagule	Chlorine (NaClO)			Chlorine dioxide				
		DI		Dam		DI		Dam	
		Rate/Residual	Time	Rate/Residual	Time	Rate/Residual	Time	Rate/Residual	Time
		(ppm)	(min)	(ppm)	(min)	(ppm)	(min)	(ppm)	(min)
Clavibacter michiganensis	Bacterial cells	1	10	1	10	1	4	1	4
Alternaria alternata	Conidia	5	20	-	-	5	4	5	4
	Mycelium	5	20	5/3.8	30	3	4	5	4
	Chlamydospores	2	20	5	20	3	4	5	4
Chalara elegans	Endoconidia	5/4.6	30	-	-	5	4	1/0.5	10
	Mycelium	5/4.3	30	-	-	5	4	3	8
Colletotrichum	Conidia	1	10	5	10	1	4	1	4
gloeosporioides	Mycelium	5	10	-	-	1	4	3	4
	Conidia	2	20	5/2.5	30	1	4	3/1.3	10
Calnectria pauciramosa	Chlamydospores	2	20	5/3.1	30	3	4	5/2.7	10
	Mycelium	1/0.4	30	5/3.2	30	3	4	3/1.6	10
	Conidia	1	10	5	10	1	4	1	4
Fusarium oxysporum	Chlamydospores	5	20	-	-	1	4	5	4
	Mycelium	5	10	-	-	1	4	3	4
	Zoospores	1	10	1	10	1	4	1	4
	Cysts	1	10	1	10	1	4	1	4
	Oospores	2	10	1/0.4	30	3	4	3	4
Phytophthora cinnamomi	Sporangia	2	10	1	20	3	4	3	4
	Mycelium	5	10	2/1.4	30	3	4	3	4
	Zoospores	1	10	5	10	1	4	3	4
	Chlamydospores	5	20	-	-	1	4	3	4
	Mycelium	5	20	-	-	1	4	3	4

To use high concentrations (5 ppm initial/ free) of chlorine and chlorine dioxide treatments to effectively disinfest irrigation water, further work is required to investigate potential phytotoxicity associated with residual concentrations in irrigation water and the effect of residuals on beneficial microbial organisms in the plant rhizosphere. A critical aspect which must be considered with water disinfesting treatments which leave residuals, is the original dosage rates and the residual concentration post the effective treatment duration (where known) and the potential phytotoxicity with residuals of 2.7 ppm post 10 minutes (chlorine dioxide) and 4.6 ppm post 30 minutes (chlorine) in the treated irrigation water to effectively disinfest the water - which in most instances of this study were unknown.

Recommendations

Selecting the appropriate disinfection system will depend on:

- current hygiene practices in the nursery
- water quality
- plant species grown in the nursery
- pathogens present and
- the resources available to the nursery.

Based on the outcomes from this study and the full reports literature references:

- Good nursery hygiene practices will reduce the risk of pathogens and disease being introduced and establishing
- Use initial water free of plant pathogens and prevent pathogen entry into the water source and the nursery
- When selecting a disinfection method for irrigation water, the water quality and pathogens present in the water and nursery must be carefully considered and done with a level of independent technical support to achieve best outcome
- Chlorine dioxide (with residuals) and UV were the most effective of the three treatments tested
- Where water quality can be maintained at a consistently high level with low

Acknowledgements

New South Wales Department of Primary Reference: Nursery Industry Accreditation

Reference: Final Report NY13003 - Increasing Productivity through Industry Research, Development and Extension Programs

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Conclusion

This study has begun to address the gaps that exist in the available data for the effectiveness of disinfection treatments on different life stages, or propagules of a given pathogen, and the role of water quality characteristics.

Ultimately, the selection of a disinfection system for any given situation will depend on a number of factors including; current hygiene practices in the nursery, water quality, plant species grown, pathogens present, targeted pathogens and their propagules and the cost to treat and resources available to the nursery.

Table 3. Calculated minimum exposure required to kill >99% of CFU propagulestested following treatment with UV-C radiation.

A '- ' indicates that propagules were not killed at the rates tested.

organic matter and turbidity, UV

pathogen propagules tested

pathogens tested

to UV treatment.

and

provides good disinfection against most

provides good disinfection against most

Where water quality is lower or pH is

likely to be variable, chlorine dioxide

Particulate matter can influence the

efficacy of the disinfection treatment

Pathogens with pigmented or melanised

cell walls are less likely to be susceptible

Pathogen	Propagule	DI water	Dam water
		(mJ/cm ²)	(mJ/cm ²)
Clavibacter michiganensis	Bacterial cells	113	113
Alternaria alternata	Conidia	250	-
	Mycelium	250	-
	Chlamydospores	113	113
Chalara elegans	Endoconidia	113	250
	Mycelium	113	113
Colletotrichum aloeosporioides	Conidia	113	113
conclothenam glocosponolaes	Mycelium	113	113
	Conidia	250	-
Calonectria pauciramosa	Chlamydospores	-	-
	Mycelium	250	-
	Conidia	250	-
Fusarium oxysporum	Chlamydospores	250	-
	Mycelium	250	-
	Zoospores	113	113
	Cysts	113	113
Phytophthora cinnamomi	Oospores	113	113
	Sporangia	113	113
	Mycelium	113	113
	Zoospores	113	113
Pythium aphanidermatum	Oospores	113	113
	Mycelium	113	113

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Roots, Hormones and in-between - Back to Fundamentals

In this month's Nursery Paper NSW Industry Development Officer, Des Boorman presents a fundamentals review of the important aspects of a propagation system conducive to high quality plants with particular emphasis on root quality.

Roots, Hormones and in-between -Back to Fundamentals

Health Status

With few exceptions, high health status is generally under-appreciated in ornamental horticulture, while in production horticulture it is widely recognised as being critical to crop performance.

Industry schemes such as the strawberry clean runner, banana, potato, citrus, grape and passionfruit focus on supplying high health, disease free material to maximise the opportunity for long term crop success - not just in the propagation and container production stages.

Certain pathogen issues are obvious in a range of clonally propagated ornamentals yet are often poorly acknowledged or addressed. *Daphne odorata* is an example where viruses, latent or expressed prevented clonal propagation. Once material was "cleaned-up" through a process of re-culturing and heat treatment to destroy the virus it contained Daphne became readily available in commercial quantities.

Both root production and quality could be directly influenced by both latent and expressed pathogens. Additionally poor propagation and production tool hygiene and material selection may perpetuate or exacerbate such issues in commercial situations (Hygiene in plant Propagation, Nursery Papers December 2004, Issue no. 11).

One NIASA accredited grower imports fresh tissue culture stock each year of a range of plants with these being grown to be used as stock plants for that seasons cutting requirements. At the end of the season these stock plants are disposed of and the process repeated to reduce the risk of pathogens and disease transfer to



Image 1 : *Jagera* sapling showing a full trunk s-bend and obvious root issues after germinating on a rock ledge. In nature, trees such as this don't always fail, however this conformation is unacceptable in commercial practice

production stock. Production at this nursery is some of the most uniform over a range that I have ever seen and is in some part attributed to the health status of the stock material used for propagating cuttings.

With the release of the **Australian Standard - Tree Stock for Landscape Use, AS 2303:2015** (April 2015), The knowledge and competency of tree growers in either sourcing and/or producing quality propagated material to grow on and/or sell is particularly important for immediate and long term compliance and the production of quality trees.

For production of quality plants and particularly trees, it is critical to focus on the root quality of both seed grown and clonal plant lines during propagation phases.

Why do we need to focus on roots so much?

GREAT ROOTS and root systems underpin the health and performance of plants and the integrity of the Nursery and Garden Industry (NGI). The move towards container-less growing media propagation systems such as Preforma®, Ellepot® and Oasis® from community seed/cutting trays and rigid containers containing growing media offers a positive step to achieving great root systems. Containerless propagation systems promote some air pruning of roots via the surrounding sides of the propagation cell being exposed to air.

The adoption of a convenient production system which may comprise quality should never be an option to the NGI. Rather the NGI needs to focus more on what makes a quality plant; i.e. **GREAT ROOTS**.



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Other systems such as Jiffy pots® require growing media but are a "free standing" propagation cell, so when prepared correctly can produce excellent root systems.



Image 2: While propagated in a suitable non-restrictive growing medium, this cutting has been held too long in the supporting tray, resulting in poor root structure.



Image 3: Jiffy® cells showing root penetration through the wall.

Correct wetting up and irrigation of the Jiffy® and growing media is essential during the propagation phase to prevent the Jiffy® drying out and possibly causing root restriction by this product.

How do we address Plant Propagation Quality Issues?

Propagation environment

The level of environmental control and adequacy of propagation facilities and the range of crops grown in Australia's generalist production nurseries tend to be the major impediments for all round great propagation. Typically propagation environments are one size fits all, where depending on volume and frequency, often 3 or 4 specific environmental controls (bottom heat, light, relative humidity, air temperature, mist / fog) and propagation media/substrate combinations would deliver better results for the range of plants being propagated. Propagators should not focus on 'cost and convenience', but determine and adopt what is technically a good growing media and environmental combination for the propagation of their specific plants.

Propagation growing media

The choice of propagation growing media options are numerous and there is often a cross-over where the propagation cell contains the growing media, such as with Ellepots®, Oasis®, Jiffy® and Preforma® systems. Apart from Jiffy®, these systems negate preparation and filling propagation cells with growing media.



The expectation now is the application of a universal propagation growing medium, container and environment which typically yields mixed results as such systems don't fit all propagation requirements. Some growers have gravitated towards whatever propagation growing media is cheapest rather than specifying or understanding the physical properties and interactions required within the propagation root zone to achieve optimum results. Other growers have implemented the newer unitised systems forgoing the "cost" per unit for the efficiency and ease of use. Reader Note - if ever there is a justification in the considerable investment and return from growing media, plant containers, propagation facility and environmental control being made, then it is the propagaton phase of production to establish the foundation for future quality plant production.

While cuttings prior to root initiation may require moisture to satisfy transpiration requirements and turgidity, the growing media doesn't need to be overly wet. A well maintained humid environment will help address transpiration loss with occasional top up watering to the growing media to satisfy water uptake through cut basal end of the cutting/stem.

The initiation of roots and their development require oxygen, and it is important to maintain uniform air exchange within the growing media to promote sufficient root numbers rather than just one or few roots. The air exchange within and through the growing media and propagation is usually supported by water entry and drainage (top to bottom) and by the surrounding air around all sides of the exposed growing media, i.e. from the top and bottom of community tray or exposed growing media in container-less propagation systems.

In larger and shallow community trays, air diffusion is much lower and the interface and variation in the sides and centre of the community trays from air/water retained is much less uniform across the tray than that in individual propagation cells without rigid containers.

Air filled porosity (AFP) is a term that doesn't get discussed nearly enough and a lot of specialist propagation knowledge has also been lost or fails to be adequately communicated to where it's needed.



Propagation containers

The type of container used has a great effect on both root quality and air exchange to the propagation growing media, where root restriction could possibly lead to structural root issues later in the production cycle.

Traditional 50mm plastic tubes, either round or square, with or without root trainers all have the potential to either direct roots downwards or around when contacting the rigid container wall. Inserting cuttings at the edge of the tube is likely to exacerbate this problem.

This early formative root training leads to root systems not inclined to spread laterally when subsequently potted-on or planted out. Without proper pre-pot preparation this could lead to root issues later in the production cycle as well as end use structural issues. Either way, a 90° root bend near the base of any seed or cutting grown dicotyledon is undesirable. Physical remediation of these formative root systems at each potting stage by manually teasing out the roots is beneficial, however it is costly, time consuming and may cause significant plant set-back so should be avoided if possible.



Image 4: Root trainers in a 50mm square tube have directed these roots down however ≤90° kinks close to the stem are likely to cause stability issues in later production stages. Ideally the propagation systems used by the NGI should allow roots to radiate outwards from the inserted section of the cutting during propagation and then facilitate air pruning or unrestricted root extension. Such a system is more likely to produce a high quality root system. These containers usually allow greater air exchange at the base of the cutting which seems to promote better root development and numbers. Ideally a cutting should produce numerous radial roots around the inserted section that allow for quicker establishment, increased stability and performance of the plant throughout the production cycle.



Image 5 : While older than ideal, this cutting in an Oasis® cube demonstrates the radial development of roots around the cutting base.

When cuttings produce poor or nonuniform root systems it is often difficult to get early plant stability and as a result staking has to be utilised. Compared with 20 years ago, staking is now common and is a significant cost in the production cycle. Staking may impact the long term plant stability and potentially yield false economies of a faster and taller plant at the expense of more robust and gaulity plants.

Plant propagation hormones

Artificial phytohormones used in propagation are designed to initiate adventitious roots on cuttings. Adventitious roots are those that have arisen from other than from the seedling root system, that is inducing stem and leaf tissue to form roots. In dicotyledons, there is a meristem responsible for bark production and also



Image 6: Poor root development will likely cause stability issues with this plant

the vascular meristem immediately below this region. Roots can initiate from the base of a cutting or up the stem where a hormone response is achieved, and typically callus (Scar tissue) can be seen swelling under the bark and forcing it off the stem at the basal cut and roots may subsequently initiate from this area.

In the case of callus production, excessive miss-shaped lumps on the cutting base can inhibit root production or a few roots may develop from these cuttings, however these tend to be not of good quality. Excess callus can also be a result of excess hormone concentration or cutting material selection and usually results in low or poor strike rates.

Personal experience propagating *Tibouchina heteromalla* 'Jules' revealed that using a basal dip of 1000ppm IBA also caused callus formation on the leaf surfaces along the veins within days of treatment and then soon after leaf abscission, usually resulting in cutting death. At 1000ppm, the IBA had a phytotoxic effect on the cuttings. Once concentrations were reduced to 150-200 ppm IBA, the cuttings reliably produced healthy roots without the detrimental effects observed at the higher concentration.

The two artificially manufactured hormones commonly used for root initiation of cuttings are;

Indole-3-YL-Butyric Acid (IBA) & Naphthylacetic Acid (NAA)

The ability for most nurseries to obtain and effectively use IBA and NAA hormones as actives makes the proprietary off the shelf products appealing for use. Three commercial available formulations are based solely on IBA and one contains both IBA and NAA.

As with any chemicals it is essential to understand risk factors involved with use and exposure so refer to specific product labels and Safety Data Sheets (SDS) for use conditions. Heat and UV light may cause degradation of certain hormone formulations so it is advisable to store them under refrigeration, however as with all other chemicals they should never be stored with foodstuffs.

Hormone formulations

Powder

Talcum powder is used as a filler to dilute the undissolved crystalline IBA concentration. At neutral pH, IBA is a relatively insoluble compound where only small amounts are likely to dissolve on the cutting base in sap or water to be available to initiate roots.

Alcohol

Rootex-L® consists of IBA dissolved in an ethanol base at 4000ppm. This can then be diluted with water to achieve the desired concentration. This product does work well and for some material it is a good option and where a convenient best fit solution is desired.

Gels

Clonex® is a potassium based gel formulation being available in various concentrations of 1000, 4000 and 8000 ppm IBA whilst being combined with some other ingredients such as vitamins and nutrients. Unlike alcohol based formulations, sensitive cutting material does not burn and being a gel there is improved potential for retention of the product and hormone on the base of the cutting after the cuttings are treated and stuck in the growing media. Gels can offer advantages over both the talc and alcohol based formulations and are extremely useful in the various concentrations available.

Detergent

Esi-root® is a detergent based liquid that can be used for dunking or soaking applications. The latter method of application has numerous benefits and few disadvantages. Compared to other hormones applied to the base of cuttings, application rates are significantly lower and often by more than a factor of 100. Esi-root® is a mix of both IBA and NAA. The inclusion of NAA notable as it is a strong root promoting hormone and works at low concentrations, noting that required concentrations vary depending upon cutting type. Cuttings soaked in this solution will take up NAA and IBA through all plant surfaces and be translocated to the base of the cutting. If cuttings are not fully turgid they may be reinvigorated once left in the solution.

Excess field heat may be removed from the material once soaked in the solution and this will aid early cutting survival and ultimately success.

Large numbers of cuttings can be prepared using the soaking method as cuttings are not deteriorating once prepared, allowing for more systematic propagation activities. Due to fully turgid material and sticking into well-watered propagation media, cuttings don't need to be watered in once stuck and placed in the propagation environment, allowing for more absorption of the hormones from the wet cutting surfaces.

Drawbacks of soaking cuttings in a hormone/hydrating solution

Any latent pathogens on the cuttings are more likely to be spread to other cuttings so selection of high health status material is essential.

Some plant material doesn't respond to being either saturated or in NAA and leaves will go glassy and shed from cuttings even when soaked for short periods of time. By example *Allamanda cathartica* 'Sunee' is one such plant, while cuttings of *Gardenia jasminoides* 'Radicans' and *Ixora compacta* 'Sunkist' have been left soak in Esi-root® solutions overnight with no observed deleterious effects.

Conclusion

There are numerous options and combinations for clonal propagation. To achieve excellent results it is essential to trial the range of options available to gain an understanding of the complex interactions between plant material, hormones, growing media and the propagation environment. While this may seem onerous it will ensure efficient space utilisation, optimum crop performance and ultimately it is an investment in long term profitability.

The ultimate goal is to produce cuttings with excellent roots that radiate unrestricted from the cutting to provide lateral support for the plant and faster, healthier more robust crops to be supplied to customers. Many other factors also affect cutting strike rate such as stock plant health, stage of growth and juvenility. These factors also need to be determined but have not been discussed here.

Further reading

Hartmann & Kesters Plant Propagation: Principles and Practices 8th edition by Hartmann, Kester, Davies and Geneve

Hygiene in plant propagation, Nursery Papers December 2004, Issue no. 11

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NURSERY PAPERS

October 2015 Issue no.9

In this month's Nursery Paper, NGIA Policy and Technical Officer, Chris O'Connor examines the recently released Australian Standard AS2303:2015 Tree stock for landscape use.

After many years of discussion, debate and development, AS2303:2015 Australian Standard Tree stock for landscape use was introduced in April 2015. This paper will cover the need for a standard, some of the background in developing the standard, some of the key aspects of the standard and future developments for the standard.

The Need for a Standard

Standards are not new to the industry and most of industry would be aware of *AS4454:2012 Composts, soils conditioners and mulches* and *AS3743:2003 Potting mixes*, but let's look first at what a standard is. A standard is a document which sets specifications and/or procedures to ensure products, services or systems are safe, reliable and consistent. Standards also establish a common language for defining quality.

The industry should see the following outcomes from the implementation of the Australian Standard for tree stock for landscape use.

- Improved tree stock quality overall.
- Recognition for growers of high quality tree stock and a market driver for those growers.
- Consistent and nationally recognised specifications for growers, specifiers and purchasers of landscape tree stock.
- Increased support for the investment into and likelihood of success of green infrastructure projects.

It must also be noted that AS2303:2015 Tree stock for landscape use is <u>NOT</u> mandatory and is a voluntary standard.



Root circling is a tree stock defect which the standard addresses.

The Development of the Standard

The drivers and benefits of a standard for treestock have been long recognised, however it has taken a number of years to successfully establish a standard. The first attempt in creating a standard started in 2006 however failed by 2010 due to a lack of support and consensus. The second attempt in developing a standard was initiated in 2012 and this was successfully implemented in April of 2015.

The standard development was guided through consultation with the Standards EVO18 committee, as well as through public and industry consultation. The EVO18 committee saw representation from a wide range of stakeholders including;

- Arboriculture Australia
- Australian Institute of Horticulture
- Australian Institute of Landscape Architects
- Australian Local Government Association
- Institute of Australian Consulting Arboriculturists
- Local Government Tree Resources Association
- Nursery & Garden Industry Australia
- Parks and Leisure Australia
- TAFE NSW
- The University of Melbourne

Much of the standard has been based upon the previous work "Specifying Trees: A Guide to Assessment of Tree Quality" authored by Ross Clark and published by NATSPEC. This publication was and is still used by many in the industry as a method to evaluate tree quality and as a de-facto standard since its first edition was published some two decades ago in 1996. Readers who are familiar with this publication will no doubt see much commonality with the standard.

Terminology

For those not familiar with Australian Standards there are some key consistent terminologies used which readers must be familiar with. The first term is "shall", which is used to state a requirement which must be strictly followed in order to conform to a Standard. When this term is used there can be no deviation from that requirement, unless there is a specified tolerance. When standards are applied in legislation the term "must" is considered an equivalent.

The second term is "should" which introduces a suggestion or recommendation which is not a requirement, so it is not necessary to be followed in order to comply with the Standard. Likewise 'should not' and 'may not' are only suggestions and are not required to be complied with.



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Stem bark ridges shall be convex

The third term "mandatory" is a term used to describe a provision of a Standard to which it is necessary to comply with so as to be able to claim compliance with the Standard. Examples of mandatory requirements include test requirements to be met or records to be kept.

The fourth term is "Normative" and this term describes an element of a Standard which must be conformed to in order to comply with a Standard. So it is similar to "mandatory" but applies to a whole element (part, section or appendix) which may demand multiple requirements, whereas mandatory applies to an individual requirement (a sentence or paragraph, a clause or a table).

The last term "informative" is a term used to describe an element (clause, note or appendix) of a Standard that gives additional information, recommendations and/or guidelines which is not mandatory. The information in an informative seeks to explain & clarify mandatory elements and provide assistance in complying with the standard.

The Standard in Detail

The Standard consists of 34 pages in total divided into four sections as well as a foreword and appendices.

- i. Foreword
- ii. Section 1 Scope and General
- iii. Section 2 Criteria for Tree Stock Assessment
- a. Above ground assessment
- b. Below ground assessment
- iv. Section 3 Tree Stock Balance Assessment
- v. Section 4 Testing
- vi. Appendices A E



Staking is permissible and may be necessary in production, however stock in 45L pots or greater must be self supporting on dispatch



Foreword

The foreword contains a preamble which highlights the intent of the standard and provides some background to tree stock production and aspects of tree quality. It is noted in the foreword that the term tree covers a broad range of species which are highly variable and influenced by many factors. Bearing this in mind, the standard provides for a sound method of determining tree stock quality which is flexible in its application.

Section 1 - Scope and General

The first section of the standard covers the scope of the standard noting that it specifies criteria to assess above and below ground characteristics of tree stock supplied for landscape use. Also noted is that the standard applies to all methods of production systems covering container grown, containerised bare rooted and ex ground tree stock. Noted exceptions to the standard include palms and tree stock grown for topiary, espalier, bonsai, pollarding or coppicing, as well as tree stock transplanted from the landscape to place other than a production nursery.

The first section also covers the application of the standard and a detailed list of terms and definitions specific to this standard.

Section 2 - Criteria for tree stock assessment

The second section specifies the criteria for the above ground and below ground assessment of tree stock which are used in determining quality tree stock for landscape use. For the above ground assessment of tree stock a number of criteria are covered, some of which are noted below.

Firstly the tree or batch should be labelled with the correct botanical nomenclature (true to type) and the height and calliper of the tree recorded.

The tree should display good health considering the time of year, location and stage of growth. Considering these aspects, tree health can be demonstrated through crown cover, form and density, as well as leaf colour and size and the absence of epicormics shoots and dieback. The tree should also be free from significant injury and wounds apart from pruning conducted in accordance with AS 4373.

Crown Symmetry is considered, noting that differences in tree crown distribution on opposite sides of the stem axis are no greater than 20%.

Apart from atypical species, the stem calliper at any given point is less than the stem calliper at any lower point, in other words the stem tapers to the apex of the tree.

Moving onto stem structure, at any branch union the stem diameter above the branch union is greater that the diameter of the branch at the point of attachment. In tree stock with a defined central leader an apical bud must be intact and the stem doesn't deviate more than 150 from the vertical axis. For branch dominant tree stock the terminal buds must be intact and any unions are sound.

Although support through staking may be required during production, at the time of dispatch treestock in containers 45L or greater need to be self-supporting, for containers less than 45L the tree stock should be self-supporting.

The standard notes that included bark (concave) shall not be present and stem or branch bark ridge unions are outwardly turned (convex). Included bark is where bark grows between the branches inside a branch union usually where two or more branches are growing closely together. Branch unions with included bark are more prone to failure than convex unions. Albeit some species may display included bark as a characteristic this should not detract from the aim to eliminate included bark from tree stock.

In grafted tree stock, the scion and rootstock must be compatible for the entire graft perimeter and the graft union sound. Additionally excluding bark and cleft grafts, the scion diameter immediately above the graft is within 20% of the rootstock diameter immediately below the graft. The second major component of section two focuses on the below ground assessment requirements of tree stock. Some aspects of the below ground assessment are discussed in the following paragraphs.

Firstly the rootball must meet specific requirements for depth and diameter; for instance rootballs of containers 45L or greater should have a diameter greater than their depth, conversely however rootballs of tube and cell stock shall have a depth exceeding their diameter.

In relation to rootball occupancy, when removed from the container, 90% of the growing media volume needs to remain intact around the rootball. This can be assisted by the requirement that treestock in containers 45L or less have undergone primary root division at least once and that tree stock in larger containers must have undergone primary root division at multiple intervals.



The tree on the left demonstrates a symmetrical crown, whilst the tree on the right demonstrates an asymmetrical crown with more than 20% difference in distribution.

Roots need have grown in an outward and downwards direction and there is to be no evidence of circling roots, girdle roots kinked roots or j-roots. Roots must also not display signs of suckering at the time of dispatch.

Finally for both above and below ground assessments the tree should show no evidence of active pests or diseases or weeds. weeds. It is noted that the Nursery Production Farm Management System contains information on the management of pests and diseases.

Section 3 - Tree stock balance assessment

The third section of the standard relates to the tree stock balance assessment. The tree stock balance assessment is a guide to assess tree stock grown in containers of greater than 20L or ex-ground treestock. It is a way of describing the proportional relationship between the above and below ground aspects of the tree stock factoring in tree height and stem calliper (size index) as well as the rootball volume.

The size index of tree stock is a good indicator of the selfsupporting nature of trees and likewise a sufficient rootball volume also contributes to the trees ability to support itself in the landscape.

To determine the tree stock balance, firstly the ratio of height to calliper or size index needs to be calculated by multiplying the height of the tree in metres by the calliper in millimetres. The resulting size index figure is then applied to a table in appendix E which gives a nominal container size appropriate for the tree stock based upon a size index range.

It is noted in the standard that tree stock are living products and hence species, production processes and climatic conditions can influence the height/calliper ratio. Hence it is important to understand that the tree stock balance assessment should not be used in isolation and rather it should inform a part of a holistic assessment of tree quality.

Section 4 - Testing

The fourth section covers testing methods to demonstrate compliance with the standard and the retention of documentation. The three listed methods of compliance demonstration include; testing at dispatch, internal nursery production systems which ensure compliance with the standard and as part of an audited quality assurance (QA) program.

Appendices

The standard contains 5 appendices, with A & B being normative and appendices C, D & E being informative.

Appendix A covers sampling strategies based upon AS 1199.1 suggesting the number of trees to sample based upon the size of the production batch. The testing process for treestock analysis is also covered by this appendix. Moving on Appendix B details the procedures and test report requirements for assessing rootball occupancy and root division and direction at the time of dispatch.

Appendix C provides two examples of treestock inspection forms which may be used or modified for recording inspection data.

Appendix D is an informative appendix which provides guidance on treestock height and calliper measurements and expected rootball diameters. Three categories are presented for tall slender species, general species and stockier thick stemmed species.

Appendix E is an informative table used in conjunction with section 3 to offer advice on the nominal container sizes for specific size index ranges.

The standard moving forward

The major area of contention during the formation of the standard, centred on the tree stock balance concept and its calculation as it applies to varying production regions and across various species. As noted in the standard, NGIA committed to undertake research to evaluate the tree stock balance parameters across all climatic regions of Australia. This research has been successfully tendered by Horticulture Innovation Australia and will be conducted by Western Sydney University through a levy funded research project. The project is expected to conclude in March 2017 and the results will be used to guide a future update of the standard.

AS 2303:2015 Tree stock for landscape use is available for purchase from the SAI Global store online at http://infostore.saiglobal. com/store/Details.aspx?ProductID=1796682 and it is highly recommended that tree growers purchase this standard for use in their business.

For further information on Australian Standards please refer to the standards website www.standards.org.au

References and further reading

Standards Australia 2015, *AS 2303:2015 Tree stock for landscape use* available from www.standards.org.au Standards Australia 2014, *Standards Development SG 003*: Standards and other publications available from www.standards.org.au

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NGIA 2013, National Plant Labelling Guidelines www.ngia.com.au

NGIA 2013, Nursery Industry Accreditation Scheme Australia Best Management Practice Guidelines 5th Edition www.ngia.com.au

Compiled and edited by Chris O'Connor NGIA Technical and Policy Officer; banner photography by Anthony Tesselaar.



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WHAT TO EXPECT FROM CURRENT R&D PROJECTS

The end of 2015 marked the beginning of a swag of new research and development (R&D) projects that benefit and support the nursery industry. In this Nursery Paper we will take a look at how R&D priorities are set, what the current projects aim to deliver and how anyone can put forward new ideas for funding to investigate critical issues affecting the industry.

Summary

- New research and development projects have been funded in the key areas of biosecurity, tree stock balance and the 202020 Vision.
- A communications project is in place to get the key messages out to industry.
- Strategic Investment Advisory Panel announced for the nursery industry.
- Projects rely on support from everyone in the industry – being involved is rewarding for you and your business.
- Hort Innovation has a new online ideas portal that anyone in the industry can use to suggest R&D priorities.

EFFECTIVELY COMMUNICATING R&D OUTPUTS

Horticulture Innovation Australia Limited has recently funded five new projects that directly benefit the nursery and garden industry. Summaries of these projects are provided on the following pages.

These projects fit within the strategic investment plan for research, development and extension projects that:

- address key environmental issues
- identify opportunities for growth
- enhance best management practice
- build stakeholder collaboration and partnerships
- drive industry innovation, expertise and knowledge.

The communication and extension of R&D project outputs and recommendations is an important function of Nursery & Garden Industry Australia (NGIA). The new 'Communications program for the Australian nursery industry 2015-2018' will deliver these outputs and recommendations through a variety of familiar and new channels, including Nursery Papers, the Your Levy @ Work website and e-newsletter, the NGIA website, articles in industry publications, posts on social media platforms, case studies, videos and information kits outlining representative and levy arrangements for the nursery industry.

Central to the delivery of this project will be collaboration between NGIA and public relations company Cox Inall Communications.

SETTING R&D PRIORITIES FOR THE NURSERY INDUSTRY

Hort Innovation is assembling Strategic Investment Advisory Panels for each of its industries to provide advice on research and development activities funded by industry levies, and matching funds from the Australian Government.

The skills based panels are comprised of industry supply chain stakeholders, the majority of whom are to be levy paying growers.

The Strategic Investment Advisory Panel – Nursery Industry will meet at least twice each year, will operate within clearly defined objectives and be guided by the strategic priorities set out in the industry's strategic investment plans.

Putting forward R&D ideas

Hort Innovation has established a new way to capture ideas and concepts from anyone interested in furthering the capacity and knowledge base of the nursery industry.

An online form, open to the public, provides a straightforward method to submit a proposal into the pipeline of research and investment concepts.

http://horticulture.com.au/about/ investing-is-our-business/conceptproposal-form/

> Horticulture Innovation Australia



Horticulture Innovation Australia

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CURRENT RESEARCH PROJECTS IN SUMMARY



EVALUATION OF NURSERY TREE STOCK BALANCE PARAMETERS (NY15001)

Root to shoot balance is considered central to the rapid establishment and successful growth of tree stock used in landscape planting.

The characteristics of high quality tree planting stock are well known, and a voluntary industry standard is in place (AS2303:2015 Australian Standard Tree stock for landscape use). However, the impact of species differences and climatic conditions is less well understood, especially for high-value container and ex-ground tree stock.

A team of researchers at the University of Western Sydney's Institute for the Environment (HIE) is working to fill this knowledge gap through a review of international and trade literature, and field studies with nursery growers throughout Australia. They will collect quantitative baseline data on the regional differences in root to shoot balance of tree planting stock and the corresponding performance of those trees, working with two or three production nursery businesses in each of the mainland states.

At each site they will survey at least five tree stock species from three categories: 1) tall, slender species that are typically faster growing; 2) general species with average form and growth rates; and 3) stockier or thick-stemmed species that are typically slower growing.

This will enable the team to provide industry with guidelines to achieve consistent, high quality results when planting tree stock grown in different regions in Australia.

The outputs from this project will include:

• root and shoot balance look-up tables to check that nursery stock conforms to the Australian standard (AS2303:2015)

- a comprehensive review of horticultural and forestry science literature
- research reports and communications briefs of the recommended best practice
- peer-reviewed articles in scientific and trade journals.

Of most practical use for growers and the extended value chain will be the root/shoot balance tables.

BUILDING THE RESILIENCE AND ON-FARM BIOSECURITY CAPACITY OF THE AUSTRALIAN PRODUCTION NURSERY INDUSTRY (NY15002)

Biosecurity in the production nursery setting continues to be a high priority for R&D projects, due in part to the industry's inherent exposure to plant pest and disease incursions.

Being 'on the front foot' at the 'front line' is considered to be the most pragmatic approach to biosecurity, and previous projects have seen over 800 people from the nursery industry participating in training workshops.

Researchers from the Department of Agriculture and Fisheries, Queensland entomology and plant pathology teams will lead this new project through to December 2020.



The practical outputs that production nursery businesses can expect from this project include:

- a variety of tools to assist in the early detection and diagnosis of potential pest infestations (be they exotic or domestic), making management and eradication more effective
- training opportunities (in person and online) for business owners and staff to increase their knowledge and understanding of practices that reduce the likelihood of pest and disease outbreaks
- expansion of the Pest Identification Tool for Insects, Beneficials, Disease, Disorders and Weeds of Nursery Production
- 10 free diagnostic samples to all NIASA businesses each year and significant discounts on diagnostic services for all nurseries
- new resources in the form of factsheets, Nursery Papers and articles in industry publications.

NATIONAL NURSERY INDUSTRY BIOSECURITY PROGRAM (NY15004)

A new national biosecurity program will secure better market access and safeguard the industry from the potential effects of plant pest incursions.





The first six months of the program will focus on bringing together the wealth of biosecurity resources that the industry has already generated, including the Nursery Production Farm Management System (NPFMS) governance documents, electronic audit platforms and manuals.

At the production level, BioSecure HACCP will be the centrepiece of the program. BioSecure HACCP is a pest management system and certification program with online document management and certification, which will promote more flexible market access for certified businesses. Certified businesses will benefit through smoother interstate trade and improved negotiation with the Department of Agriculture and Water Resources – Biosecurity (formerly known as AQIS).

Over the next few months the project team will survey growers currently involved in the NPFMS across Australia to assess their interest in adopting BioSecure HACCP. The survey will collect ideas and identify growers who are willing to contribute to the planning phase of the project and guide the construction of the market access resources that will be required. NGIA is the lead agency for the National Nursery Industry Biosecurity Program, which will run until December 2020.

The practical outcomes that can be expected from this project include:

- a national MoU signed, recognising BioSecure HACCP as a national legal market access instrument in participating Australian jurisdictions
- negotiated market access implemented across Australia for all participating jurisdictions relevant to nursery stock and Entry Condition Compliance Procedure (ECCP) developed, approved and implemented
- training packages available to growers via a web-based platform for each ECCP
- at least 50 businesses BioSecure HACCP certified and actively engaged in market access through the electronic NGI Audit Management System (AMS)
- continued work at a government and policy level to increase the level of biosecurity preparedness of the nursery industry
- improved industry biosecurity awareness (delivered partly through the NY15002 project).





CAPACITY BUILDING WORKSHOP FOR THE 202020 (NY15007)

The 202020 Vision Strategy aims to have 20% more green space in urban areas by 2020.

Republic of Everyone is leading this new capacity building project to hold two Urban Forest Masterclasses in Australian cities, following the success of two sessions in Perth and Melbourne previously, involving personnel representing 70 urban local government areas (LGAs).

The ultimate aim is to encourage all 139 urban LGAs to plan and implement an Urban Forestry Strategy, which is considered one of the major projects within the 202020 Vision Plan.

The speakers at these events are chosen to address specific issues and ideas relevant to the locality, with sessions designed to achieve rapid transfer of practical information and to encourage discussion amongst participants regarding ways to increase and improve the green space in urban areas. The practical outcome of this project for nursery businesses is the increased awareness amongst councils, planners and developers of the value of providing more green space in existing and newly developed urban areas, and the subsequent increase in demand for a variety of plant types.

EXTENSION OF BARRIERS TO ADOPTION OF 202020 VISION GOALS (NY15008)

In 2014, Hort Innovation engaged project consultants Josh Byrne Associates (JBA) to identify barriers to the adoption of 202020 Vision Goals (NY14007), including regulatory barriers, planning constraints and implementation difficulties.

Republic of Everyone will lead the current project to identify practical solutions to those policy constraints.

The project will focus on gaining a deeper understanding of the regulatory and planning processes that LGAs follow when making decisions about urban green space and how to influence the relevant regulatory and legislative levers. The practical outcomes of this project will be proposed solutions to the constraints LGA planners and policy makers currently face when making decisions about increasing the area allocated to, and the type of, green space projects.

The resources generated through this project will assist the nursery industry in their campaign to achieve the 202020 Vision for urban green space in Australia.

LINKS TO RESOURCES

Tree stock standard AS2303:2015 Australian Standard Tree stock for landscape use. Available for purchase from SAI Global: infostore.saiglobal.com

202020 vision website: http://202020vision.com.au/ help-centre/growers-hub/



THE VALUE OF A LEAFY NEIGHBOURHOOD

People like living in leafy suburbs, and an avenue of a single tree species has a special appeal—but what value do homebuyers place on having trees along the street and how does the size, age, health and diversity of the trees influence their purchasing decisions? These were the questions that University of Queensland researcher Lyndal Plant set out to answer. Ms Plant's research has quantified the additional value that homebuyers place on the quantity and type of trees in the streetscape.

Summary

- Homebuyers are willing to pay a premium for houses in leafy streets—and the leafier the better.
- Homebuyers tolerate 'a mixture, but not a mess' when it comes to types of trees in the streetscape.
- House values above the median sale price are achieved where the species diversity in nearby streets includes up to six species.
- Streetscapes with mature trees also attract premium house prices.
- Local government tree managers are seeking greater species diversity in the urban environment to improve the resilience of urban forests.
- The nursery industry can meet the likely increased demand with a range of high quality tree species options for councils and developers.

DIVERSITY IN STREETSCAPE VEGETATION

A diversity in street tree species within the urban forest can better suit the wide-ranging growing conditions and infrastructure constraints of roadside environments, provide resilience to changing climatic conditions, minimise pest and disease impacts and optimise the multiple functions of green infrastructure.

However, little was known about how tree species diversity within Australian streetscapes might influence homebuyers' decisions. With 69 per cent of Australian residents being home owners, the preferences they express through their house purchase patterns can assist with, and inform, the community consultation process regarding streetscape developments.

In the Brisbane City study area there was strong support for a limited level of species diversity within streets and a strong preference for some mature aged trees in the streetscape. These findings suggest some tolerance on the part of homebuyers, but also some caution required by councils and developers when moving toward more resilient, multipurpose streetscapes with mixtures of tree species at the street scale.

THE BUSINESS CASE FOR STREETSCAPE PLANTINGS

The average level of footpath leafiness (i.e. 35 per cent footpath tree canopy cover) added \$26.8–29.5 million to house sale prices in residential Brisbane in 2010. This was more than twice the annual costs of planting and maintaining the street vegetation and related insurance claims. Another \$2 million per year was also returned to the local council through increased rates revenue and to the state government in stamp duty taxes.

Home owners in Brisbane highly value street trees, which are paying their way in property value benefits alone. Returns to local councils and other beneficiaries suggest a strong case for collaborative investment in sustaining leafy streetscapes.

ANNUAL COSTS AND REVENUE RELATED TO PLANTING AND MAINTAINING STREET TREES IN BRISBANE, 2010





This project has been funded by Horticulture Innovation Australia Limited using the Australian Nursery Industry levy and funds from the Australian Government. Horticulture Innovation Australia

NURSERY PAPERS May 2016

THE RESEARCH

Study method

This study used both linear and spatial regression analysis with house sale price as the dependent variable along with ten house, property and suburb attributes, and five to six street tree attributes as independent/ explanatory variables. This type of analysis is also called a Hedonic Price Model (HPM), where the sale price of the house is explained as a function of the 'shopping trolley' of attributes homebuyers are willing and able to afford in making their purchase.

Each attribute that makes a significant contribution to explaining the price variance in a sample of house sales can be 'unpacked' or isolated and its value calculated while controlling for the effect of other



Tree maturity is more important than tree size.

attributes. Also called a 'revealed preference valuation' method, HPM uses actual house sales data rather than data collected through stated preference surveys.

Data from house sales between 2008 and 2010 was combined with attribute data from spatial analysis, Census 2011 and Brisbane City Council 2010 street tree survey data across 80 sample sites. Two data sets were analysed:

- house sales where street trees were present on the front footpath
- house sales where street trees were present within 100 m of the property, but were not present on the front footpath.

Street tree features were converted to two continuous, and up to four dummy, variables for each house sale. Dummy variables are used to test the contribution of just two scenarios for a particular attribute, such as footpath frontages with or without powerline constraints and the effect of mature and aged street trees compared to all other age categories. Features of street trees on the front footpath not found to be significant were not tested again in the nearby streetscape data set.

TABLE 1: HOUSE, PROPERTY, SUBURB AND STREET TREE FEATURES USED IN THIS STUDY.						
House variables	Property variables	Suburb variables	Suburb variables Street tree features			
 Sale price (\$) Number of bedrooms Number of bathrooms Number of garage spaces 	 Lot size Distance to nearest park 	 % house sales in pre-war (WW2) suburbs % house sales in post-war (WW2) suburbs % households with income in upper quartile % households with Yr 12 or higher education level Distance to CBD (Translink zone) 	 On the property frontage Number of street trees Average tree height (m) Powerline constrained or not Tree health-poor, good Tree age – Mature+aged, Maturing, New+juvenile 	 Within 100m of property frontage Number of street trees Average tree height (m) Species richness (number of species) Species diversity (Shannon-Weiner) Tree age – Mature+aged, Maturing, New+juvenile 		



Study results

This research investigated the value that Brisbane homebuyers place on street trees on the property frontage and nearby. It has revealed that while homebuyers are indifferent to street trees on the property frontage and within 30 m of the property, leafy streetscapes nearby (within 100 m of the property) are significant and valued. In addition, street tree size, type and condition were not significant, but the age and level of species diversity within the street does influence the price homebuyers are willing to pay for houses with similar structural, property and location features.

Street tree features on the front footpath explained 70.4 per cent of the variance in house sale prices of that sample. However, only one of the six street tree attributes was significant at the 90 per cent probability level. Street trees in the mature and aged (>16 years) category had a significant positive effect and, when other variables were held constant, these trees added a 6.92 per cent premium to median house sale price. However, the small sample size limits the robustness of this model.



Mature trees provide a significant positive contribution to house sale price.

The second stage of this analysis confirmed the significant effect of mature and aged street trees nearby on house sale price and an indifference to tree size. While species diversity had no significant effect on house price, species richness (or number of species) was significant and negative. The greater the number of different tree species in the street, the lower the house sale price.

Using a dummy variable equivalent to the mean number of street tree species nearby (5.85 species), a threshold of no more than six species reversed this negative effect to a significant positive effect. Six or fewer different species added \$15,015 (or 2.86 per cent) to the median house sale price and each additional street tree nearby added \$683 to the median house sale price.

The presence of some mature age street trees nearby added between \$17,168 and \$17,220 to the house sale price (3.27 per cent to 3.28 per cent above the median house sale price). This premium is equivalent to the price the same home buyers were willing to pay for houses with 0.66 extra bedrooms or located almost twice as close to the city centre.

In summary, home buyers expressed their preference for more street trees, especially of mature age, and less variety, through their willingness to pay a premium house price.



Brisbane home buyers prefer less diversity in tree species mix (tolerance for up to six species) at the street scale.



IMPLICATIONS OF THE FINDINGS FOR PLANNERS

There is a strong business case for the establishment and maintenance of trees in the streetscape with returns from property value premiums flowing to both homeowners and government. There is evidence of some level of support for increased diversity in urban forest planting within streetscapes, however, this study suggests that the community in Brisbane has a preference for a low level of diversity—fewer than six different street tree species within 100 m of a property.

While such levels of diversity tolerance align with Brisbane's streetscape design guidelines for 'neighbourhood streets', introducing too much of a mixture of tree species to satisfy resilience or biodiversity targets at individual streetscape scale in other cities may require substantial community consultation. Species diversity within streets is perhaps the most delicate scale, which must be tested with local communities in other cities and perhaps across different residential forms such as multi-unit dwellings or mixed use streetscapes.

The value expressed by home buyers in having street trees of mature age nearby also supports the investments that local government and developers made in the past. The increased premiums that buyers are willing to pay for these streetscape features translates to increased property values and tax revenues and support ongoing investment in planting, maintenance and protection of street trees within the urban environment.



Local governments prefer tree species that are compatible with ground-based pruning.

IMPLICATIONS OF THE FINDINGS FOR THE NURSERY INDUSTRY

This study lends weight to the business case for increased investment in the establishment and maintenance of urban forests and multifunctioning streetscape environments in Australian towns and cities.

It will provide further support to the messages of the industry's 202020 Vision – to create 20 per cent more green space in urban areas by 2020. For the industry, this will help to drive demand for product and increase the size of the nursery market, providing more opportunities for growers.

Local governments are increasingly keen to strategically expand their urban forests and streetscape designers will be looking for more variety and high quality stock.

The 'AS2303:2015 Australian Standard Tree stock for landscape use' provides guidelines for nursery professionals to use when preparing tree stock for streetscape uses. The new nursery levy-funded 'Evaluation of Nursery Tree Stock Balance Parameters' project (NY15001) will also provide key resources to the nursery industry regarding the optimal root to shoot balance of different tree stock species grown in different climatic regions of Australia. Root to shoot balance is considered central to the rapid establishment and successful growth of tree stock used in landscape planting.

The Brisbane community's preference for streetscapes with trees that have grown to mature age also supports nursery industry strategies for the provision of high quality, high-value container and ex-ground tree stock to local government and developers. Consultation in other towns and cities may highlight a different set of home buyer preferences.



BRISBANE'S GREENSCAPE TARGETS

- Restore 40 per cent of mainland Brisbane to natural habitat by 2026
- Continue to be the capital city with the highest level of biodiversity in Australia
- Reconnect ecological corridors that facilitate wildlife movement
- Provide 50 per cent tree shade cover to footpaths and park pathways
- Maintain 95 per cent of Brisbane's population living within a five minute walk to a local park

This work has been funded by Horticulture Innovation Australia Limited using the Australian Nursery Industry levy and funds from the Australian Government, through the project Research and Development Program 2014/2015 for the Production Nursery Industry (NY13029) and was undertaken by University of Queensland PhD student Lyndal Plant.

The research used data made available under licence agreement from Brisbane City Council.

LINKS TO RESOURCES

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202020 Vision: www.202020vision.com.au

Appendix 6

Nursery Papers Page Views

	Total Views
Nursery Paper	Apr 2013 - Apr
	2016
Supporting and Advancing Australian Plant Breeding	1133
Ornamental Plant Breeding in Australia	1406
Working towards greener cities	901
Assessment of hand watering in production and retail nurseries	1036
A generic economic decision model for the nursery industry to assess proposed changes to a business	874
Upgrading an irrigation system can improve water uniformity and reduce your operating expenses	1074
Do soil moisture sensors have a role in containerised nursery production?	1076
Smart Approved WaterMark: Helping consumers make water-wise choices	921
A taster of innovative technologies for the nursery & garden industry	1079
Changing perceptions for a stronger future	835
Promoting the green credentials of the nursery & garden industry to the consumer through World Environment Day	874
What is NIASA and how can it benefit you?	1902
Nursery Paper March 2008	1670
Plant Breeders Rights- An Australian Nursery & Garden Industry Perspective	1154
The art of strategic merchandising	1766
Transforming a dead spot into a hot spot: how to make the most of your retail space	1012
Avoiding the Discount Addiction	1087
Taking control of your future - business succession planning	996
Reducing the water weed risk - How government and industry can contribute to a safer trade	898
Plant Intellectual Property	902
Managing emergency plant pest incursions - the Emergency Plant Pest Response Deed (EPPRD) and the nursery industry	1230
Future options - moving on from retailing or growing	936
Water management in retail nurseries and garden centres	1029
Water use in the nursery and garden industry - results of the 2006 Water Use Survey	1002
EcoHortâ. C - the environmental management system for Australian nursery production	1677
Weeds and the nursery industry	1036
Non-ornamentals: the forgotten members of our industry	922
Future options: new directions for a profitable future	1239
Scheduling irrigation to maximise efficiency	1279
Home is where the heart is	921
Get the recognition you deserve - the Certified Nursery Professional Program	882
How efficient is your business water management?	1018
Gardening: A modern-day oasis?	937
How do the new water rules affect your business?	947
Nurserv and Garden Industry Strategic Plan 2006-08	893
Protecting your business against fire	852
The cultural experience of retail	995
Adding value to your product, your service and your customers experience	974
Threes a crowd, the three generation workplace.	902
Advising, Allocating and Approving - the role of the IAC	862
Achieving a profitable husiness	1260
Inderstanding nonulation and social trends	1200
Professional strategies for profitable products and businesses	922
Develonment Officers Ruild Retter Rusinesses	890
Greenbouse design	2962
Hygiene in plant propagation	3290
Marketing programs: ideas from garden centres	1547
Lising not plants to clean indoor air	1193
Managing Western Flower Thrins using Integrated Pest Management (IPM)	1135
Water restriction effects on gardeners, and how to respond	930
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Appendix 7

Industry Policy



Australian Nursery & Garden Industry Environmental Sustainability Position

Version 2 February 2014

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You

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Foreword

The sustainable development of Australia's nursery and garden industry is a principal concern for Nursery & Garden Industry Australia (NGIA). In recent times, the importance of environmental stewardship has been brought into sharp focus through issues such as drought, climate change and natural resource management. These issues have required careful consideration and management by NGIA to ensure sound environmental outcomes are achieved.

This Position Document 'Australian Nursery & Garden Industry Environmental Sustainability Position' provides the public and other key stakeholder groups with a summary of NGIA's views on key environmental issues. This document captures the many environmental achievements of industry and reaffirms that NGIA is committed to achieving on-going improvements in its environmental performance and is well positioned to act positively in improving our environment. The publication of this Position Document firmly cements Australia's nursery and garden industry as a true, green industry that has long been concerned about working in harmony with the environment for a sustainable future.

This Position Document has been finalised by NGIA following feedback from State and Territory Nursery & Garden Industry Associations as well as members. NGIA gratefully acknowledges this assistance.

I highly recommend this Position Document for your reading.

Dr Anthony Kachenko Research and Market Development Manager Nursery & Garden Industry Australia

February 2014



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1 Introduction

Nursery & Garden Industry Australia (NGIA) is the peak national industry body representing producers, retailers and allied traders involved in the production of plants across all states and territories of Australia. In partnership with state and territory peak industry bodies, NGIA is responsible for overseeing the national development of the Australian nursery industry.

The nursery and garden industry provides significant economic, cultural, social and environmental benefits to the Australian community. Nationally, production nurseries support a diverse array of end users through the provision of green-life as starter crops or finished products. End users include retail outlets, landscapers, cut flower growers, orchardists, vegetable growers, interiorscapers, sustainable forestry and revegetation enterprises. Production areas are well established with some having been in existence and having industry representation for over 100 years. Along the supply chain, allied traders provide products and services that support the production, sale and health of green-life and include growing media and fertiliser manufacturers.

Owing to the diverse nature of nursery production, and its customer base, nurseries typically occur in urban, peri-urban and regional localities across Australia. As such, industry is confronted with a variety of environmental and natural resource impediments that require careful consideration and management to ensure sound environmental outcomes are achieved. NGIA recognises that maintaining a healthy environment is critical for a viable and thriving industry and is mindful that preserving the environment in a rapidly changing landscape is a necessity that shouldn't be overlooked. Government policy can also impact on the sustainability of industry and therefore it is imperative that industry is prepared for the challenges and opportunities that may arise through this process.

The Australian nursery industry has had a long history of embracing change and managing key environmental issues through investment in research, development and extension programs via the nursery products levy. The purpose of this Environmental Sustainability Position is to demonstrate that the industry remains committed to safeguarding the environment and minimising any adverse environmental impacts of its operations. To this end, the industry is committed to working with government, research organisations, the community and other stakeholders to address and manage key environmental issues.

This document covers environmental issues across all sectors of the supply chain from cradle to grave, including issues pertinent to the gardening public and the broader community. By responding to and undertaking activities in relation to key environmental issues such as climate change and natural resource management, the industry aims to ensure that these issues are addressed through a triple bottom line approach. This will inevitably result in the sustainable development of the Australian nursery and garden industry.


2 Mission Statement

Position the Australian nursery and garden industry as the community's leader on relevant environmental issues

3 A sustainable future begins here

In response to the issue of sustainability and environmental responsibility, NGIA has developed this Environmental Sustainability Position. This document demonstrates NGIA's commitment to environmental sustainability, the appropriate management of the association and its operations, the engagement of businesses in principles and applications of sustainability and the engagement of and collaboration with the broader community.

The industry recognises that sustainability of the environment directly affects the sustainability of businesses. NGIA is engaged in helping to build a sustainable future and has developed several initiatives to ensure the use of environmentally sound practices across the full supply chain. These initiatives cover a wide range of environmental issues, framed to encourage and not discourage the industry. NGIA is committed to promoting and encouraging environmentally sound business practices and is dedicated to assisting industry in working towards this goal.

NGIA is committed to maintaining an Environment & Technical Committee for the ongoing improvement of this Environmental Sustainability Position. This national committee will review this document biennially and make necessary revisions as/where required. An environmental risk assessment matrix, developed by the Environment & Technical Committee, underpins this document. This matrix depicts key environmental issues that have the

potential to impact on the sustainability of industry and is reviewed every six months by the Environment & Technical Committee.



Environmental Sustainability Position

4 Environmental Best Practice Programs

4.1 Nursery Production Farm Management System (FMS)

The Australian nursery industry operates a tiered suite of internationally soughtafter best management practice (BMP) programs nested under the Nursery Production Farm Management System (FMS).

These programs include:

- Nursery Industry Accreditation Scheme Australia (NIASA) BMP.
- EcoHort environmental stewardship and natural resource management.
- BioSecure HACCP biosecurity management.

These programs are available in separate streams, to production nurseries, growing media manufacturers and greenlife markets.

4.2 Nursery Industry Accreditation Scheme Australia (NIASA)

NGIA encourages production nurseries, growing media manufacturers and greenlife markets to gain NIASA accreditation and operate in accordance with national Best Management Practices (BMP). These guidelines detail industry BMP for crop hygiene, crop management practices, water management and general site management and have been developed over two decades by respected industry representatives and researchers. They are reviewed annually by the National Accreditation and Certification Committee to ensure they cover relevant and current production and environmental issues. This national, third party audited scheme, developed in 1994, aims to enhance business professionalism, profitability and encourage continuous improvement whilst being mindful of the environment. The program can also be used as a reference guide to assist in the setup and establishment of new businesses. NIASA also serves as a base level of certification which must be achieved prior to EcoHort and BioSecure *HACCP*.

4.3 Environmental Management System – EcoHort

NGIA advocates the adoption of EcoHort across all production nurseries, growing media manufacturers and greenlife markets. EcoHort is an industry specific Environmental Management System (EMS) that provides businesses with a systematic approach to assess their environmental and natural resource management responsibilities, as part of their daily business management.

This program addresses the following key areas:

- Efficient irrigation
- Wastewater management
- Nutrient management
- Managing biodiversity
- Efficient energy use
- Waste minimisation
- Land and soil management
- Pest & weed management, and
- Recycling of waste products





The EcoHort guidelines provide businesses with the tools to ensure they can demonstrate to industry, government and the community, their sound environmental and natural resource stewardship and compliance with the diverse range of environmental legislation. This national third party audited EMS offers businesses with a risk assessment-based pathway to continuously improve their management systems. Businesses engaged with EcoHort must first achieve NIASA accreditation.

4.4 BioSecure HACCP – Guidelines for Managing Biosecurity

BioSecure HACCP is an industry-specific biosecurity program for production nurseries, growing media manufacturers and greenlife markets. This third party audited program provides businesses with a systematic approach to assess on-farm biosecurity hazards and responsibilities and it details how to best manage these identified risks. These guidelines have been developed following HACCP, which is the world recognised standard in risk management processes.

BioSecure HACCP guides businesses in:

- Assessing their current and future pest and disease risks
- The implementation of management strategies at critical control points
- Identifying internal and external threats to the integrity of a business biosecurity preparedness
- The establishment of an effective internal quarantine process for both imported and exported plant material
- The conduct of internal audits and self-improvement systems

Businesses engaged with BioSecure HACCP must first achieve NIASA accreditation.

4.5 Environmental Best Practice for Garden Centres

4.5.1 Australian Garden Centre Accreditation Scheme

The Australian Garden Centre Accreditation Scheme (AGCAS) is a national third party audited industry managed scheme, designed to raise retail standards, encourage business improvement and promote excellence in garden retailing. NGIA encourages engagement in this scheme across all garden centres throughout Australia. Embedded in this scheme are four environmental modules to provide businesses with a high level of environmental awareness. These modules provide industry standard guidelines on water, weeds, chemicals and waste management to ensure businesses reduce their environmental footprint. A key component of this program is to position AGCAS businesses as a trusted and reputable source of information for the general public.



5 Biosecurity preparedness

One of the biggest threats to the Australian environment is the introduction of exotic pests. Owing to Australia's geographic isolation, it has remained relatively free from many exotic pests such as Sudden Oak Death (Phytophthora ramorum), that have significantly affected other parts of the world. To ensure Australia remains proactive in managing biosecurity, a 'whole of community' approach, involving State and Federal Governments, industry and the wider public is required.

NGIA acknowledges that it plays a vital role in the biosecurity continuum, and as such, maintains a policy position on biosecurity referred to as 'Reducing the Pest Risk' and is actively engaged in several biosecurity initiatives across Australia. NGIA is also a member of Plant Health Australia (PHA) further demonstrating its willingness to participate in this arena.

NGIA has developed a number of supporting tools and documents to assist industry in its biosecurity responsibilities. Resources include:

- Biosecurity Manual for the Nursery Production Industry
- Pest Fact Sheets
- Best Practice Videos
- Pest Management Plans
- Farm Biosecurity Signage

5.1 Industry Biosecurity Plan for the Nursery Industry

Developed in 2005 the Industry Biosecurity Plan for the Nursery Industry provides a blueprint for the exclusion, eradication and control of key pests relevant to the Australian nursery industry. This plan is a living document and undergoes review by the Industry Biosecurity Group annually to embrace changes to industry biosecurity. Reviews to the document saw a version released in 2008 and another in May 2013.

This plan is vital to ensure industry has the capacity to better prepare for and respond to, incursions of pests ensuring the future sustainability and viability of the industry. As part of the Industry Biosecurity Plan for the Nursery Industry, NGIA has developed contingency plans for key pests which provide background information on the pest biology and available control measures to assist with preparedness in the event of an incursion. Each contingency plan provides guidelines to assist in developing a pest specific Response Plan.





5.2 Emergency Plant Pest Response Deed

In 2005, NGIA became a signatory to the Emergency Plant Pest Response Deed (EPPRD). As a signatory to the EPPRD, NGIA is at the forefront of developments in biosecurity. The EPPRD is a progressive partnership arrangement that sees Australian industries and Governments cooperating as equal parties in the management of emergency plant pests (EPPs).

An EPP can be defined as a:

- Known exotic plant pest
- Variant form of a plant pest already established in Australia
- New serious plant pest
- Plant pest that is being officially controlled in Australia but requiring a significant emergency response to ensure that there is not a large scale epidemic of regional or national significance

As part of this deed, NGIA is directly involved in categorising the EPPs based on their likely environmental, human health, trade, economic and industry impacts. In the event of an incursion, NGIA is also directly involved in decision making about mounting and managing EPPs relevant to industry. In 2013 the nursery and garden industry agreed to establish a biosecurity levy, to be enacted during an EPP Incursion thereby meeting its funding obligations under the EPPRD.





6 Climate change and variability

Australian horticultural industries (which include nursery production) fall under the umbrella of Agriculture, which is responsible for approximately 16% of Australia's greenhouse gas emissions. Of this 16%, Australia's combined horticultural emissions account for approximately 1.2%. The Australian nursery and garden industry has the capacity through the production of living products to make a significant contribution to reducing greenhouse gas emissions and may also play an integral role in mitigating climate change and variability.

Historically, the industry has shown to be resilient and adaptive in response to environmental pressures; no more noticeable than the ongoing drought which continues to impact across large expanses of Australia. In light of this adversity, the industry has the capacity to cope with climate change and remain viable in a highly variable climate. In February 2011, the Australian nursery and garden industry released a policy position on climate change and variability in order to further cement its position on this issue.

NGIA has developed a carbon foot printing tool to estimate emissions from production nurseries. This tool can provide full lifecycle and cost/ benefit analysis to measure the environmental impacts of specific nursery lines from cradle to grave. This model will benchmark the carbon footprint of production nurseries, identify areas of improvement and prioritise potential actions for mitigation through offsets or emission reductions. Emission benchmarking, based on nursery 'best practice' emissions, will be reviewed and updated as technology improves.

NGIA recognises that greater adoption of renewable energy technologies is a sound approach in reducing the demand on nonrenewable energy, hence reducing emissions. NGIA has developed a Renewable Energy Calculator for growers to evaluate energy co-generation, namely solar and wind power for the generation of electricity onsite. Utilising renewable technologies in lieu of non-renewable energy may present opportunities for growers to also potentially reduce economic burdens. Fact sheets have also been developed to guide industry on renewable technologies.



6.1 Urban forestry

Urban forestry - encompassing the planning, design, establishment and management of trees and forest stands in public or private areas - has become widely accepted both locally and internationally as an essential element in the built environment. In addition to the amenity value, the urban forest provides a multitude of environmental, human health and wellbeing benefits including:

- Improved air quality through interception of pollutants and oxygen production
- Reducing the impact of the Urban Heat Island Effect
- Improving human mental and physical health
- Provision of habitat for plants and animals
- Consumption of C0, through photosynthesis
- Maintaining ground water hydrology and reducing the load of rainfall
 on stormwater infrastructure
- Production of food for humans
- Stabilisation of climate
- Maintaining soil organic matter
- Enhancing soil nitrogen and recycling of nutrients
- Provide a sense of place and enhanced community
- Improved aesthetics

NGIA urges greater recognition of the benefits associated with urban forests and the role they play mitigating climate change and variability. In 2009, NGIA hosted the inaugural Urban GreenScapes Symposium to position green-life and plants as an integral part of the solution to climate change by presenting the research and the reasoning in the areas of environment, health/wellbeing and planning to support this.

Since the 2009 Urban Greenscape Symposium, NGIA has actively supported and funded research focused on the benefits of the urban forest with leading researchers from around the country including the Commonwealth Scientific and Industrial Research Organisation (CSIRO). NGIA has also invested in the development of Australian data for use in the iTree suite of software tools that allow for urban forest analysis and an assessment of the benefits provided by the urban forest. This peer reviewed tool is free to use and allows urban forest managers to quantify the urban forest as a community asset.

In 2011, NGIA became a founding partner of the National Urban Forest Alliance (NUFA) which is an alliance of key stakeholders such as Arborists and councils, who have a focus on the promotion

and councils, who have a focus on the promotion and investment into Australia's Urban Forest. The vision of NUFA is to promote a thriving, sustainable and diverse Australian urban forest that supports healthy ecosystems which are valued and cared for by all Australians as an essential environmental, economic, and community asset for future generations.





7 Managing water

Water is considered a finite resource, and one that industry is dependent upon for the production and care of plants. Industry recognises that managing water efficiently is a key driver to sound environmental performance and is committed to achieving improvements in water use efficiency across whole of industry. In recent years, industry has developed several initiatives that demonstrate the Australian nursery and garden industry is an efficient and responsible water user.

Given the significant importance water has to the nursery and garden industry, NGIA maintains a policy position on water.

7.1.1 Nursery Industry Water Management Best Practice Guidelines

Developed in 1997, with the third edition published in 2010, these guidelines promote best practice water management in production nurseries. These guidelines highlight five key areas to achieve sustainable water use:

- 1. Efficient water use to minimise water demand
- 2. Increased reuse of waste water to minimise water demand
- 3. Efficient management of sediment and litter
- Maximum retention of nutrients to improve efficiency of production and maintain water quality
- 5. Environmentally responsible use of plant protection products to promote quality plants

7.1.2 Smart Approved Water Mark

NGIA in cooperation with Water Services Association of Australia, Australian Water Association and Irrigation Australia developed the Smart Approved Water Mark program. This independent program is Australia's national labelling scheme for outdoor water efficient products and services and is supported by the National Water Initiative, and the Water Smart Australia program. Both NIASA and EcoHort programs have been Smart Approved WaterMark certified as approved services since 2010.



7.1.3 Water Management Toolbox

NGIA is committed to ensuring production nurseries are equipped with the most up-to-date irrigation system delivering optimum water use efficiencies. To achieve this, The Water Management Toolbox (www.watertoolbox.ngi. org.au) has been developed to assist production nurseries in on-farm water management.

This resource comprises of simple calculators for growers to manage nursery irrigation and drainage water to support sustainable and responsible use of water resources as well as the industry accreditation, certification and training programs. The calculators are derived from:

- The popular industry book titled 'Managing Water in Plant Nurseries'
- The industry training program Waterwork
- Existing industry programs and Nursery and Garden Industry Queensland

7.1.4 Managing nutrients in production nurseries

NGIA supports the pragmatic use of fertilisers to minimise nutrient leaching from potting media during irrigation of containerised plants. Research by NGIA into experimental reed beds, as a mechanism to filter nutrient laden run-off water from nurseries, resulted in a 90% reduction of nitrate and 96% of the phosphate present in nursery run-off. These reed beds can also eliminate Phytophthora.

Where feasible, NGIA encourages the uptake of this technology as a viable mechanism to efficiently remove nutrients and organic matter from nursery run-off.





8 Invasive plants

Industry is committed towards lessening the impact of invasive plants on the natural environment and halting the spread of garden escapes. The nursery and garden industry is responsibly working towards eliminating known invasive plants from sale to ensure a sustainable future for generations to come. To achieve this, industry consults scientific literature to identify potentially invasive plants. In recent years, NGIA has taken significant steps forward in tackling the spread of invasive plants and maintains a policy position on invasive plants since 2009.

8.1 Grow Me Instead



The national *Grow Me Instead* (GMI) educational program is the largest and most important initiative undertaken by NGIA to reduce the spread of potentially invasive plants. This program has been designed to educate stakeholders including landscapers, government, industry, gardeners and the wider public about potentially invasive plants and the impact they may have on the environment.

For each state/territory, a GMI booklet has been developed that identifies potentially invasive garden plants and suggests superior, non-invasive alternative plants. The GMI program has also been developed into a rich online resource

(www.growmeinstead.com.au) with an interactive database. Through this program, NGIA is committed to educating the public about making responsible plant choices and managing potentially invasive plants they may already have.

8.2 Plant Risk Assessment Tool

In conjunction with a number of key Botanical Gardens, Regulatory Agencies and Researchers, NGIA has developed an online weed risk assessment tool (www.plantrisktool.com.au) based on peer reviewed science. This database can be used by growers, retailers and consumers to determine the weed risk potential of specific plants based on regional climatic data.



8.3 National Plant Labelling Guidelines

NGIA recognises the importance of correct naming and labelling of plants, including the use of full species names. In collaboration with plant nomenclature experts, industry stakeholders and horticulturists, NGIA has developed national plant labelling guidelines, which were updated in January 2013. These guidelines provide direction on how to correctly label plants and include:

- Correct botanical names nomenclature
- Intellectual property Plant Breeders Rights and Trademarks
- Plant growth requirements and characteristics
- Potentially harmful plants health and environment

8.4 Plant Safely

The Plant Safely website (www.plantsafely.com.au) aims to highlight some of the potentially hazardous gardening items, organisms and activities commonly found in gardens and provide useful information, resources and links to help reduce the risks that they may pose.

Topics covered by the Plant Safely website include invasive plants, poisonous plants as well as general information on the safe use of garden chemicals. This website is the only comprehensive garden safety site on the web and provides easy links to organisations that are subject matter experts on issues of gardening safety.





9 Managing waste

NGIA promotes the reduction in waste materials entering landfill. The industry is committed to minimising waste and maximising efficiencies by reducing, re-using, recycling and donating waste where appropriate.

This is demonstrated by the industry's use of bark and coconut fibre (coir), waste by-products of timber and coconut harvesting, as a component of the raw ingredients that constitute a professional growing media and waste minimisation programs incorporated in EcoHort.

10 Education initiatives

NGIA recognises that educating staff and business owners about key environmental issues is vital to ensure industry is adequately equipped with the knowledge and skills to competently tackle these issues head on. A skilled industry will cultivate innovation and a responsiveness to change that will enable it to command the knowledge required to excel as the community's leader on relevant environmental issues. To achieve this goal, industry has developed multiple training packages including:

- EcoHort An introduction to EMS for production nurseries
- BioSecure HACCP Guidelines for managing biosecurity in nursery production
- Environmental Management for Retail Garden Centres How to implement EMS in retail garden centres
- Waterwork series Water treatment, irrigation, recycling and fertigation options for production nurseries and retail garden centres
- Recognising and Monitoring Pests and Diseases
- Control & Management of Pests
- Implementing Integrated Pest Management
- Growing Media Handling and physico-chemical properties of growing media in the context of industry Best Practice

These training packages are offered through face to face workshops and field days as well as online via the NGIA eLearning portal (www.ngia.talentlms.com).

10.1 Best Practice Manual for Pesticide Application in the Nursery and Garden Industry

The nursery and garden industry recognises that safe pesticide use is vital to protect individuals and the environment and promotes best practices for handling, storage and disposal of pesticides. NGIA has developed BMP for pesticide application to assist production nurseries identify and understand the range of pesticide application equipment available and the key issues relating to the use of pesticides in the nursery environment. An industry tailored pesticide management diary to record pesticide application events has also been developed to further assist in BMP.



11 Environmental extension

11.1 Industry Development Officer network

Extension of nursery and garden industry research and development is paramount to improve the environmental standing of industry. The Industry Development Officer (IDO) network, established in the early 1990s, is the primary conduit for the extension of industry research and development to businesses. This valuable resource of qualified and experienced professionals provides the skills and expertise required by business to ensure they operate in an efficient, productive and sustainable manner.

The IDO network is also responsible for:

- Developing research and development projects
- Managing and/or facilitating training
- Representing industry on environmental
- Delivering industry developed environmental BMP to businesses

11.2 Environmental communication

NGIA publish monthly Nursery Papers which provide information to the whole of industry on key issues that impact industry. The Nursery Papers report on research and development outcomes, emerging environmental issues and business sustainability. The information presented is clear, concise and includes actionable conclusions to assist in greater uptake.



NGIA also provides targeted environmental communications through social media including the Your Levy at Work Blog, Facebook, Twitter and YouTube pages as well as the NGIA website.



12 Participating in the broader environmental debate

Industry believes that increasing public awareness about key environmental and sustainability issues is paramount to achieve behavioural change and is committed to being a community leader on relevant issues. Likewise industry also believe that there is scope for those in positions of influence such as politicians and regulators to effect positive change at the macro level by developing favourable policies and processes to incorporate greenlife as an essential component to urban design.

Many Australians are keen to make change at a grass roots level, by making a difference in their own backyard. Indeed, 89% of Australians want more trees and green space in their local environment. In order to achieve this, retail garden centres are well positioned with experience and an understanding of local environmental issues. Furthermore, they are seen by the community as a credible source of information on key environmental issues.

12.1 202020Vision

202020 Vision is the latest marketing campaign facilitated by the Australian nursery industry with the objective to increase urban greenspace by 20% by the year 2020. This will be achieved through influencing the influencers namely government at Local, State and Federal levels, major developers, town planner's and landscape architects. The campaign provides a collaborative platform of information and facilitates the exchange of ideas between key communities in order to understand, recognise and establish urban green space co-benefits.

202020 Vision is supported by the body of research conducted both locally and internationally of the benefits of the urban forest. Further details on the campaign can be found at www.202020vision.com.au





13 Research & development

Key environmental issues such as climate change and variability, biosecurity, water availability and invasive plants will continue to impact on the long term health and sustainability of the nursery and garden industry. These key environmental issues, where they are managed well, can present our industry with opportunities for growth.

In order for Industry to identify these opportunities and enhance industry's capacity for innovation, the nursery and garden industry is committed to investing in research and development. NGIA's research and development program aims to lessen the impact of industry on key components of the environment and conserve and enhance Australia natural resources. By linking with national research institutions and external stakeholders, the nursery and garden industry will minimise duplication and maximise transfer of knowledge to industry through greater research and development outputs. All completed levy funded research and development reports can be accessed on the NGIA website via a searchable database.

Research and development will enhance industry capacity for innovation, expertise and knowledge to promote a sustainable future & position the industry as an environmental steward and leader.

14 Further information

If you would like more information about the NGIA Environmental Sustainability Position, contact NGIA on: (02) 8861 5100 or info@ngia.com.au; or visit www.ngia.com.au



This Policy Position has been funded by Horticulture Australia Limited using the Nursery Industry Levy and matched funds from the Australian Government.



National Plant Labelling Guidelines

Version 2 January 2013





GUIDELINES FOR LABELLING OF PLANTS

Introduction:

These guidelines for labelling plants have been developed by the Australian nursery industry in conjunction with the Tree & Shrub Growers Victoria, the wider industry and a legal team with a specialist interest in intellectual property within the nursery industry. They are recommended for adoption by all plant producers, suppliers of plant material, plant retailers and label manufacturers.

These guidelines have been developed to reduce confusion and provide clear guidance in relation to the content of labels used on plants, and how plant information is conveyed to the market. These guidelines also support the efforts of regulators to address market access, invasive plant and potentially harmful plant issues.

Objectives of the Guidelines:

Provide a standard of acceptable and recommended guidelines for the nursery industry to adopt in preparation of labels and marketing material.

In these guidelines the definition of a label is any tag, brand, mark or statement in writing or any representation or design or descriptive matter on or attached to or used in connection with or accompanying any plant or plant material. This covers labels attached to plants, barcodes, sleeves, bulb cards, seed packets, planting guides; plant lists catalogues, printed plant pots and electronic representation.

To assist in understanding the obligations of providing clear, unambiguous and accurate information on labels and to avoid the public or others in the plant trade from being misled and deceived.

It is not the aim of these guidelines to include everything that should be on every label produced. It is to provide guidance on how to correctly deal with issues including:

- 1. Correct botanical names nomenclature
- 2. Intellectual property Plant Breeders Rights and Trademarks
- 3. Potentially harmful plants health and environment

Definitions:

- 1. <u>Botanical Names</u> A botanical name is the actual scientific name for the plant. It is the only internationally unique identifier for the plant.
 - **1.1. Species:** A wild or natural species is the smallest population which is, in human terms, distinct and distinguishable from all others. It is the primary taxonomic unit, and gene exchange within the species occurs freely, while exchange between species via hybridization is usually restricted or even impossible.

The name of a species is <u>always</u> identified by a botanical name comprising two words; the genus name and a specific epithet or species name (e.g. *Grevillea rosmarinifolia*). A botanical name must be latinized, and validly published in a recognised international journal in order to be legitimate.

- **1.2.** Hybrids: If natural hybrids do occur, the name of a hybrid can be given as the two species names separated by a multiplication sign e.g. *Calystegia sepium* x *Calystegia silvatica*, or if an author wishes, a latinized binary name linked by the multiplication sign e.g. *Calystegiax lucana* (the same taxon as the last example)
- **1.3.** [Botanical] Variety: 'Variety' used in a taxonomic sense describes members of a species that differ from others of the same species, in a naturally occurring population, in minor but heritable characteristics. A variety is often a local or ecological race or ecotype.

The botanical variety name must be published and is latinized. It is used in conjunction with the name of the genus and species with the added abbreviation 'var'. e.g. *Ceanothus gloriosus* var. *exaltatus*.

- Note. The recognition of a distinct variety also automatically means that there is a typical variety of the species i.e. *Ceanothus gloriosus* var. *gloriosus*. Using the name *Ceanothus gloriosus* does not imply the typical form and the user of the name may be unaware of the existence of varieties.
- 1.4. Cultivated plants: When a naturally occurring species is domesticated and 'bred' to change its characteristics, new 'cultivars' are developed. The term cultivar and botanical variety cannot be used interchangeably (see above). Cultivars are of diverse nature e.g. clones, self-fertilized lines or lines of hybrid origin developed in cultivation. In Plant Breeder's Rights terms, a 'plant variety' or a 'variety' is the same as a 'cultivar'.

Cultivar names can be associated with a genus name, a species name or a hybrid. They are not latinized, are written with an initial capital letter

and in single quotation marks e.g. *Rubus idaeus* 'Malling Wonder', *Viburnum x bodnantense* 'Dawn', *Rosa* 'Crimson Glory'.

- 2. <u>Intellectual Property</u>: -Intellectual property represents the property of your mind or intellect. In business terms, this also means your proprietary knowledge.
 - 2.1. Plant Breeders Rights: Plant Breeder's Rights (PBR) are time-limited exclusive commercial rights, granted by IP Australia for a plant variety that has been bred (i.e. a cultivated plant), is new, distinct from all other know varieties, uniform and stable. In PBR terms, a 'plant variety' or a 'variety' is generally the same as a 'cultivar', not to be confused with the botanical variety described above. The rights are a form of intellectual property, like patents, trade marks and copyright, and are administered under the Plant Breeder's Rights Act 1994.
 - 2.2. Trade marks: A trade mark is used to distinguish the goods and services of one trader from those of another. A trade mark is a sign, for example a word or logo, which is used to indicate that *a plant has been grown by a particular grower*. The use of trade mark is implying that the owner of the trade mark has control over trade in relation to that plant. The owner of a trade mark can license others to use the mark. This use can be subject to conditions which could be in relation to quality and origin of the end product and the class of product to ensure that the integrity of the trade mark is maintained. This would apply to plants grown under licence that are grown to a particular standard. Trade marks should not be used on plants if the trade mark owner has no control over the way it is used in relation to a product.
 - 2.3. Copyright: Copyright protects the original expression of ideas, not the ideas themselves. It is free and automatically safeguards your original works of art and literature, music, films, sound recording, broadcasts and computer programs from copying and certain other uses. Copyright is not registered in Australia but arises automatically when the work is created. Copyright can apply to labels, manuals, brochures, videos, photographs and other such works developed by a business.
 - 2.4 Plant Patents: 'A patent is a right that is granted for any device, substance, method or process that is new, inventive, and useful' (IP Australia web site). Plant related patents may be obtained over a plant variety, a process for producing a plant variety or biological information (e.g. a DNA sequence). In Australia new plant varieties can be patented if they meet the criteria, but this should not be confused with a 'plant patent' granted in the United States. The latter is granted under a special section of the patent law (designed to meet UPOV requirements) which applies

specifically to asexually reproduced plant varieties. In the USA, the Plant Variety Protection Act only covers sexually reproduced plants. Sexually and asexually reproduced plant varieties can also be the subject of a normal US utility patent if they meet the relevant patent criteria, as in Australia.

3. <u>Potentially harmful plants</u>:

Consumer Health – A potentially harmful plant is a plant that causes:

- Poisoning: that is a toxic reaction when put into the mouth or ingested, or
- A skin reaction, that is a rash, swelling, dermatitis, allergy, pain or infection when handled or when skin comes into contact with a plant part, or
- Respiratory problems as a result of exposure to pollen, perfume or sawdust.

Environment – An environmentally harmful plant is one that:

- Has been identified to have sufficient weed impacts as to warrant publication of national specific control recommendations.
- Is undergoing assessment for potential invasiveness utilising National Guidelines to variety or cultivar level and may need increased awareness remanagement, or disposal.
- An invasive plant has the ability to thrive and spread aggressively outside its natural range. A naturally aggressive plant may be especially invasive when it is introduced to a new habitat. An invasive species that colonizes a new area may gain an ecological edge since the insects, diseases, and foraging animals that naturally keep its growth in check in its native range are not present in its new habitat.

The Guidelines

It is recommended that a label be:

- in the English language,
- legible and prominent in distinct contrast to the background,
- indelible must not fade or be able to be rubbed off under normal conditions, and
- true and correct regarding information (i.e. not false or misleading).

Required Information:

a. The botanical name of the plant is always written in italics with the first word or genus name having a capital letter and the species written in lowercase e.g. *Grevillea rosmarinifolia*. The name of a

validly published natural variety is also written in italics and separated from the species name by the abbreviation var., e.g. *Ceanothus gloriosus* var *exaltatus* (compare with cultivated variety below).

b. A cultivar name (cultivated variety) is always written with a capital letter, single quotation marks and is not italicised e.g. *Grevillea rosmarinifolia* 'Nana'. If the cultivar name (referred to as the plant variety name in PBR terms) is subject to protection under the Plant Breeders Rights Act the PBR symbol can be used beside the cultivar name, e.g. *Grevillea rosmarinifolia* 'Nana'. Then somewhere on the label the full PBR text should be included.

Appendix 2 contains a copy of the PBR Industry Guidelines for the use of the PBR symbol and letters.

- c. **The common name** for the plant (when this differs from the botanical name). This is not required to be written in any particular way and preferably **must not** be depicted in italics or in quotation marks or in any way to confuse it with the botanic or cultivar name.
- d. **Plant cultural notes.** These provide guidance on the requirements for the plant to be successfully grown and should cover:
 - Brief description
 - Desirable characteristics
 - Preferred aspect
 - Preferred soil type
 - Likely height and width at maturity
 - Special uses (e.g. bird attraction, suitable for coastal conditions)
 - Any necessary cautions (e.g. potentially harmful plants [health and environment], invasive tendencies or disposal guidelines).

This information may be provided by text or pictogram but must be easy to understand and accurate.

If a grower uses a trade mark as a commercial designator to identify the plant as **originating from that grower** the trade mark should also appear on the labels.

a. The trade mark is **not to be used as the botanical or cultivar name of the plant** or as a substitute for the botanical or cultivar name of the plant.

- b. If a trade mark is used on the label it should be consistently used in the same way on all labels which bear that trade mark. Preferably it should be depicted in capital letters, fancy script, in bold print or a colour all of which are different to the way in which the botanical and cultivar names are depicted.
- c. If the trade mark is registered the ® can be used in close proximity to the trade mark. If the trade mark is awaiting registration or is an unregistered trade mark the letters ™ can be used in close proximity to the trade mark until registration is achieved. The TM is normally in capital letters and 'raised' above the name/expression it is associated with. This is also the case with the ® symbol.
- d. The trade mark should be followed with a noun or the botanical name, the cultivar name or the common name, e.g. EVERGREEN CASCADE [®] Weeping Alder Alnus jorullenesis 'Pendula'. It is recommended that the botanical name be in a font size that is in proportion with the general label font and is legible.

License Names or Trade Marks:

- a. Where a grower uses a cultivar name which is the subject of protection under the Plant Breeders Rights Act and the use of that name is licensed to the grower by the PBR owner, the grower should indicate that he/she is the licensee of the PBR protected variety. The label should be in accordance with this guide and any terms of use in the licence agreement.
- b. Where a grower uses a trade mark under license from another party the grower should use the trade mark in accordance with this guide and also in accordance with the licence agreement with the other party. It is recommended that the grower indicates that the trade mark is used under license e.g. EVERGREEN CASCADE [®] Weeping Alder Alnusjorullenesis 'Pendula' used under licence.

Other Notices:

a. Some growers may wish to include a "passing off" notice on their plant labels. Such a notice is appropriate and can be used when the grower has adopted a trade mark to identify the commercial origin for a plant and the trade mark has been used to such an extent (either as a registered or an unregistered trade mark) for a reputation to have developed in that trade mark. [e.g. This plant has been promoted by XYZ Nursery in the course of their business. ANY PERSON PASSING OFF a plant or plants as being those of XYZ Nursery or their authorised distributor by using the name XXYYZZ or imitating this label will be liable to civil action.] A "passing off"

notice is not to be directed to the botanical name, cultivar name or common name of the plant. To date, many uses of the "passing off" notice have not been used in conjunction with the correct use of a trade mark. Growers must be careful in the correct use of any "passing off" notice(s).

A copyright notice may appear on the label if the grower is the owner of copyright in the artistic material or photographs appearing on the label, e.g. © Copyright 2005 – (XYZ Nursery).

b. It is recommended that the grower seeks legal advice to determine ownership of copyright.

Potentially Harmful Plants - Consumer Health

1. <u>Introduction:</u>

Australians are fortunate in having access to a wealth of plant species. Most of these are harmless. However, there is a level of public concern regarding the potential harm from some plants in the house and garden. These guidelines for labelling will ensure that the public is informed of potentially harmful plants.

Plants that are known to be harmless do not require a warning.

A list of potentially harmful plants that are harmful if eaten can be found in Appendix 1.

This list has been established as a guide only by Nursery and Garden Industry Australia (NGIA). It was developed from a combination of reputable international and local sources and contains the list of plants known to be potentially harmful. The list will be regularly reviewed and updated by the NGIA Board and relevant subcommittee(s) with input from external expertise. This list is restricted to potentially harmful plants that are commonly cultivated for sale, and excludes weeds of national significance e.g. Lantana camara.

The list of potentially harmful plants posted on the <u>NGIA website</u> will be considered to be the most up-to-date list.

Disclaimer:

While every effort has been made in preparing this list, Nursery and Garden Industry Australia, accepts no responsibility for any errors, omissions or inaccuracies. NGIA accepts no responsibility to persons who may rely on this document, in whole or in part, for whatever purpose. As new species are continually being discovered and commercialised they need to be verified by authoritative institutions such as State Herbariums.

2. <u>Need for Referencing on the Label</u>

The required wording for each potentially harmful plant is as per Appendix 1 and must be presented in such a way as to not be confused with the general text of that label (as per the definition of a plant label).

Potentially Harmful Plants - Environment

The Nursery and Garden Industry is an active participant in processes relating to invasive plant management. The correct identification of plants by their botanical name will ensure accuracy in plant identification. The diversity of plant lists and regional focus of plant producers make it essential that there is an agreed scientific process for risk assessment that is valid to variety or cultivar level. With this in mind, the Australian nursery industry has recently developed an invasive plant risk assessment tool which can ascertain the degree of invasive risk associated with plants. This can be accessed by visiting the <u>NGIA website</u>.

Plant producers are urged to adhere to the following recommendations:

- Be aware of the legislation relevant to plant production and trade in their area. All plants on the WONS list are banned from production, sale or trade in all jurisdictions in Australia. Details of the WONS list can be found by clicking <u>HERE</u>.
- Do not produce plants for sale if they are on the <u>National Environmental Alert</u> <u>List</u> and <u>Noxious Weeds List</u>. This list is jurisdiction specific and will impact on what may be sold in various regions. The label should state any restrictions to where the plant is grown.
- Review the degree of invasive risk associated with plants available for sale using the Australian nursery industry invasive plant risk assessment tool.
- Provide cultural guidelines re plant management if a plant MAY show invasive characteristics e.g. Remove seed heads after flowering, dispose of plant or fruit via burial or approved composting facility.

General Requirement for Industry:

A grower must take all reasonable steps to avoid using labels for ornamental plants which are misleading or deceptive or likely to mislead or deceive. To mislead someone may include leading them to a wrong conclusion, creating a false impression or making false and inaccurate claims.

Designing and printing labels can be a difficult, detailed and expensive operation if done incorrectly. NGIA would recommend that you seek independent legal advice in this area to check your labels for accuracy and compliance before printing. You should also ensure your label supplier is providing labels that conform to the guidelines.

If barcodes are used on labels then they should comply with standards set by GS1. A copy of these can be found on the <u>GS1 Australia website</u>.

Questions or Issues:

Any questions or complaints about the content of plant labels can be directed to the Nursery & Garden Industry Australia, 7129 Baulkham Hills BC NSW 2153 or your state or territory nursery industry association. The version of these guidelines located on the NGIA website is the latest and current version. The Guidelines will be reviewed every 3 years by the NGIA Board and relevant subcommittee(s).

References and Links:

- Botanical Names database: <u>www.ars-grin.gov/~sbmljw/istaintrod.html</u> accessed October 2012.
- Code of Recommended Retail Practice Relating to the Labelling and Display of Potentially Harmful Plants - Published for its members by The Horticultural Trades Association December 2005
- Frohne, D. and Pfänder H. J. (2005). Poisonous Plants: A Handbook for Doctors, Pharmacists, Toxicologists, Biologists and Veterinarians. Manson Publishing, UK.
- IP Australia (for PBR, Trademark and Patent information) <u>www.ipaustralia.gov.au</u> accessed October 2012.
- McKenzie, R. (2012). Australia's Poisonous Plants, Fungi and Cyanobacteria, A Guide to Species of Medical and Veterinary Importance. CSIRO Publishing, Australia.
- Noxious Weeds List by State Jurisdiction: <u>www.weeds.org.au/noxious.htm</u> accessed October 2012.

Plants and fungi poisonous to people in Queensland: Queensland Government Booklet 2005 – Queensland Health and Environmental protection Agency.

Primefact 359 – Garden Plants poisonous to people. NSW DPI: November 2006

The Plant List: <u>http://www.theplantlist.org/</u> accessed October 2012.

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The Australian Centre for Intellectual Property in Agriculture (ACIPA) Griffith University, Queensland

SUMMARY AND EXAMPLES

The examples below indicate how these guidelines should be put into practice.

We have identified eight different kinds of names that now appear quite frequently on retail plant labels and here we show how the words "spring splendour" can be presented in different ways to indicate different kinds of names.

Botanical Name:

• The botanical name is the single unique identifier for the plant and should be placed somewhere on the label. It may be put on the back of the label when the front is used for strong promotion. Botanically this is the species name consisting of the genus and specific epithet.

Grevillea rosmarinifolia

• If the plant is a botanical variety of this species it would be written:

Grevillea rosmarinifolia var exaltatus

• If the plant is a cultivar of this species it would be written:

Grevillea rosmarinifolia 'Spring Splendour'

- In the above botanical name the words 'Spring Splendour' in single quotes are known botanically as the cultivar epithet and this kind of botanical name is often referred to as the cultivar name. As presented here the cultivar has no legal protection.
- Note: the terms 'cultivar' and 'botanical variety' refer to very different things and must not be used interchangeably. In Plant Breeder's Rights terms, a 'plant variety' or a 'variety' is the same as a 'cultivar'.

Synonym:

• Alternative or old names are placed in brackets after the botanical name.

Corymbia citriodora (syn. *Eucalyptus citriodora*). In Plant Breeder's Rights terms, a synonym is generally an alternative plant variety name that is included in the application for PBR.

• The synonym is placed immediately after or under the botanical name.

Trade Marks

- These are generally placed on the front of labels as promotional brand names.
- An unregistered common law trade mark:

SPRING SPLENDOUR ™ Grevillea rosmarinifolia

- In this example the TM would indicate an unregistered trade mark, and that Spring Splendour is a brand of *Grevillea rosmarinifolia*.
- A registered trade mark:

SPRING SPLENDOUR® Grevillea rosmarinifolia

- In this example the [®] would indicate a registered trade mark and that Spring Splendour is a brand of *Grevillea rosmarinifolia*.
- The trade mark cannot be used as the botanical or cultivar name of the plant or as a substitute for those names.
- There are no absolute rules on writing trade marks. However, in general a plant trader's trade mark is given the letters ™ written beside it when it is found on packaging and advertising. The symbol™ is generally taken to indicate a pending registration or common usage, while the symbol ® indicates a registered trade mark with full legal protection. We recommend this usage even though it is not legally required.
- It is recommended that the trade mark be written in capital letters or possibly a fancy script or bold colour that is different from the botanical or cultivar names. If the trade mark is a logo, make sure that it is written in the form that it is registered.
- A particular trade mark should be used consistently in the same way on all labels
- Somewhere on the label the trade mark should be followed by the botanical and/or cultivar and/or common name, for example:

EVERGREENEDGER[®] Buxus sempervirens 'Rotundifolia', Round-leaf Box

• Where a trade mark is used under licence from another party it should be used in accordance with the licence agreement and it is recommended that licensing be indicated on the label, for example:

EVERGREEN EDGER[®] Buxus sempervirens 'Rotundifolia', Round-leaf Box, trade mark used under licence.

• Sometimes a copyright notice may appear on the label to protect the literary, artistic material or photographs appearing on the label, for example:

© Copyright 2005 – GreenGills Nursery

 Avoid genercising the trade mark, this is where the product becomes generic or commonly known by. Trade marks should be used as an adjective not a noun or a verb for example;

> SPRING SPLENDOUR™ grows to 2 metres is incorrect SPRING SPLENDOUR™ Grevillea rosmarinifolia grows to 2 metres tall is correct

Plant Breeder's Rights:

• A true cultivar name protected by PBR:

Grevillea rosmarinifolia 'Spring Splendour' (D

- A plant protected by PBR under a PBR variety name: Grevillea rosmarinifolia 'SPRSPLEN'
- Where a PBR protected plant is used under licene from another party it should be used in accordance with the licence agreement and it is recommended that licensing be indicated on the label, for example:

Grevillea rosmarinifolia 'Spring Splendour' ^(D) is under licence

Note, it is advisable (but not mandatory) for all names protected under PBR legislation to carry the PBR symbol or the letters "PBR".

The PBR symbol or letters should not be applied to trade marks, only varieties can bear the PBR logo or letters.

Also, note that plant material sold for test marketing before the <u>lodgement</u> of an application for a PBR should be labelled to establish an intention and time frame for an application for PBR. The following words should be used:

"Eligibility of this plant as a registrable plant variety under Section 43(6) of the Plant Breeder's Rights Act 1994 will expire on <insert date>."

Note: The date nominated must not exceed 12 months from the date of first sale in Australia and not more than four years from the date of first sale overseas (or six years in the case of overseas sales of tree and vine varieties).

Common Names:

• Common names are "generic" and therefore cannot be used as trademarks or cultivar names: they are written without quotes or any other embellishment or symbol.

Potentially Harmful Plant Wording

If this plant was known to be potentially harmful we would recommend the following wording:

Amaryllis belladonna - CAUTION Harmful if eaten

Potentially Environmentally Harmful Plant Wording

If the plant is known to be a declared weed in another state we would recommend the following wording on the label:

Lavandula stoechas - This plant is a declared noxious weed in Victoria and Western Australia

Hedera helix - English Ivy is a declared weed in ACT and considered highly invasive. Ensure the plant is controlled if planted and dispose of appropriately.

Appendix – 1. Potentially Harmful Plants: Health

Potentially harmful plant genus - includes all species unless specified	Potentially harmful plant common name/s	Required warning
	Coral Pea, Crab's Eyes, Paternoster	
Abrus precatorius	Beans	CAUTION Harmful if eaten
	Red Hot Cat-Tail, Copperleaf, Chenille	CAUTION Harmful if eaten/skin & eye
Acalypha	Plant	irritant
Acokanthera	Dune Poison Bush, Wintersweet	CAUTION Harmful if eaten/skin & eye irritant
Aconitum napellus	Badger's Bane, Monkshood, Wolfsbane	CAUTION Harmful if eaten/skin irritant
	Doll's Eyes, White or Red Banberry,	
Actaea	Snake Berry	CAUTION Harmful if eaten/skin irritant
Adenium	Desert Rose, Impala Lily, Sabi Star	CAUTION Harmful if eaten
Aesculus hippocastanum	Buckeye, Horse Chestnut	CAUTION Harmful if eaten
	Aglaonema, Painted Drop-Tongue	CAUTION Harmful if eaten/skin & eye
Aglaonema		irritant
Agapanthus praecox	African Lily, Lily-of-the-Nile	CAUTION Harmful if eaten/skin & eye
ssp.orientalis		irritant
Agrostemma githago	Common Corncockle	CAUTION Harmful if eaten
Ailanthus	Tree of Heaven	CAUTION Skin & eye irritant
	Allamanda, Golden Trumpet	CAUTION Harmful if eaten/skin & eye
Allamanda		irritant
	Taro, Chinese Taro, Giant Taro, Cunjevoi,	CAUTION Harmful if eaten/skin & eye
Alocasia	Spoon lily, Elephant's ear	irritant
Alstromeria	Lily of the Incas, Peruvian Lily	CAUTION Skin irritant
	Belladonna Lily, Jersey Lily, Marach Lily,	
Amaryllis belladonna	Naked Ladies	CAUTION Harmful if eaten
Anthurium	Anthurium, Flamingo Flower	CAUTION Harmful if eaten/skin & eye

		irritant
Apocynum cannabinum	Dogbane	CAUTION Harmful if eaten
Argemone	Mexican Poppies	CAUTION Harmful if eaten
	Arisaema, Dragonroot, Green Dragon,	
	Cobra Lily, Indian Turnip, Jack-in-the-	CAUTION Harmful if eaten/skin & eye
Arisaema	Pulpit	irritant
	Lily	CAUTION Harmful if eaten/skin & eye
Arum		irritant
Atropa belladonna	Belladonna, Log Fern,	CAUTION Harmful if eaten
Aucuba japonica	Japanese laurel, Spotted laurel	CAUTION Harmful if eaten
Baptisia	False indigos	CAUTION Harmful if eaten
Borago officinalis	Borage	CAUTION Harmful if eaten
Bowenia	Zamia 'fern', Byfield 'fern'	CAUTION Harmful if eaten
	Angel's Trumpet	CAUTION Harmful if eaten/respiratory
Brugmansia		irritant
	Lady of the Night, Francisia, Yesterday-	
Brunfelsia	today-and-tomorrow	CAUTION Harmful if eaten
	Brazilian Ironwood, Leopard Tree, Bird-of-	
	Paradise Shrub, Barbados Pride,	
Caesalpinia	Peacock Flower	CAUIION Harmful if eaten
Colodium	Angel Wings, Elephant Ears	CAUIION Harmful if eaten/skin & eye
	Motor Arum	
Calla	Water Alum	caunon harmuni eaten/skin & eye
	Populy loof Alexandrian Jourel	
Calophyllum inophyllum	beauty lear, Alexandhan ladier	irritant
Capsicum annum	Penner Cansicum Bell Penner	CAUTION Harmful if eaten/skin & eve
(ornamental cultivars)		irritant
	Fish-tail palm	CAUTION Harmful if eaten/skin & eve
Caryota		irritant
	Lucky nut	CAUTION Harmful if eaten/skin & eye
Cascabela	-	irritant

Cassia fistula	Golden shower tree	CAUTION Harmful if eaten
	Black Bean, Moreton Bay Chestnut	CAUTION Harmful if eaten/skin, eye &
Castanospermum australe		respiratory irritant
	Madagascar periwinkle, Cayenne	
Catharanthus roseus	jasmine	CAUTION Harmful if eaten
	Night Shade, Orange cestrum, Green	CAUTION Harmful if eaten/skin, eye &
Cestrum	cestrum, Night-scented jessamine,	respiratory irritant
	Greater Celandine	CAUTION Harmful if eaten/skin & eye
Chelidonium majus		irritant
Clivia	Bush lily	CAUTION Harmful if eaten
	Croton	CAUIION Harmful if eaten/skin & eye
Codiaeum variegatum		irritant
Colobicum	Autumn Crocus, Meadow Sattron,	CAUTION Hormful if actor
Colenicum	Nakeu Laules	CAUTION Harmful if actor/skin & ava
Colocasia esculenta	Cocoyani, Dasneen, Taro	irritant
Convallaria maialis	Lilv of the Valley	CAUTION Harmful if eaten
Corchorus olitorius	Jute	CAUTION Harmful if eaten
Coriaria	Coriara	CAUTION Harmful if eaten
Cotinus coggygria	Smoke bush, Venetian sumac, Wig tree	CAUTION Skin irritant
Cotoneaster	Cotoneaster	CAUTION Harmful if eaten
Cycas	Cycas	CAUTION Harmful if eaten.
	Cyclamen, Alpine Violet, Persian Violet,	
Cyclamen	Sowbread	CAUTION Harmful if eaten
Daphne	Daphne	CAUTION Harmful if eaten/skin irritant
Datura	Angel's Trumpet	CAUTION Harmful if eaten
Delphinium	Larkspur	CAUTION Harmful if eaten
Dianella	Dianella	CAUTION Harmful if eaten
	Lady's locket, Dutchman's breeches,	CAUTION Harmful if eaten/skin & eye
Dicentra spectabilis	Bleeding heart	irritant
Dictamnus albus	Burning Bush, Dittany	CAUTION Skin irritant

	Dumb Cane, Mother-in-Law's Tongue,	CAUTION Harmful if eaten /skin & eye
Dieffenbachia	Tuftroot	irritant
Digitalis	Foxglove	CAUTION Harmful if eaten
	Black Arum, Dragon Arum, Voodoo Lily,	CAUTION Harmful if eaten/skin & eye
Dracunculus	Snake Lily	irritant
	Duranta, Golden Bead Tree, Golden	
	Dew Drop, Pigeon Berry, Brazilian Sky	CAUTION Harmful if eaten/skin & eye
Duranta	Flower	irritant
	Echium, Paterson's Curse, Purple Viper's	
Echium	Bugloss, Blue Weed, Pride of Madeira	CAUTION Harmful if eaten/skin irritant
Epipremnum (E. aureum)	Centipede Tongavine	CAUTION Harmful if eaten/skin & eye
(SynScindapsusaureus)		irritant
	Loquat, Japanese medlar, Nispero,	
Eriobotrya japonica	Japanese plum	CAUIION Harmful if eaten
Erythrina	Coral Tree	CAUTION Harmful if eaten
Erythrophleum	Ironwood	CAUTION Harmful if eaten
chlorostachys		
	Burning Bush, Corkbush, Winged Spindle	
Euonymus europaeus	Iree, Strawberry Bush, Wintercreeper,	CAUIION Harmful if eaten
Euphorbia (except E.	Euphorbia, Wood spurge	CAUTION Harmful if eaten/skin & eye
pulcherrima)		irritant
	Formosan rice tree, Japanese fatsia	CAUIION Harmful if eaten/ skin & eye
Fatsia japonica		irritant
Gelsemium sempervirens	Carolina Jasmine, Yellow Jessamine	CAUTION Harmful if eaten
Ginkgo biloba	Maiden-hair tree	CAUTION Harmful if eaten/skin irritant
Grevillea	Grevillea	CAUTION Skin irritant
Hedera	lvy	CAUTION Harmful if eaten/skin irritant
Heliotropium		CAUTION Harmful if eaten
Helleborous	Lenten Rose, Winter Rose	CAUTION Harmful if eaten/skin irritant
Hemerocallis	Day lily	CAUTION Harmful if eaten
Hippeastrum	Amaryllis, Knight's Star Lily	CAUTION Harmful if eaten/skin & eye

		irritant
Homeria (syn. Moraea)	Cape Tulip, Puerto Rico yellowseed	CAUTION Harmful if eaten
Hyacinthoides	Bluebells	CAUTION Harmful if eaten
Hyacinthus	Hyacinth	CAUTION Harmful if eaten/skin irritant
	Hydrangea	CAUTION Harmful if eaten/skin & eye
Hydrangea		irritant
Hyoscyamus	Henbane	CAUTION Harmful if eaten
Hypericum perforatum	St John's wort	CAUTION Harmful if eaten
llex	Holly	CAUTION Harmful if eaten
	Belle de Nuit, Moonflower, Cardinal	
	Creeper	
	Norning Glory, Spanish Flag	
ins	IIIS Decogrine Corol Diant Dhysic Nut Spicy	CAUTON Harmful if eaten /ekin & eve
latropha	Latropha, Cout Plant, Physic Nut, Spicy	irritant
	Sheep Laurel Calico Bush Mountain	interne
	Laurel	
Kalmia	Eastern Bog Laurel, Swamp Laurel	CAUTION Harmful if eaten
Laburnum anagyroides	Laburnum, Golden Chain Tree	CAUTION Harmful if eaten
Lagenaria siceraria	Gourd	CAUTION Harmful if eaten
Lathyrus	Sweet Pea, Vetchling, Wild Pea	CAUTION Harmful if eaten
Lepidozamia	Wunu, Scaly Zamia	CAUTION Harmful if eaten
Leucaena leucocephala		CAUTION Harmful if eaten
Ligustrum	Privet	CAUTION Harmful if eaten
Lobelia (except L. erinus)	Lobelia	CAUTION Harmful if eaten
	Honeysuckle	CAUTION Harmful if eaten/skin & eye
Lonicera		irritant
Lupinus	Russell Iupin, Lupine	CAUTION Harmful if eaten
Macrozamia	Burrawang	CAUTION Harmful if eaten
Mandevilla	Chilean jasmine	CAUTION Harmful if eaten

Mandragora	Mandrake	CAUTION Harmful if eaten	
Manihot esculenta	Cassava	CAUTION Harmful if eaten	
Melia	Persian Lilac, White Cedar	CAUTION Harmful if eaten	
	Four O'Clock Flower, Marvel of Peru,		
Mirabilis	Vieruurtjie	CAUTION Harmful if eaten/skin irritant	
	Fruit Salad Plant, Swiss Cheese Plant,	CAUTION Harmful if eaten/skin & eye	
Monstera deliciosa	Mexican Breadfruit	irritant	
Moraea	Cape tulip	CAUTION Harmful if eaten	
Muscari	Grape hyacinth	CAUTION Harmful if eaten	
Narcissus	Daffodil, Jonquil	CAUTION Harmful if eaten/skin irritant	
Nerine	Spider lily	CAUTION Harmful if eaten	
	Oleander	CAUTION Harmful if eaten/skin &	
Nerium		respiratory irritant	
Nicotiana	Tobacco	CAUTION Harmful if eaten	
Ornithogalum	Chincherinchee, Star of Bethlehem	CAUTION Harmful if eaten	
Papaver	Opium Poppy	CAUTION Harmful if eaten	
Parthenocissus	Virginia creeper	CAUTION Harmful if eaten	
	Devil's Backbone, Zig-zag plant, Slipper	CAUTION Harmful if eaten/skin & eye	
Pedilanthus	flower	irritant	
Phaleriaclerodendron	Rosy Apple	CAUTION Harmful if eaten	
	Philodendron,	CAUTION Harmful if eaten/skin & eye	
Philodendron		irritant	
	Poke, Pokeberry, Pokeweed, Bella		
Phytolacca	Sombra Iree	CAUIION Harmful if eaten	
Physalis alkekengi	Chinese lantern, winter cherry	CAUIION Harmful if eaten	
Pimelea		CAUIION Harmful if eaten	
DL	Pagoda Iree, White Frangipani,		
Piumeria		CAUTION SKIN & eye irritant	
Podopnyllum		CAUIION Harmful if eaten	
Polygonatum	Solomon's seal	CAUIION Harmful if eaten	
Polyscias	Aralia, Malaysian Aralia, Geranium	CAUTION Harmful if eaten/skin irritant	
	Aralia, Ming Aralia		
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Primulaobconica	German Primrose, Poison Primrose	CAUTION Skin irritant	
Prunus	Cherry Laurel, Laurel Cherry		
laurocerasus&lusitanica	Portugal Laurel, Portuguese Laurel	CAUTION Harmful if eaten	
	Italian Buckthorn, Coffeeberry, Redberry		
	Common Buckthorn, South African		
Rhamnus	Dogwood	CAUTION Harmful if eaten	
Dhua	Rhus Iree	CAUIION Harmful if eaten/skin & eye	
Rhus	Coster Door Diget Coster Oil Diget		
	Castor Bean Plant, Castor Oli Plant	CAUIION Harmful If eaten/eye &	
Ricinus communis	Diack Locust False Acadia	respiratory irritant.	
Robinia psuedoacacia	Black Locust, False Acacia CAUIION Harmful if eaten		
Ruta graveolens	Common Rue, Herb of Grace, Rue	e, Rue CAUIION Skin & eye irritant	
Sambucus	Elder, Elderberry	CAUTION Harmful if eaten	
Schefflera	Umbrella Plant	CAUTION Skin irritant	
Scilla	Bluebell, Squill	CAUTION Harmful if eaten	
		CAUTION Harmful if eaten/skin & eye	
Scindapsus		irritant	
Solandra maxima	Chalice Vine	CAUIION Harmful if eaten	
Solanum	Solanum	CAUTION Harmful if eaten	
Sorbus aucuparia	Rowan, Mountain ash	CAUTION Harmful if eaten	
	Peace Lily	CAUTION Harmful if eaten/skin & eye	
Spathiphyllum		irritant	
Symphytum	Comfrey, Knitbone CAUTION Harmful if eaten		
	African Milkbush, Grant's Milkbush	CAUTION Harmful if eaten/skin & eye	
Synadenium grantii		irritant	
	Syngonium, Arrowhead Vine, Five	CAUIION Harmful if eaten/skin & eye	
syngonium	Fingers vine	Irritant	
Crape Gardenia, Crape Jasmine,		CAUTION Hormful if actor	
	Ina Prinwheel Flower, IVIIIKWOOd CAUITON Harmful if eaten		
laxus	rew	CAUIION Harmful if eaten	

Templetonia retusa	Cockie's tongue, Bullock bush	CAUTION Harmful if eaten		
Thevetia (syn.	Lucky Nut, Yellow Oleander			
Cascabelathevetia)		CAUTION Harmful if eaten /skin irritant		
	Californian Poison Oak, Western Poison	CAUTION Harmful if eaten/skin & eye		
Toxicodendron	Oak	irritant		
Triunia	Spice Bush CAUTION Harmful if eaten			
Tulipa	Tulip	CAUTION Harmful if eaten /skin irritant		
Veratrum	False Hellebore	CAUTION Harmful if eaten		
Wisteria	Wisteria	CAUTION Harmful if eaten		
	Yautia, Tannia, Blue taro	CAUTION Harmful if eaten/skin & eye		
Xanthosoma		irritant		
	Zanzibar gem, Zee zee, ZZ plant, Money	CAUTION Harmful if eaten/skin & eye		
Zamioculcas zamiifolia 💦	tree, Arum 'fern', Eternity plant	irritant		
	Arum Lily, Calla Lily	CAUTION Harmful if eaten/skin & eye		
Zantedeschia		irritant		
Zephyranthes	Wind flower, Fairy lily, Rain lily	CAUTION Harmful if eaten		
Zigadenus	Death Camas, Zygadene	CAUTION Harmful if eaten		



Appendix – 2. Industry guidelines for PBR labelling (from the <u>IP Australia</u> website)

Varieties covered by provisional or full protection under the *Plant Breeder's Rights Act 1994* should use the accepted form of the logo and warning as illustrated.

If several varieties of the same species under a brand name are listed, the PBR symbol (b) should be displayed next to the protected varieties.

Note: It is no longer necessary to display application or grant numbers.

Labelling Seed Bags

This version of the logo prints either solid PMS 562 or Black onto seed bag packaging.

The warning should appear immediately under the logo but must not encroach into the blank space required around the logo.

The minimum amount of blank space to surround the logo is indicated by the dotted line.



Unauthorised commercial propagation or any sale, conditioning, export, import or stocking of propagating material of this variety is an infringement under the *Plant Breeder's Rights Act 1994.*

Application of Logo to Variety Name

Space between name and the logo = the width of a character "c"



Labelling Plants

Use of the logo on 'tie-on' or 'push-in' labels.



Seed and plant categories

Right holders should use the PBR symbol to denote varieties under protection of Plant Breeder's Rights in catalogues offering for sale.

eg.

Asplenium antiquum Victoria (D) Acacia cognata Green Misto Phaseolus vulgaris Phoenix (D)



ESSENTIAL FOR GROWTH

The Australian Nursery & Garden Industry's Policy Position on Water



Essential For Growth The Australian Nursery & Garden Industry's Policy Position on Water

The viability of the Australian Nursery and Garden Industry is intrinsically linked to the availability and affordability of suitable quality water for the production and ongoing care of plants.

The impact of water availability in the wider community plays an important part through influencing the profitability and strength of markets in which the Nursery and Garden Industry (NGI) operates. These markets consist primarily of the retail market, landscape sector, and farming and forestry markets.

Given this, it is clear to see how water is essential for growth in the NGI in more ways than one. Likewise, based upon its reliance on water, the nursery industry acknowledges that it has a lead role to play in the wider water debate in Australia.

Since the mid-2000's the industry has undergone much change as wide spread drought resulted in water restrictions being placed upon businesses, the public and environment. These restrictions caused massive impacts to nursery industry markets and certainly had a detrimental impact upon industry profitability. Since then however, there has been a greater understanding develop within the industry and the wider community of the value of water, along with a number of cultural shifts in the use of water.

Focus at the consumer level has been directed upon smart water practices, conservation methods, such as alternate irrigation methods (drip irrigation) cultural practices (appropriate plant selection, mulching and the prudent use of allied products) and alternative water sources such as grey water, recycled water and rain water.

At the industry level more growers have adopted improved water conservation methods, updated irrigation infrastructure and adopted a more prudent approach to water budgeting, management and stewardship.

Water regulators have also taken a more considered approach to water restrictions and have indeed shifted their focus beyond water being a commodity to that of an enabling resource.

However we now operate in an era where the effects of climate change and variability expressed through increasingly frequent extreme weather events are being more strongly felt. Drought still remains an issue and is likely to remain so into the future. Storms and large scale floods have the potential to pollute our water environment and these events have been seen numerous times in recent years. This level of climate uncertainty therefore drives the NGI to continue undertaking a proactive approach to water policy.



Issues facing the Australian Nursery and Garden Industry

The Australian NGI faces a number of intrinsically linked challenges in relation to water, which can be broadly summarised into the areas of climate uncertainty and the influence of government policy on water.

First and foremost of these are the ongoing impacts of drought and climate variability. The past decade has seen some of the most extreme weather conditions reflected in recorded Australian weather data. This high degree of climate impact places stresses upon the industry, indeed unlike other horticultural industries the Australian NGI is affected on both sides of supply and demand through weather events.

Rising water costs are another issue which poses challenges to the industry, as water is a key production input. Cost pressures on water supply directly influence the cost of production and these costs are by necessity passed onto the markets which influence sales volumes. Likewise rising water costs also influence the market directly as user markets need to supply water to maintain the product post farm gate. Water quality must also be factored into consideration when discussing water costs as in production nursery systems high quality water is essential for producing quality plant material. There are costs associated with establishing and operating recycled water schemes and this may result in a price discrepancy between recycled and mains water.¹ These pricing discrepancies limit adoption rates of recycled water products and leave industry and the markets more vulnerable to the impact of water restrictions and

conservation measures if and when introduced in peak demand/limited supply periods.

> Noted with water restrictions and enforced conservation measures are the influence that policy decisions have upon the Australian NGI. Policy decisions and how they are implemented directly impact the industry. Evidence of this was certainly seen beforehand with the introduction of widespread water restrictions in the middle of the previous decade.

Flowing on from the impact of policy and its implementation is the influence of general public opinion. There has been a considerable shift in the public's attitude to water in Australia in the past

decades and this has certainly impacted upon sales ² and indeed the product demographics of the industry, with focus certainly in the height of drought to low water use plants and increasing use of xeriscaping (low water use landscaping).

¹ Water recycling; What to consider before setting up a recycled water scheme Sydney Water, 2013 http://www.sydneywater. com.au/web/groups/publicwebcontent/documents/ document/zgrf/mdu3/~edisp/dd_057020.pdf

² Queensland lifestyle horticulture industry survey report Queensland Department of Employment, Economic Development and Innovation, July 2011



The variation in markets has also been demonstrated in the changing of urban demographics. Populations in urban areas are increasing, as is population density in these areas. The flow on effects from this will influence the debate around urban water in the coming years and will certainly impact upon the Australian NGI.

With the high degree of volatility surrounding weather impacts and the increasing pressures on urban water, comes the need for the Australian NGI to take proactive steps. This will ensure it and its markets have the ability to access sufficient water in a sustainable and economical manner, maintaining the viability of both the industry and urban green infrastructure which will enhance the livability of cities.

Responding to these challenges, six central strategies have been formulated with industry consultation:

- 1. Leadership in policy development and investment in the area of water. Recognising the impact of policy decisions and investment on businesses and their customers, and the need for consultation.
- 2. Investment in on-farm support to address water management. The realignment of investment and a commitment by governments to support on-farm practices, innovation and incentives to adapt, manage and respond to water issues.
- 3. Building upon established industry best management practice. Recognising and supporting the Nursery Production Farm Management System (NPFMS) as a key water management strategy for the industry and investment in research development and extension.
- 4. Water security and assurance of access. Without water and a future for water management both at the industry and community level then the industry will suffer and decline.
- Recognition of water as an enabling resource.
 This recognises the capacity that water has to enable jobs, economic development as well as the impact it has on the livability of our cities.
- 6. Support and acknowledgment for industry initiatives in water management by government and water regulators.





1. Leadership in policy development and investment in the area of water

Recognising the impact of policy decisions and investment on businesses and their customers, and the need for consultation.

Policy development by state, territory and federal governments has significant implications for the Australian NGI. Rapid policy development that is poorly designed and orchestrated may lead to greater impact on the industry than current water management arrangements across Australia.

> Changes in water policy, especially urban water policy have significant impact upon the sustainability of the Australian NGI. Therefore, the opportunity to provide input into strategies and decisions made by Commonwealth, State and Territory Governments or authorities will always be required.

Proposed changes to water policy must be based upon sound science, credible and accurate data and demonstrated improvements to water conservation. Policy impact statements must be undertaken with any proposed changes to water policy to identify and consider all impacts and benefits including social environmental and economic aspects before implementation.

Water policy must be based upon principles of fairness and equitability and conservation measures must be applied in a transparent, consistent and predictable manner complimented with industry consultation.

The Australian NGI requests that they be consulted and given adequate time and mechanisms to respond to issues regarding current and future changes to water management arrangements. This will ensure the industry has the best opportunity to contribute meaningfully in these discussions, take ownership of decisions made and assist in producing policy of substance.

Water policy must also be subjected to ongoing review and improvement processes. This will ensure an adaptive approach to the changing needs of industry, community and government and will see the continual incorporation of new knowledge and best practice into policy.

The Australian NGI is in principle supportive of national coordinated water policy approaches.

Likewise the Australian NGI is supportive of the ongoing development of water market and pricing mechanisms to support water conservation efforts, provided that such pricing mechanisms are fair and equitable across the water use spectrum and the development of water markets do not unduly disadvantage the Australian NGI and are based upon sound information on water use needs.



2. Investment in on-farm support to address water management

The realignment of investment and a commitment by governments to support on-farm practices, innovation and incentives to adapt, manage and respond to water issues.

The production of quality plants requires access to reliable water supplies of appropriate quality. As a result the Australian NGI has valued water as the foundation on which industry growth and productivity is based. As such the Australian NGI support government policy which encourages on-farm practices, innovations and incentives to manage water use and improve efficiencies.

This importance of water has led to the development of innovative approaches to water management and use and has driven continued improvements in water use efficiency.

In the past years a great deal of investment has been directed into water use efficiency. Much of this investment has been in partnership with the Federal Government and Horticulture Innovation Australia Limited (previously Horticulture Australia Limited) through the Nursery Industry levy.

Some examples of this investment include;

Nursery Industry Water Management Best Practice Guidelines ³ - first produced in 1997 it was incorporated into the Nursery Production Farm Management System (FMS) in 2005 and subsequently updated in 2010. These guidelines focus upon 6 goals including; efficient water use, irrigation management tools, reuse of waste water, management of sediment, nutrient retention, and the environmentally responsible use of plant protection products.

Waterworks industry workshop series is a suite of workshops designed to assist growers in better understanding and improving on-farm water management practices through practical workshop delivered information. Delivery of these workshops is primarily conducted through the industry extension network, which deliver and facilitate on farm extension outcomes.

Water Management Tool Box for Nursery Production ⁴ is a group of excel based calculators designed to support growers with water budgeting and managing irrigation and drainage water. This assists in the sustainable and responsible use of water on farm.

These examples constitute some of the change management tools which deliver results at the industry coal face and result in direct positive outcomes for industry water management. They also constitute a great method for delivering R&D outcomes through the industry extension network. It is also cognisant to consider that behavioural change in water management will be fundamental in ensuring long term water security.

Given the success of these initiatives it is of no doubt that further investment into this area will continue to see positive returns, as growers adopt these basic processes into their business practices and continue to translate new information into on farm practice and better water management outcomes.

> ³ Water Management Best Practice Guidelines http://www.ngia.com.au/Section?Action=View&Section_id=556

⁴ Water Management Tool Box for Nursery Production http://www.watertoolbox.ngi.org.au/



3. Building upon established industry best management practice

Recognising and supporting the Nursery Production Farm Management System (NPFMS) as a key water management strategy for the industry and investment in research development and extension.

The Australian NGI seeks recognition and support of the Nursery Production Farm Management System (FMS) by all levels of government as a key water management tool for the local industry. This industry driven best management practice (BMP) program provides production nurseries, growing media suppliers and greenlife markets with a framework for sound on farm risk management in relation to water amongst other key areas. ⁵

The Nursery Production FMS incorporates three key programs

- Nursery Industry Accreditation Scheme Australia Best Management Practice (NIASA-BMP),
- EcoHort[®] which promotes best management practices in environmental and natural resource management and;
- BioSecure HACCP- which promotes best practice in pest and disease management and biosecurity risk assessment and management

Both the EcoHort[®] and BioSecure HACCP programs play key roles in managing the impact of nursery use on water in areas such as nutrient loads and pathogen control.

It is essential that the NPFMS utilise the best available science and are regularly updated as research evolves and new findings on innovative practices to manage water become available. Investment in R&D into these best practice programs is vital to ensure these programs are relevant and in line with innovation and technological advancements in areas such as water scheduling, application methods, recycling and treatment.



Ongoing investment is also required to ensure the resources are available to deliver this valuable program to whole of industry through an extension network. Extension activities will ensure businesses can apply the outcomes of the Nursery Production FMS, as well as provide businesses with the outcomes of other government and industry research and development programs to directly address water management and water use efficiency.

> ⁵ Nursery Production Farm Management System http://www.ngia.com.au/Category?Action=View&Category_id=524



4. Water security and assurance of access

Without water and a future for water management both at the industry and community level then the industry will suffer and decline.

This policy position acknowledges that the availability of reliable and appropriate quality water supply is integral to the sustainability of the Australian nursery and garden industry at both the industry level and at an individual business level.

The Australian NGI acknowledges that water is a finite resource and is committed to sustainable water use. The industry is an efficient and responsible water user, and has demonstrated a commitment to addressing water issues and making ongoing performance improvements.

The availability of water extends to the markets that the Australian NGI services namely, the retail sector, landscape sector, farming and forestry sectors. Without access to water these markets will suffer which will directly influence the profitability of the Australian NGI. In addition water availability will impact upon urban greenspace quality and viability.

> Complementing the need for industry water security and assurance of access, urban water use supply must be considered in a broader context addressing the whole of water cycle. Such considerations include the disposal, capture, treatment and reuse of water, as well as the incorporation of storm water, wastewater and treated effluent into the commonly available suite of water resources.

The Australian NGI strongly supports a move away from reliance on potable water sources in both production nurseries and in the urban forest setting and actively encourages moves to on site recycling and improved access to reclaimed storm water or treated effluent fit for use where available. Indeed the Australian NGI supports

moves to optimise the use of all available water resources. This will ensure that our water sources are diverse and will drive resilience to the impacts of climate change and variability.

With the importance of water to the industry clearly seen the Australian NGI will seek to develop a greater understanding of the risks to long term water availability and seek to develop strategies to manage these risks.



5. Recognition of water as an enabling resource

This recognises the capacity that water has to enable jobs, economic development as well as the impact it has on the livability of our cities.

The Australian nursery and garden industry is a significant sector of the Australian horticultural industry with an estimated value in excess of \$1.5 billion annually.⁶ It is important to note that the breadth of the industry is quite diverse with end user markets being supported in nurseries, forestry, revegetation, fruit and vegetable farming, cut flower markets and other specialised arenas.

Central to supporting this industry is water, without it the economic impacts would be significant. This has been demonstrated in the past, in the wake of the 2004 drought and the introduction of stringent water restrictions at business, consumer and public levels, which led to job losses and reduced turnover.

Transitioning beyond the direct economic impacts to the NGI, it is prudent to consider the impact of water as an enabling resource on the urban green infrastructure of our cities, towns and suburbs.

Improving our urban green infrastructure is increasingly being seen as an essential component to managing some of the key negative products of the urban environment.⁷ A good level of tree canopy coverage has positive benefits to ameliorate the urban heat island effect which has flow on effects to the levels of human mortality rates due to heat injury. Another important flow on effect of a good tree canopy cover is the positive influences on power consumption for heating and cooling. By shading our suburbs and reducing wind velocities with trees, peak energy use demands can be reduced. This can reduce load requirements on energy infrastructure.

Further to this good tree canopy coverage will reduce the impact of rainfall events, especially through reducing peak load pressures upon existing water management infrastructure. This is especially important as urban population densities increase and the base load on waste water management systems is placed under strain.

Likewise it has been documented through numerous peer reviewed studies that a good level of urban green infrastructure plays an invaluable role in improving human mental health and physical wellbeing in the urban environment. Biodiversity is also improved through increasing the levels of urban green infrastructure.

However without the support of water these benefits would cease or would be at the very least severely impacted upon. It is therefore vitally important that the extended green infrastructure of our cities, towns and suburbs be incorporated into water policy and that the enabling ability of water is recognised in this arena.

⁶ IBISWorld Industry report A0111 Plant Nurseries in Australia

⁷ Green Infrastructure: Life support for human habitats Ely M. and Pitman S. 2014 http://www.environment.sa.gov.au/ files/1a6b24e1-d957-4da7-bb86-a12d0114fccd/bg-gen-Green_ Infrastructure_Evidence_Base_December_2012.pdf



6. Support and acknowledgment for industry initiatives in water management by government and water regulators

Over the past 20 years the Australian NGI has undertaken a number of initiatives designed to promote and improve water management both within the industry and the wider community. Indeed the Australian NGI is both well positioned and committed to educate consumers on water management within the urban environment. Likewise Nursery & Garden Industry Australia (NGIA) is, and will continue to be, committed to improving industry water management through promoting best practice supported by sound science and the delivery of innovation and implementation of new technologies.

Some of the current initiatives that the industry has developed and support are detailed;



Smart Approved Water Mark⁸; A collaborative effort between NGIA, Water Services Association of Australia, Australian Water Authority and Irrigators association of Australia developed the Smart Approved Water Mark scheme. This scheme provides a channel to inform consumers about the outdoor products and services they can use to save water.



Best Management Practice (BMP); as previously acknowledged in this policy the Nursery Production Farm Management System (NPFMS), incorporating Nursery Industry Accreditation Scheme, Australia (NIASA), EcoHort and BioSecure HACCP, is a suite of best management practice programs (BMP) which are designed to facilitate incremental improvements and assist in a systematic management of processes in production nursery businesses. A key aspect of this is the integration of water management into each of the NPFMS programs.



202020 Vision⁹; An initiative of the Nursery & Garden Industry Australia in conjunction with Horticulture Innovation Australia, the 202020 Vision is a national campaign with the goal of increasing urban

green space in Australia by 20 percent by 2020. Complimenting this vision is a significant body of research supportive of the need for increasing urban green space and infrastructure. Aspects of this research relate directly to water management in the urban environment through the use of trees and plants to intercept rainfall and control run off, thereby reducing load on waste water systems and limiting the impact of erosion.

These initiatives demonstrate the determination of the Australian NGI in relation to being a leader in pertinent water issues. It also clearly demonstrate the ability of the Australian NGI to act as an educator of the public in water conservation and conduit of water conservation information.

⁸ Smart Approved Water Mark www.smartwatermark.info
⁹ 202020 Vision www.202020vision.com.au



Further Information

If you would like further information about the Australian Nursery & Garden Industry's Policy Position on Water please contact:

Nursery and Garden Industry Australia Unit 58, 5 Gladstone Road Castle Hill, NSW, 2154

Mailing Address

PO Box 7129 Baulkham Hills BC NSW 2153

Phone:02 8861 5100Email:info@ngia.com.auWeb:www.ngia.com.au

This policy position has been funded by Horticulture Innovation Australia Limited using the Nursery Industry levy and funds from the Australian Government.





Horticulture Innovation Australia



Nursery & Garden Industry Australia

Communication Policy & Procedure

2015



2015 Nursery & Garden Industry Australia

For further information contact;

Mr Chris O'Connor Policy and Technical Officer Unit 58 Quantum Corporate Park 5 Gladstone Road, Castle Hill NSW 2154 PO Box 7129 Baulkham Hills BC NSW 2153

Phone (02) 8861 5100 Email <u>chris.oconnor@ngia.com.au</u>

Background

Nursery & Garden Industry Australia (NGIA) is the national peak industry body for the nursery and garden industry (NGI). It delivers on a broad range of activities which directly impact upon the viability and success of the nursery and garden industry.

NGIA works in an environment which poses a number of challenges and uncertainty and as such must leverage the work it does with its available resources.

NGIA undertakes regular communication with members, levy payers, the State/Territory NGI's, the public, as well as a wide range of other influencers such as government, research bodies and other industry groups. As the industry representative body, NGIA has a key role to play in communicating issues of importance to its members, levy payers and the wider community.

All communication needs to be relevant, accurate, clear, concise, targeted, well delivered and understood by the recipient. The quality of communication content can also dramatically impact upon NGIA credibility and its ability to influence and leverage stakeholders.

The delivery of communication has changed dramatically over the past decade as various print communication mediums have declined or gained in significance. Social media has rapidly gained mainstream acceptance and importance. The delivery of information in rich multimedia, multi-channel, streams is now a norm. Communications infrastructure improvements such as the NBN are increasing the wide uptake and capacity of online media and digital communication means.

NGIA has embraced the opportunities that online media offer however the external communication approach of NGIA is not always consistent and there are some gaps in the delivery of information.

However, communication still remains a fundamental component of NGIA's core business regardless of the form it takes. Likewise, communication is essential for the success of the NGIA and the wider industry.

Why do we need a communication policy and procedure document?

- To ensure the consistent and effective delivery of key industry messages
- To maintain and improve current communication mediums and develop future communication mediums
- To increase stakeholder engagement
- To assist in identifying gaps in delivery
- To protect the integrity and longevity of our communication mediums
- To maintain effective administration and efficiency
- To keep pace with emerging communication trends and help establish the benchmark for industry.



Objective

Communication is central to the work undertaken by NGIA. This document will assist in the continuing development and refinement of communication between NGIA and its stakeholders. This will result in a more coordinated approach to NGIA communication through the provision of a set of common communication principles. These principals are aligned with the objectives 2 and 3 of the NGIA Industry Strategic Plan 2010-2015 and NGIA Industry Strategic Investment Plan 2012-2016.

Objective 2 of the SIP is to "Enhance the capacity and efficiency of the industry's resources through upgrading industry skills, knowledge and practice (internal)"
Objective 3 of the SIP is to "Build industry support through shaping government, public and related industry understanding of the industry's benefits, and enhance these benefits through communications related to industry activities and benefits (external)."

This policy document aims to;

- Analyse and document stakeholder groups
- Audit and record current communication mediums
- Identify and define the process for ensuring;
 - The right message
 - The target audience
 - The best suited communication medium
 - Corporate consistency
- Establish a review process cycle to identify weakness and opportunities.
- Identify targets for communication levels
- Establish protocol for external communication

Stakeholder Identification

Identifying the communication stakeholders is vital in ensuring a robust communication plan. As such NGIA has identified three broad key stakeholder sectors for external communication;

- Industry (NGI's members, levy payers and ancillary stakeholders),
- Public and;
- External Influencers

Each of these stakeholder sectors are integral to the success of the Australian NGI, however each audience sector has different motivations, information needs and communication medium preferences. Compounding this situation, each sector has a number of subsectors again with their own needs and preferences.

A degree of overlap exists in each of these audience sectors, whereby the same information streams, motivations or information needs can be applicable to multiple audience sectors.



Figure 1 is a visual depiction of the stakeholder sectors, subsectors and their interaction.

Figure 1 - Audience sectors Australian Nursery & Garden Industry

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Present communication environment

NGIA has a number of different mediums at present covering a range of audience sectors. Figure 2 depicts a current audit of what communication mediums are present and what audience sectors they service.



Figure 2 Current communication mediums of NGIA

White circles represent websites and orange squares represent written material which may or may not be replicated online. The "Flora for Fauna" and "Life is a garden" websites are now both defunct; however a presence of material is still available online. Social media connected with websites is indicated via social media icons. Yellow websites are operated by external groups on behalf of NGIA. NGIA has a number of communication vehicles in use and a number of potential new vehicles/delivery mechanisms for further evaluation. These are depicted in Figure 3 and the key elements summarised below.

Web sites

NGIA operates two core websites. The "NGIA" website is aimed at industry with a minor focus on external influencers. "Plant Life Balance" targets the consumer/public demographic. These websites facilitate a central digital hub for the industry and act as repository of information and provide direction to services and other communication mediums.

Consultation

Consultation is essential for NGIA as it provides opportunity to impart information to, and obtain feedback from stakeholders. Consultation is achieved through a variety of means. At the formal level this includes; consultation meetings, AGMs, committee meetings (National Accreditation and Certification Committee (NACC), Environment & Technical Committee) and Adhoc surveys. NGIA also engages in consultation with government through various committees, written submissions and responses to policy. Consultations may be facilitated through face-to-face meetings, teleconferencing, webinars or other digital means.

Consultation also occurs at the informal level through one on one discussion.

Social Media

Current and developing social media communication tools offer considerable scope for NGIA to enhance its message delivery. This can be achieved firstly through a greater breadth and depth of message penetration. Currently 81% of all Australians own a smartphone device with more than half of Australians updating or check social media daily.

Secondly social media also offers the opportunity to engage in two way communication with audience participants, as opposed to the primarily one sided communication of static media. This two way communication can be used to enhance service delivery and engagement with NGIA members and service users as well as the public and influencer sectors.

Scope for greater utilisation of existing social media communication tools exists through the development of materials and systems to ensure regularity of content posting and quality of posting.

NGIA currently uses Twitter Facebook and LinkedIn as its social media channels. Usage statistics¹ as of April 2015 indicate the follow rates.

Facebook – 14,000,000 users LinkedIn – 3,500,000 Twitter – 2,791,300 Active Australian Users

¹ Social Media News - www.socialmedianews.com.au/social-media-statistics-australia-april-2015/

NGIA maintains two Facebook sites; an Industry NGIA page and the Public Plant Life Balance page. As noted in the statistics previously given Facebook has the highest social media uptake in Australia and an NGIA presence in this sector is beneficial given the potential reach of communication to both internal and external audiences.

Facebook was also critical in the 2011 launch of the Improve your Plant/Life Balance industry marketing campaign.

LinkedIn is a social media tool with a strong professional focus on networking and discourse. This platform provides mechanism for the industry to leverage the extended network of industry to promote industry messages. LinkedIn is also becoming a preferred medium for jobseekers. The NGIA presence includes the NGIA company page and two specific forums -Nursery & Garden Industry Business Improvement and Australian Nursery Industry Statistics. The 202020 Vision also maintains a LinkedIn forum which is linked from the NGIA company page. The forums provide a mechanism for growers to clarify technical questions and to connect directly with researchers in the arena.

Twitter is another mainstream social media tool which facilitates real-time micro-blogging. Twitter is also effective as a repeater channel of industry communications, extending the reach and support of aligned industry messages to a broader audience.

Whilst YouTube is used by industry, at this stage it is primarily used as a media hosting facility rather than as a social media channel. Content is readily adaptable to other digital assets as well as being shared socially. YouTube has potential to develop into an audio-visual library to support both consumer and industry knowledge.

Conferences and Field Days

Conferences and field days provide opportunity for face to face meeting and knowledge transfer through presentation, practical demonstration and participation in industry R&D. Conferences and field days also offer a social aspect to the industry fostering an environment conducive to informal knowledge transfer.

Portals

Portals are online hosted tools which provide submission facilities and act as a controlled repository of information. They are security managed with individuals accessing their own materials.

<u>eLearning</u>

eLearning presents an opportunity to convey knowledge transfer through targeted training messages applicable to specific audience sectors and subsectors. Cost effectiveness and a high degree of flexibility are inherent attributes to eLearning. Whilst not superseding face to face learning completely, eLearning provides a complementary means of delivery. The NGIA eLearning portal used is hosted by American based Talent LMS which is accessible via smartphone, tablet and PC. Opportunities for communication and improvement identification can be facilitated via surveys which can be embedded into the end of each course.

Farm Management System (FMS) Portal

The FMS portal is a custom designed management system to retain information on audits conducted as part of the Farm Management System.

<u>Awards</u>

The awards portal is an externally hosted mechanism for conducting online delivery of the National awards program. Entrants to the awards are able to respond to criteria and support this with multimedia assets such as video, images, documents. Judging is also easily facilitated via this platform.

Digital Magazines

Readymag represents a relatively new medium which allows for the publication of a wide variety of digital assets and packages them into a magazine style format for PC, tablet devices and smartphones. This has the advantage of incorporating multimedia assets including videos and interactive forms into a publication.

Multiple editors can submit items to be included and these can be vetted by a chief editor prior to inclusion in the magazine. Articles selected can be from NGIA source or from other sources of interest to NGIA members and the wider industry. Likewise NGIA authored content may be incorporated into NGIA members own Readymag publications providing opportunity for member benefit, furthering the reach of industry messages.

In comparison to traditional print mediums digital magazines offer a cost effective and adaptable solution.

Trade Register

The NGIA Trade register is a national publication detailing member businesses. The publication is available in both an online format as well as a printed version.

Webinars

Webinars offer an opportunity for presentation of an issue and provide a mechanism for audience participation. Webinars can also be recorded for later review and contribute further to our online industry knowledgebase. There are some drawbacks to webinars; as numbers of participants increase free discussion can be limited. As with all other technological based mediums access to IT and the degree of familiarity with IT can limit the numbers of users. However, webinars are becoming seen as an alternative to traditional conferences and field days due to their cost effectiveness and time convenience. Likewise webinars also offer advantages in eLearning knowledge transfer.

Electronic Direct Mail (EDM)

EDM provides a targeted distribution method across various market segments through email. Current EDM campaigns administered by NGIA include the monthly Your Levy at Work and direct NGIA mail outs. These are delivered via platforms that provide detailed analytics for each mail out. EDM has been utilised by NGIA for a number of years.

Printed Collateral

NGIA, where required, produces a range of printed collateral. This includes information on industry programs for distribution at events such as conferences, trade expos and consumer events. Key documents include NGIA policy positions, FMS information and Plant/Life Balance/202020 Vision marketing materials and Annual Reports.



Figure 3 - Desired communication landscape

Review process for communication

NGIA should undertake an annual review of its communication policy. This is to ensure that focus is given to the choice of communication mediums being utilised, identify any gaps and to determine if NGIA can service its stakeholders with better communication tools and processes.

As part of this review attention should be given to any available metrics associated with communication uptake. Examples include Facebook engagement, email campaign opens, and website analytics. There is also an imperative to build into communication programs a mechanism to provide feedback on the effectiveness of those communication programs. For example the eLearning modules incorporate a survey at the end of each course for participants to provide feedback and shape further course improvements.

Reviews should also be guided by consultation with members to determine their engagement, uptake and perceived value of NGIA communications. This could be facilitated through targeted surveys (survey monkey) or as part of ongoing evaluation through interactive forms embedded in communications.

Given that communication via electronic mediums is progressing rapidly consideration should also be given to emerging communication mediums. This rapid progress of technology also demands that existing mediums are reviewed and if needed dated forms renewed to current standards; for example upgrading websites to reactive format.

Consideration should be given to ensuring the cost effectiveness of communications. This includes reviewing costs of print publications and mail house services, website hosting, teleconferencing/webcasting/webinar/ePortal/etc.

Procedures

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Considerations for ensuring content quality and relevance

The fundamental question that must be asked in any communication is; what is the purpose of the communication? It is a call to action, is a response required or is it to inform only.

The purpose of the communication will influence;

- the importance of the message to both NGIA and the recipient,
- the relevance to audience subsectors,
- the choice of communication medium.

The message content needs be tailored with consideration to the following

- a brief synopsis of what the issue is,
- what are the implications to intended recipient,
- does the intended recipient need to take action and if so what action,
- where can more information be found.

Prior to release of any communication a vetting and editing process should be undertaken to ensure the accuracy of the message content, presentation and to ensure the absence of grammatical and typographical errors.

Considerations for selecting the best communication medium

The process of selecting an appropriate communication medium is of high importance to ensure successful communication outcomes.

The selection of appropriate communication mediums is dependent upon a number of factors. First and foremost amongst these factors is that the appropriate messages are conveyed to and understood by the intended audiences.

To ensure that the message is successfully conveyed to the target audience, thought must be given to the most suited medium. Considerations here are;

- convenience for the recipient
- number of engaged participants in a medium
- the technological savviness of the recipients

The choice of communication medium will be influenced by the speed at which it must be disseminated and the formality of the message. Official letters may be required to be printed for example.

The cost effectiveness of a medium must also be scrutinised. Electronic mediums such as direct emailing, social media and the use of pdf publications offer a cost effective alternative to print publications and traditional mailouts. However this must be balanced against the uptake by the audience, which can be influenced by factors

- perceived message importance (i.e. what's in it for me)
- volume of electronic communications received by the individual
- levels of IT skill and access to the internet

Another consideration is the ability for sharing information once it has been released. Electronic mediums and social media in particular easily facilitate the sharing of information, which can have both desirable and undesirable consequences.

Desirable consequences include the transfer of information to parties not engaged but relevant to NGIA such as levy payers, allied industries or other green industry players. Undesirable consequences could include the transfer of information to parties not intended to view the information, or for sensitive information to make its way into the hands of persons or parties which may utilise it to cause damage to NGIA and industry reputation.

Protocol for External Communication Standards

Employees and representatives of NGIA including office holders such as Board Directors or committee representatives should be aware that their communications reflect upon NGIA. They should therefore conduct any communications related to their NGIA role in a professional manner; this includes email, other written communications, during committee representation and on social media.

In all communications the following rules and guides apply;

- Care should be taken to maintain the confidentiality of sensitive information.
- No material is to be sent via communication media (including social media) which is; offensive, discriminatory, threatening, malicious, demeaning or harassing in nature.
- Communications should not cause intentional damage to the reputation of NGIA, to its members, the wider industry and the public.
- Intellectual property rights must be observed for all content.
- Sources should be clearly referenced.
- Be aware that personal use of social media may still occur in the public forum. You should be aware that your actions here can still affect NGIA's reputation.
- Editing should take place on all communications and important communications should be reviewed by another person prior to release.
- All communications must comply with relevant legislation such as Spam Act 2003; Privacy Act.

Be aware of communication protocols and norms;

- Avoid sending courtesy copies (CC) to multiple persons or replying all if it is not required.
- Do not use emoticons and be aware of the limits in tone that are transmitted via email or other electronic communications.
- Avoid the use of capitalised words.
- Profanity and/or unsuitable content sharing.

Corporate brand identity

NGIA maintains a corporate brand identity. To ensure consistency the use of NGIA logo, typeface and colour palette is directed through a usage guide available on the common drive: I:\PHOTOS & IMAGES\7.3 Logos\Nursery & Garden Industry

Specific programs including; Plant/Life Balance, the Nursery Production Farm Management System and 202020 Vision also have specific logo usage guidelines which can be found on the common drive.

202020 Vision

I:\MARKETING\202020 Vision 2013-2015\Vision 202020\202020 Vision Material\Asset pack\Guide

Plant/Life Balance <u>I:\MARKETING\Plant Life Balance\Logos and images</u>

Nursery Production Farm Management System I:\ACTIVITIES & PROJECTS\Farm Management System\FMS Artwork & Logos

Acknowledgement of funding - Horticulture Innovation Australia (HIA) and the Nursery Industry Levy

Where required, acknowledgement for levy funds used in projects and outputs of those projects must be stated. Approval of acknowledgment statements must also be sought from HIA prior to publication.

Information on the process and wording of acknowledgement statements can be found at the HIA website located here;

http://www.horticulture.com.au/wp-content/uploads/2014/12/HIA-Interim-Publications-Guide.pdf

NOTE - This publication is an interim publication and may change. Please check the HIA website for updates.

Passwords and login administration

Passwords and login details must be recorded and details provided to <u>Ms Heather</u> <u>Henderson</u> NGIA Reception and Administration Manager.

Where possible an alternate staff member should also have administration rights on websites, social media communication tools and other forms of electronic media. This is to prevent any administrative issues arising if the key staff member is unable to access the tool due to leave, illness or on departure from NGIA.

Where possible the linked email address to accounts should be <u>info@ngia.com.au</u> rather than personal email addresses. Again this is to facilitate easier administration of the tool.

Crisis management and communication

As part of its preparation for dealing with potential crises NGIA maintains an industry crisis management guideline. The current version of the guidelines is available on the NGIA common drive.

I:\ACTIVITIES & PROJECTS\Crisis Management Plan\2015 version Crisis Management Guidelines

NGIA staff should be familiar with the plan and actions they should take in a crisis situation. NGIA staff should also be aware of their responsibilities if dealing with media requests or requests from industry, government or the general public.

Identified examples of potential crisis for the industry include pesticide poisoning or contamination, illness or death from legionella in potting media, biosecurity incursion.

The key point of contact for the Industry will be the NGIA CEO in conjunction with the Board President of NGIA.

Media

NGIA staff and representatives may in the course of their duties be exposed to the media, both mainstream and industry. In all dealings with the media NGIA staff and representatives must at all times conduct themselves in a professional manner. Prior to commenting to media NGIA staff should seek permission to do so from the NGIA CEO or President.

NGIA staff who are funded through levy funded projects are reminded to refrain from commenting on agripolitical matters.

For considerations when dealing with the media in a crisis situation refer to NGIA Crisis Management Guidelines.

An NGIA template exists for a media release which is located at;

I:\MEDIA RELATIONS\Media Releases\TEMPLATE

Completed media release should be sent to <u>Mr Matthew Carroll</u> NGIA Communications Officer for distribution through media channels.

Appendices

Appendix 1 Summary of NGIA digital communication assets

Name	Location	Objective of medium	Delivery Frequency Target
Nursery and Garden Industry Australia website	www.ngia.com.au	Landing point for industry communications and information repository	Ad Hoc news feed. Website is reviewed each month
- NGIA Facebook	https://www.facebook.com/nurseryandgardenindustry	Communicate Industry events news and personalities	Weekly post minimum
- NGIA Twitter	https://twitter.com/NGI_NEWS	Communicate Industry events news and personalities	Weekly post minimum
- NGIA YouTube	http://www.youtube.com/user/ausngi	Communicate Industry events news and personalities, business improvement	Adhoc
Nursery Papers	http://www.hortjournal.com.au/ www.ngia.com.au	Business Improvement and build Industry Capacity	Monthly
Policy Statements	http://www.ngia.com.au/Category?Action=View&Category_id=139	Communicate the position of Industry on pertinent issues	As required
Your Levy At Work	http://yourlevyatwork.com.au/	Communicate to Industry on Levy related activities	Minimum of 4 per month
Plant Life Balance	http://www.plantlifebalance.com.au/	Communicate to Public Industry and Influencers the PLB campaigns - more trees please & put a plant on your desk	Ad Hoc reviewed monthly
- PLB Facebook	https://www.facebook.com/plantlifebalance	Communicate to Public Industry and Influencers the PLB campaigns - more trees please & put a plant on your desk	Weekly post minimum
- PLB Twitter	http://twitter.com/improveyourPLB	Communicate to Public Industry and Influencers the PLB campaigns - more trees please & put a plant on your desk	Weekly post minimum
- PLB YouTube	http://www.youtube.com/user/plantlifebalance	Communicate to Public Industry and Influencers the PLB campaigns - more trees please & put a plant on your desk	As required
National Audit Portal	https://www.ngi.org.au/	Facilitate the recording and reviewing of FMS audit results	As required
FMS Online Manuals	http://fmsmanuals.ngia.com.au/login	Online store for FMS Manuals	As required
LinkedIn	http://www.linkedin.com/company/nursery-&-garden-industry-of- australia?trk=hb_tab_compy_id_2897257	Promote professional connectivity and networks to the Nursery Industry Stimulate professional discussion on topics pertinent to industry	Company page static needs quarterly review. Posts from this site should be as required
- Nursery & Garden Industry Business Improvement	http://www.linkedin.com/groups?home=&gid=5121115&trk=anet_ug_hm	Forum designed for the promotion of business improvement within the Australian Nursery industry	Weekly min postings
- Australian Nursery Industry Statistics	http://www.linkedin.com/groups?home=&gid=4846649&trk=anet_ug_hm	Targeted focus group engaged with the need for Industry Statistics	Ad Hoc reviewed monthly
NGIA Awards portal	http://www.ngiaevents.com.au/awards2014/	Submissions and management of judging for awards	As required

Plant Safely Website	www.plantsafely.com.au	Increase awareness of risks in gardening to the public Repository of information	Static site - Review on 3 monthly basis
E Learning Portal	www.ngia.talentlms.com	Facilitate delivery of industry specific training and business improvement to Industry	Email as new courses released
Vision 202020	http://202020vision.com.au	Landing page for Influencers and Public for Vision202020 program	HIA / Republic of Everyone - Targeted focus
Grow Me Instead	www.growmeinstead.com.au	Increase awareness of invasive plants to the public	Static site
Invasive Plant Risk Assessment Tool	www.plantrisktool.com.au	Increase awareness of invasive plants to the public	Static site

Appendix 2 Summary of NGIA paper based communication assets

Name	Location	Objective of medium	Delivery Frequency Target
Nursery Papers	Appear in HortJournal and on NGIA website (currently open searchable database) and back issues on the Hort Journal website	Increase awareness of technical, business and marketing issues that impact whole of industry. Linked to levy funding.	Monthly to Hort Journal readership
Trade Register	Mailed to NGIA membership and online via http://traderegister.ngia.com.au/	Directory of NGIA members, products and services.	Annually to NGIA membership
Targeted editorial content	Hort Journal, Greenworld and Horticulture Media Association News as well as related industry publications such as The Bark/Landscape Contractor Magazine. Non-industry publications also included.	Increase awareness of technical, business and marketing issues that impact whole of industry. Linked to levy funding.	Adhoc
NGIA Annual Report	Mailed to NGIA membership is required. Appears on NGIA website.	Comprehensive report on NGIAs activities throughout the preceding year.	Annually prior to NGIA AGM as required
HAL Industry Annual Report	Mailed to Levy Payers and on NGIA and HAL website.	Comprehensive report on levy investment program.	NIL -retained for reference post HAL/HIA transition