Horticulture Innovation Australia

Final Report

Communications Support for the Hazelnut Industry

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Hazelnut Growers of Australia Inc
Project Number: HZ13001

HZ13001

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Summary

In Australia the landscape of volunteer organisation has changed over the past decade and this brings some challenges to Hazelnut Growers of Australia Inc, in its aim to best guide the industry and its growth in a positive fashion. We were finding it difficult to gather and maintain volunteers in this space where commercial realities were difficult yet vast.

The Hazelnut Growers Association (HGA) is the peak body representing the interests of hazelnut growers in Australia. The industry is rapidly expanding its production as a result of increased plantings over the last five years. As a result the industry required substantial continuing development to support this expansion.

As the Project Team Leader and President (2013 to 2015), I have limited experience in the Australian horticultural industry and have found the Communications Project Officer's role to be an invaluable one in identifying and realising opportunities. It is vital that our industry stands tall amongst our peers and this role has assisted greatly in this aim by identifying and projecting opportunities, clarifying past experiences and working with the Executive to grow our industry.

HGA has established itself as an important and integral member of the Australian Nut Industry and while the smallest industry within the nut sector HGA has been able to present itself as a professional and competent organisation. HGA has and continues to present itself and relevant industry issues at a wide range of government, industry and community committees, organisations and meetings.

Hazelnut Growers of Australia Inc has continued the Communications Project Officer project through to December 2015 to build on the success of the first two years.

Regular communication of technical and regulatory developments to a developing industry's grower base by a trusted well informed source was vital to support industry up-take, growth, development and profitability resulting in confidence and further growth.

While the "Communications Support for the Hazelnut Industry" was a small project ($16,500 over eighteen months) it has been a very important one for the Australian Hazelnut Industry because it has brought some focus into the past, current and future needs and activities of the Hazelnut Growers of Australia Inc, and introduced a high level of professionalism. Over the past three and a half years the Communications Project Officer has undertaken a wide range of activities that have been most important in achieving the goals of the project and clarifying and re-prioritizing future goals.

HGA is committed to continuing the programs and projects generated from this project utilising all available resources to ensure the momentum gained over the past three and a half years is not lost. HGA is already planning a range of new initiatives post December 2015 including:-

a) improving the industry's ability to manage biosecurity activities,
b) development of a new Strategic plan, R,D & E investment strategies, Marketing investment strategies, and specific development activity schedules, and
c) participating in the inaugural 'Tri-Nut Conference'.

As well as consolidating the recent past relationship building of sponsors, supporters and members.

Further with the changes to available funding effectively removing access of HGA to Government assistance, this role has placed HGA in a position where we may continue to be the best advocates for our growers.

Keywords

Hazelnuts; Communications; Technology Transfer; Communications Project Officer; Biosecurity; Grower survey; Statistics; Conference; Pests; Diseases; Chemicals.

Introduction

Regular communication of technical and regulatory developments to a developing industry's grower base by a trusted well informed source is vital to support industry up-take, growth, development, and profitability, resulting in confidence and further growth has been determined as an essential component of any Horticulture Industry. The Australian Hazelnut Industry is no different.

The Australian hazelnut industry's PIB, Hazelnut Growers of Australia Inc (HGA), has a membership of 80 – 100 financial members and is administered by a voluntary Board of Management. HGA is aware that an unknown number of hazelnut growers exist who are not members of HGA.
The need for professional support in communications to improve member service and reach all commercial hazelnut growers was identified as a result of a strategic planning workshop in October 2011.

The HGA estimates that production is currently about 70 tonnes, from a planted area of 130 Ha (including young orchards yet to come into production). The HGA predicts that by 2015 production could total 150 tonnes in-shell, from an area planted of close to 200 Ha. This development will be the result of a continued expansion in area planted to hazelnuts, and the use of new high yielding varieties identified in research conducted by the HGA.

The peak industry body decided to take a leadership role and support the further development of the industry. In the recent process of developing an industry strategic plan the HGA identified a number of activities that would support continued industry growth and development.
In order to complete these tasks the employment of a part time Communications Officer to support the voluntary Board of Management of HGA was determined as an essential part of the process.

HGA"s lodged an application for funds from HAL and this gained approval in November 2011. Advertisements were placed for a part time Communications Project Officer (CPO) and a skilled professional Horticultural administrator, mentor and communicator has been appointed on a part time contract. The appointee, Trevor Ranford, has an excellent track record of advancing the communications reach, technical transfer and development of small and large horticultural industries.
Furthermore, Mr Ranford has broad experience of representing, mentoring and meeting the needs of several Australian tree nut industries.

During the period of 2012 – 2015 Mr Ranford has continued to provide supporting communication capacity, expand, develop and implement projects initiated in year one, and provide direction and guidance to HGA Board.

Over the past three and a half years HGA has been able to build recognition for and relevance to industry of HGA as a source of technical information and industry leadership through a structured internal and external public relations campaign.

This report covers the second project of a broad program of 'Communications Support for the Hazelnut Industry'.

Methodology

This project built on the methodology of the previous two-year project through the management of a number of broad industry activities undertaken around the collection and compilation of information and resources and the communication of this information to hazelnut industry participants.

The previous project team was maintained and included:

Sallianne Faulkner – Project Team Leader and President of HGA
Darren Baguley
Colin Carter
Vanessa Cox
Nathan Bracken

The project team was responsible for the maintenance and implementation of a range of activities to be undertaken by the Communications Project Office.

The broad activities/program included the following:-

a) Maintenance of current and development of new Industry Fact Sheets.

b) Development of biosecurity 'tools' and implementation of programs related to broad industry Biosecurity and On-Farm Biosecurity (organised in partnership with PHA).

c) Communications of articles on Biosecurity and other pertinent cross industry issues through the quarterly HGA Newsletter, regular e-newsletters and e-mail blasts.

d) Development and implementation of Industry Best Management Practice through information relating to pests and diseases and life-cycles, prevention and control, chemicals; permits; orchard sanitation; operator , plant and environmental health and safety.

e) Communication to growers by submitting technical material for inclusion on the HGA web-site.

f) Encouragement and promotion of industry uptake by the broad grower base through

- direct contact with HGA as the source of advisory information,
- State based Farm Walks,
- Seminars and Annual Conference, and
- Networking with other growers and suppliers to the industry.

g) Representation of HGA at external conferences and industry appropriate meetings.

The Outputs were designed to be suitable for posting on a web site, access and downloading through cloud technology, and for further circulation within the industry by e-mailing/e-sharing but documents were also designed so that they met the needs of non-computer literate members, and the printing of all or discrete sections for traditional methods of distribution as hard copy.

Outputs

The following are the outputs across the life of the project:-

a) Newsletters/Grower Communications:

(1) Preparation and distribution of e-newsletters in October and December 2014 and April, May and August 2015.

Copy of the August 2015 e-newsletter is attached as Appendix L of this report.

With the information being prepared and presented for the 2015 Conference and the production of the Summer Edition of the 'Hazelnut Log' e-newsletters were not prepared in October or December 2015.

(2) Contributed technical/general information for HGA's 'The Hazelnut Log' Newsletter.

- Oregon Hazelnut crop expected to be off 20% (Spring 2014, Vol 43);
- Bad weather threatens supplies of Nutella (Spring 2014, Vol 43);
- Media Release – Market Access for Small Exporters (Autumn 2015, Volume 45);
- Ferraro to pilot Indian Hazelnut project (Summer 2015, Volume 48);
- Spain: Galicia studying Hazelnut cultivars (Summer 2015, Volume 48);
- Hazelnut chips, a natural alternative to the Potato version (Summer 2015, Volume 48);
- Update on Plant Health Australia meetings held in November 2015 (Summer 2015, Volume 48).

Copy of the Summer 2015 'Hazelnut Log' is attached as Appendix M of this report.

(3) Regular e-mail of relevant information, articles and newsletters to the growers utilising the Hazelnut growers e-mail list.

(4) Supplying material for placement on the HGA website.

b) Biosecurity:

(1) Fact sheets on Filbertworm and Eastern Filbert Blight have been accessed from Plant Health Australia and were utilised in the on-farm biosecurity training program/packages.

(2) Full set of photos of all the relevant hazelnut exotic pests within the Nut Industry Biosecurity Plan have been sourced and will be used in the finalisation of the Hazelnut On-Farm Biosecurity Manual.
(As soon as Plant Health Australia and the Australian Nut Industry Council finalise and release the new Nut Industry Biosecurity Plan HGA will be in a position to finalise and print the Hazelnut On-Farm Biosecurity Manual and utilise the photos.)

(3) Distribution of the Plant Health Australia/Animal Health Australia On-farm Biosecurity planner to ALL hazelnut growers of HGA.

(4) Preparation of industry biosecurity issues and submission of those issues to the Department of Agriculture and the CRC for Plant Biosecurity.

(5) Development of industry awareness through participation in an ANIC/PHA project to review the pest and disease lists in the Nut Industry Biosecurity Plan and then work to the release of the update Nut Industry Biosecurity Plan. This included participation in a multi-industry workshop on 25th August 2015

(6) Development of industry awareness through participation in national biosecurity programs including the Department of Agriculture Biosecurity roundtable and the review of the National Biosecurity R, D and E strategic plan.

(7) Submitted the following as biosecurity issues of concern to the CRC for Plant Biosecurity:-

- National listing of ALL Australian Hazelnut growers.
- National surveillance program including inputs from the growers assessing their orchards directly or through consultants.
- Lack of chemicals available to smaller/emerging industries.
- Lack of control of external contractors entering and working on properties eg, miners, electricity workers.
- Management of Blight in Australia Hazelnut Orchards
- Vertebrates – damage to trees and nuts as well as moving of other pests around orchards
- Pests – Filbert worm and Eastern Filbert Blight (Exotic Pests)

(8) Development of industry awareness of Biosecurity through attendance a range of PHA Meetings on the 25th and 26th November 2014, 26th March, 19th May and the 24th to 26th November 2015.

(9) Participated in the Biosecurity Industry Liaison Officer Training undertaken by the Victorian Horticulture Industry Network on the 2nd July 2015.

(10) Participated in the Victorian Biosecurity Surveillance teleconference to discuss the development of ongoing industry surveillance programs.

(11) Finalisation of Hazelnut Growers of Australia becoming a signatory to the Emergency Plant Pest Response Deed.

(12) Preparation and submission of the 2014 Hazelnut Status Report for the National Plant Biosecurity Status Report to Plant Health Australia.

The Report is part of this document as Appendix A

c) Industry Communications:

(1) Preparation of a hazelnut industry leaflet for distribution at the ANIC Nut Conference.

(2) Attendance at the ANIC Nut Conference and promotion of the technical aspects of the industry to the Australian nut supply chain.

(3) Liaison with growers, processors and value chain, and literature review of factors affecting kernel quality and recommendations for future strategy.

(4) Collect research and technical papers and information from around the world and utilize the relevant information in newsletters and e-mails to the growers.

(5) Developed communication linkages with the supply chain companies.

(6) Assist with the establishment of a Hazelnut Consultants e-mail list.

(7) Participation in the SA State Farm Walk held on 12th July 2015.

(8) Assisted inexperienced President on matters of horticultural and industry history.

d) Pests and Diseases/Chemicals:

(1) Preparation and submission of the industry priority pests/diseases and associated industry chemical needs to the Department of Agriculture/Rural Industries Research and Development Corporation /Horticulture Innovation Australia Limited.

(2) Maintenance of chemicals and minor use permits through representation at the AgVet Chemical Collaborative Forum in Canberra in February and June 2015, by the HGA Communications Officer.

(3) Technical input into the chemical requirements for Australian Hazelnut Growers ensuring the hazelnut industry chemical needs were a part of the first round of applications for consideration for ongoing permits or full label registration.
(The AgVet Chemical Forum is part of a project funded by the Australian Government and managed by RIRDC and it is looking at establishing a Forum to direct/manage minor use permits from mid 2015 onwards.

(4) Development and submission of pest/disease and chemical priority lists to the AgVet Chemical Forum.
(The process of prioritising the pests/diseases and chemicals were undertaken in June 2015 and the initial outcomes reported to the HGA Executive Committee.)

(5) Continued review of the chemical minor use permits held by HGA and the New Rural Industries/Rural Industries Research and Development Corporation.

e) Project Reporting/Communications:

(1) Preparation of regular project reports to the project team and the HGA Executive Committee.
Copy of the most recent report is attached as Appendix B

(2) Assistance given to the President and Executive Committee on a number of specific items including the Chemical and R&D portfolios.

(3) Reports prepared and submitted on the project to the HGA Executive Committee during their teleconference meetings on the 20thAugust and 3rd December 2014 and the 4th March, 11th June, 2nd September and 2nd December 2015.

(4) Planning meeting held between Sallianne Faulkner (Project Leader) and Trevor Ranford (CO) on the 10th February and the 16th June 2015.

(5) Presentation of a project report to the 2014 Annual General Meeting.

f) 2015 Grower Survey

(1) Results from the grower survey seeking input into the most important issues facing the Hazelnut Industry and individual businesses have been collated and are being fed into the ongoing HGA Strategic Planning process.

The results are detailed in Appendix C.

(2) Preparation and distribution of the 2015 production survey in December 2015.

The survey form has been prepared and was distributed in December 2015 to collect industry data on:-

- tree numbers,
- production,
- varieties
- processing capacity, and
- quality systems

(The survey forms are being collected and collated through the 1st Quarter of 2016 and the results will be made available during the 2nd quarter of 2016)

Copy of the 2015 Production Survey Form is a part of this report as Appendix D.

g) Industry Responses:

(1) Preparation of HGA individual submission and a joint submission with Chestnuts, Walnuts and Pistachios to the HIA Consultation Paper: "Determining the Strategic Investment Priorities for the Australian Horticulture Industry".

(2) Assisted with technical information to be included in the Hazelnut response to the Agriculture Competitiveness Green Paper by HGA.

h) Linkages with researchers and technical experts:

(1) Linkages developed with the Victorian Horticulture Industry Network (Through this network HGA is able to gather and exchange relevant information. Copies of the HGA e-newsletter have been supplied to the HIN coordinator, Jen Treeby, for distribution through the network).

(2) Linkages developed with the NSW Department Temperate Nut Officer and participation in the associated R&D project/program.

(3) Collection and distribution of information from the Bureau of Meteorology in relation to climate patterns.

i) Annual Hazelnut Conference:

(1) Planning and preparation of and facilitation at the 2014 and 2015 Annual Hazelnut Conferences. (2014 held in October 2014 in South Australia and 2015 held in October 2015 in New South Wales.)

(2) Planning and preparation of and facilitation at the 2014 and 2015 Annual Farm Walks linked with the Conferences. (2014 held in October 2014 in South Australia and 2015 held in October 2015 in New South Wales.)

(3) Reports on both activities are covered in the Final report of Project HZ13701 – ***"2014 and 2015 Annual Conference of the Hazelnut Growers of Australia Inc"*** but the following are summaries of specific components of the assessment of both Conferences:-

(a) 2015 EVALUATION:

A full evaluation was undertaken and a total of 32 forms were completed and returned to the Conference Committee.

The results in relation to the length of the Conference:

Average (Overall) 5.89 (Out of 7)

The results in relation to content of the Conference program:

Average (Overall) 6.04 (Out of 7)

The results in relation to whether the participants found the Conference to be interesting and informative:

Average (Overall) 6.32 (Out of 7)

The results in relation to whether the participants found the Conference relevant to my needs:

Average (Overall) 6.05 (Out of 7)

(b) 2014 EVALUATION:

A full evaluation was undertaken and a total of 37 forms were completed and returned to the Conference Committee.

The results in relation to the length of the Conference:

Average (Overall) 6.21 (Out of 7)

The results in relation to content of the Conference program:

Average (Overall) 6.17 (Out of 7)

The results in relation to whether the participants found the Conference to be interesting and informative:

Average (Overall) 6.58 (Out of 7)

The results in relation to whether the participants found the Conference relevant to my needs:

Average (Overall) 6.13 (Out of 7)

(c) COMMUNICATION/EXTENSION ACTIVITIES.

To ensure that the each Conference meets the expectations of the HGA, the growers and the suppliers it is important to communicate to all sectors before and after conference.

HGA continues to be committed to maintaining and expanding communications and extension in relation to each Conference.

The components of communication and extension that are considered by the HGA Executive and each of the Conference organising committees include:-

(i) Utilisation of local knowledge to achieve the best possible program and farm walks that meet the needs of the industry but are also cost effective.

(ii) Utilisation of the industry resources to assist in the planning and management of each conference.

(ii) Gaining media coverage before, during and after each Conference.

(iv) Ensuring appropriate recognition of the Speakers and Suppliers/Sponsors.

(v) Ensuring technology transfer occurs through the utilisation of the HGA website.

(d) 2015 COMMUNICATIONS/EXTENSION ACTIVITIES:

(i) The Conference Project Team undertook the following communications:

- Site visit to Goulburn by the National President and the HGA Communications Officer,
- Regular e-mail and teleconference exchanges, and
- Regular reporting to the HGA Executive Committee through their meetings, and
- Regular e-mails and postage to hazelnut growers as a lead in to the Conference.
- Inclusion of information on the Hazelnut Industry website.

The HGA President, using her local knowledge and contacts, assisted with the planning including the technical program, trade exhibits and the Field Day visits.

(ii) The HGA Communications Officer acted as the facilitator/MC for the Conference program, Conference Dinner and the Field Day.
In addition the HGA Communications Officer gave a presentation of his project bringing the participants up to date on the research, development and extension being undertaken by the Hazelnut Industry through Hazelnut Growers of Australia Inc.

(iii) A Media release, attached to this report as Appendix C, was prepared and distributed resulting in a number of media articles/interviews leading into the event.

- A photographer from Rural Press (Fairfax Media) attended and took photographs that were displayed after the event in 'The Grower' section of 'The Smart Farmer'.
- Material was prepared and utilised in the first edition of 'Australian Tree Crop' magazine.

- Reports were prepared and printed in the Australian Nutgrower magazine and the HGA newsletter –'Hazelnut log'.

(iv) During the Conference Program each of the speakers were thanked and given a small gift in appreciation of giving of their time and knowledge.

During the Conference Dinner each of the Sponsors were thanked and given a Certificate of Appreciation.

(v) As part of the HGA Technology Transfer program, all the power point presentations that have been sent to Carol Bracken (website manager) for placement on the Hazelnut Growers of Australia Inc web site

(e) 2014 COMMUNICATION/EXTENSION ACTIVITIES.

(ii) The Conference Project Team undertook the following communications:

- Site visit to Hahndorf by the National President and meeting with the SA planning committee representatives,
- Regular e-mail and teleconference exchanges, and
- Regular reporting to the HGA Executive Committee through their meetings, and
- Regular e-mails and postage to hazelnut growers as a lead in to the Conference.
- Inclusion of information on the Hazelnut Industry website.

(ii) The HGA Communications Officer, using his local knowledge and contacts, assisted with the planning including the technical program, trade exhibits and the Field Day visits. He also acted as the facilitator/MC for the Conference program, Conference Dinner and the Field Day.
In addition the HGA Communications Officer gave a presentation of his project bringing the participants up to date on the research, development and extension being undertaken by the Hazelnut Industry through Hazelnut Growers of Australia Inc.

(iii) A Media release, attached as Appendix G to this report, was prepared and distributed resulting in a number of media articles/interviews leading into the event including:

- Michael Keelan Weekend Garden Program – Radio 5AA.
- Article in 'The Mount Barker Courier' (Adelaide Hills, SA).
- Article in 'The Advertiser' (Main daily paper in SA).

A photographer from Rural Press (Fairfax Media) attended and took photographs that were displayed after the event in 'The Grower' section of 'The Smart Farmer'.

After the Conference the Communications Officer gave an interview on Radio Coast FM – a community radio station in Adelaide, SA.

(iv) During the Conference Program each of the speakers were thanked and given a small gift in appreciation of giving of their time and knowledge.

During the Conference Dinner each of the Sponsors were thanked and given a Certificate of Appreciation.

(v) As part of the HGA Technology Transfer program, all the power point presentations that have been sent to Carol Bracken (website manager) for placement on the Hazelnut Growers of Australia Inc web site

(4) Speaker presentations from both Annual Conferences have been loaded onto the HGA website.

j) Technical Information material.

The following technical information bulletins have been produced or revised or are in a DRAFT format for completion once reviewed by the HGA Executive Committee:-

(1) Fact sheet on Hazelnut Blight has been completed and distributed to the Hazelnut Growers.
Copy of the Hazelnut Blight Technical Bulletin is attached as Appendix N of this report.

(2) Fact sheet on Suckers has been completed and distributed to the Hazelnut Growers.

Copy of the Sucker Technical Bulletin is attached as Appendix O to this report.

(3) Fact sheet on Borers has been completed but has to be finally formatted and distributed.

Copy of the DRAFT Borer Technical Bulletin is a part of this report as Appendix E.

(4) Fact sheet on Scale has been completed but has to be finally formatted and distributed.

Copy of the DRAFT Scale Technical Bulletin is a part of this report as Appendix F.

(5) Structure of Grower Yearly Calendar of tasks developed. (Being reviewed and then formatted).

Copy of the DRAFT Grower Yearly Calendar is a part of this report as Appendix G.

(6) Information Bulletin on Hazelnut Health Information (reviewed, up dated and distributed).

Copy of the Hazelnut Heath Information Bulletin is supplied as an attachment to this report.

(7) Chemical list required by HGA for Hazelnuts (reviewed and to be reassessed by HGA)

Copy of the DRAFT Chemical List is a part of this report as Appendix H.

(8) Nursery Tree Specifications & Tree Types Description (Draft to be reviewed by HGA)

Copy of the DRAFT Nursery Tree Specifications is a part of this report as Appendix I.

(9) DRAFT TEMPLATE for Quality Parameters for Australian Hazelnuts (Template to be utilised in discussions with growers.)

Copy of the DRAFT TEMPLATE for Quality Parameters for Australian Hazelnuts is a part of this report as Appendix J.

(10) DRAFT Risk Assessment for Hazelnut Industry June 2015. (Requires final ratification from HGA Executive Committee.)

Copy of the DRAFT Risk Assessment for Hazelnut Industry is a part of this report as Appendix K.

k) Statistics:

(1) Utilising historical data and through discussions with the larger producers statistics on the current Hazelnut industry and future predictions were prepared and submitted to ANIC as part of developing a national overview of the Australian Nut Industry.

	2015	**2020**	**2025**
Value of Industry	$1.2 million	$2.1 million	$7 million
Area (Hectares)	200	300	700
Production (Tonnes)	150	300	1,000

(These figures do not take into account the oncoming production from Ferraro.)

l) BMP manual:

A DRAFT overview for a hazelnut Best Management Practice/Environmental Management Systems Plan has been developed by the Communications Officer and is to be reviewed by the members of the Project Team before being distributed for input by the growers.

A copy of the DRAFT Hazelnut Best Management Practice/Environmental Management Systems Plan is attached as Appendix P to this report.

m) Orchard Management portal on the HGA website:

The concept of a orchard management portal has been designed as the 'Hazelnut Orchard Puzzle'. Once approved by the Project Team and the HGA Executive Committee the puzzle page will be added to the site and the relevant technical information added to each of the relevant pages.

A copy of the DRAFT 'Hazelnut Orchard Puzzle' is attached to this report as Appendix Q.

n) Literature review of factors affecting kernel quality and recommendations for future strategy

A range of publications and reports have been accessed by the Communications Officer and will be utilised to develop a set of Australian Hazelnut Kernel Quality Standards.

Some of the publications include:-

- UNECE Standard DDP-04: Hazelnut Kernel. 2010
- Hazelnut Kernel Standard TO 3025. Turkish Standardization Institution. 2002
- Oregon Grade Standards – Hazelnuts in Shell and Hazelnut Kernels.
- International Standard for Fruit and Vegetables: In-shell hazelnuts and Hazelnut Kernel. OECD.
- UNECE Standards for Hazelnut Kernel. June 2008
- "Hazelnuts". Oklahoma State University.
- 'Factors influencing storage quality of Hazelnut varieties'. Kais Ebrahem PhD report. 1992.
- AIF Specifications for shelled Hazelnuts. FDA and USDA.
- 'Comparison of the Quality of Hazelnuts shelled with Modified Conical Sheller and Stone Shellar'. Turkey. 1998.
- Hazelnut – Kernel Moulds. Plant Disease Management Handbook.

The Standards will be developed as a standalone document as well as being incorporated into the Hazelnut Quality Parameters Manual.

Outcomes

The broad outcomes achieved from the project include:-

- Professional and effective communications support for the Hazelnut Industry
- Technical information in readily accessible and easy to understand and implement formats provided to Australian hazelnut growers and associated businesses.
- Regular assistance to growers to overcome or correct major identified obstacles to successful orchard establishment.
- Improve profitable production of high quality hazelnuts.
- A framework for the development of further initiatives required to progress the size and viability of the industry.
- Increased grower awareness and provide tools to ensure that hazelnut growers meet external responsibilities – eg biosecurity, food safety, chemical residues, environment, health and safety.
- Assisted existing growers to improve performance and adapt, and provide new growers and investors with the tools for success in a rapidly growing industry.
- Provided guidance to develop a more professional industry body.

Evaluation and Discussion

The "Communications Support for the Hazelnut Industry" was a small project but it was a very important one for the Australian Hazelnut Industry because it brought some focus into the past, current and future needs and activities of the Hazelnut Growers of Australia Inc, and introduced a level of professionalism.

Over the past year and a half the Communications Project Officer has

a) built on the work undertaken over the previous two year (2012 – 2014), and
b) undertaken a wide range of activities that have been most important in achieving the goals of the project and clarifying and re-prioritizing future goals of the industry.

Putting the project in perspective the total value of the project was $16,500 and the Communications Officer was contracted to undertake 5 hours work a week across the life of the project – a total of 390 hours or 51 days.

Given the limited resources the Project Team and the HGA Executive Committee believes that the project met and passed all expectations. A full range of activities were embraced and many completed but those not fully finalised are at a point where the industry can bring them to full completion over 2016.

One of the advantages of contracting Trevor Ranford as the Communication Officer has been that he has also undertaken similar roles for the Pistachio, Chestnut and Walnut industries. This has resulted in the Hazelnut industry being able to expand the programs and share the costs across the four industries. Not only has this resulted in efficiencies it has brought new information and knowledge to the hazelnut industry.

The Project Team believes that the Communications Project Officer has achieved the KPI's set out in the project and achieved a high level of outputs for the industry.

In summary the following are some of the major KPI's from the project:-

- Attendance and Presentations at the 2014 October Annual Conference/Trade Display/Farm Walk/AGM.
- Managed compliance with Plant Health Australia (PHA).
- Technical input into the HGA paper to the Agriculture Competitiveness Green Paper.
- Technical input into the Department of Agriculture Horticulture and Biosecurity activities.
- Participation and Hazelnut input into the AgVet Chemical Collaborative Forum.
- Liaison with ANIC regarding Hazelnut industry presentation at the upcoming Nut Conference.
- Participation in the Victorian Horticulture Industry Network and liaison with researchers.
- Communications with the Project Team and Hazelnut Australia Executive Committee.
- Publications - Preparation and distribution of articles and bulletins.
- Technical Strategic Development.
- Member information.
- Chemicals
- Attending as a Hazelnut industry representative at the ANIC Nut Conference.
- Preparation and distribution of technical bulletins to the growers and placement on the Hazelnut industry website
- Preparation of technical e-newsletters.
- Attendance, present a technical report and facilitate the 2015 National Conference and associated Farm Walk day in October 2015.
- Commencement of an end of season production survey to gauge the 2015 production and projected planting to establish new base line data and process post 2015.
- Finalisation of the review of the Hazelnut components of the Nut Industry Biosecurity Plan.
- Commence the development of a Hazelnut Quality Parameters manual.

One of the major successes of the project has been the advancement of the HGA Technology Transfer through:-

a) Re-design and re-development of the HGA website has been undertaken by the web manager Carol Bracken and relevant material has been supplied to her by the Communications Officer. The website has become one of the primary modes of communication with hazelnut growers in general and HGA members - www.hazelnuts.org.au.

b) The Communications Project Officer has been linked to the members of the Hazelnut Growers Association via e-mail. Through this link the membership has received regular e-mails with relevant industry information and technical material, and a regular e-newsletter – 'Cobnut'.

c) Material being produced as technical information bulletins and the reports being printed and made available to the members in a hard copy format as well as through the website.

d) The introduction of E-bulletins focusing on general information pertinent to horticultural enterprises, for instance changes to: - Occupational Health and Safety Legislation, FSANZ legislation on labelling, produce safety alerts, changes in APVMA legislation and requirements.

e) In addition Darren Baguley established a Hazelnut Facebook site.

The Communications Project Officer has communicated regularly with the Chair and members of the project team, as well as other members of HGA Board of Management and Sub-Committee leaders and the individual grower members of the Hazelnut Growers of Australia Inc.
Also as necessary the Communications Project Officer has communicated with experts external to HGA Board and membership.
As part of the process the Communications Project Officer has reported on the project at each of the HGA Executive Committee teleconferences and prepared reports for the HGA's existing Quarterly newsletter – 'Hazelnut Log'. This has ensured that both the project team and the HGA Executive were well informed of the activities and outcomes and could make adjustments to the project and/or take appropriate actions through the Executive Committee.

As indicated previously, due to the experience and involvement with other Horticultural and Nut Industries by the Communications Project Officer he has been able to provide insight, information and guidance on expectations and interrelationships between a horticultural industry and regulatory, advisory, and research and development bodies. This has been invaluable to the voluntary members of the Board of Management, many of whom do not have horticultural background.

Some of the more important issues covered through the life of the project included:-

a) Biosecurity: This has been an important aspect of the second year of the project and the work on the pest and disease list within the Nut Industry Biosecurity Plan, the On-Farm Biosecurity Manual and general pests and disease topics has been very valuable in focusing the Industry.

b) Leadership: The role of the peak industry body to take a support role in the further development of the industry. The recent work of developing an industry strategic plan is assisting HGA to identify a number of activities that will support continued industry growth and development.

c) Bacterial Blight: This is a major disease of hazelnuts and while there is information available it has never been drawn into a single document. The production of a comprehensive information bulletin has brought the technical and scientific information together into one document.

d) Similarly work undertaken on the management of borers and suckers and presented as grower information bulletins has been important to developing the new and emerging industry.

The Hazelnut Growers Association (HGA) as the peak body representing the interests of hazelnut growers in Australia is overseeing the rapidly expanding production as a result of increased plantings over the past five years. As a result the industry requires substantial continuing development to support this expansion and has received an immeasurable amount of support and technical information from the Communications Support project.

Recommendations

"The Hazelnut Growers of Australia Inc recommends that the position of Communications Officer/Industry Development Officer be continued and utilise the resources to building on past programs/projects to continue to grow the Australian Hazelnut Industry."

Scientific Refereed Publications

None to report

Intellectual Property/Commercialisation

No commercial IP generated

References

No References.

Acknowledgements

Thanks to the Hazelnut Growers of Australia Inc for having the initiative to prepare, submit and administer the past year and a half of a three and a half year Communications Project

Also thanks to the researchers, growers and processors who took the time to participate in the events, activities and communications associated with this project.

Specific thanks to Vanessa Cox, Sallianne Faulkner and Darren Baguley for their organization and support during the life of the project.

Thanks also to the members of the HGA Executive Committee, past and current, for their input and guidance on the project and its outcomes.
Thanks to Carol Bracken for the development and maintenance of the HGA website.

Thanks also to the Australian Government, through Horticulture Australia Limited, in making available the matching funds for this project to compliment the Voluntary Contributions made available through Hazelnut Growers of Australia Inc.

Appendices

Appendix A: 2014 Hazelnut Status Report for the National Plant Biosecurity Status Report to Plant Health Australia.

Appendix B: Communications Project Officer Report to the project team and the HGA Executive Committee (most recent report).

Appendix C: Results from the grower survey seeking input into the most important issues facing the Hazelnut Industry and individual businesses.

Appendix D: 2015 Production Survey Form.

Appendix E: DRAFT Borer Technical Bulletin.

Appendix F: DRAFT Scale Technical Bulletin.

Appendix G: DRAFT Grower Yearly Calendar.

Appendix H: DRAFT Chemical List.

Appendix I: DRAFT Nursery Tree Specifications.

Appendix J: DRAFT TEMPLATE for Quality Parameters for Australian Hazelnuts.

Appendix K: DRAFT Risk Assessment for Hazelnut Industry June 2015.

Appendix L: August 2015 e-newsletter.

Appendix M: Summer 2015 'Hazelnut Log'.

Appendix N: Hazelnut Blight Technical Bulletin.

Appendix O: Sucker Technical Bulletin.

Appendix P: DRAFT Hazelnut Best Management Practice/Environmental Management Systems Plan.

Appendix Q: DRAFT 'Hazelnut Orchard Puzzle'.

Appendix R: DRAFT Hazelnut On-farm Biosecurity Manual.

Appendix A: 2014 Hazelnut Status Report for the National Plant Biosecurity Status Report to Plant Health Australia.

Represented by Hazelnut Growers of Australia Incorporated (HGA)

www.hazelnuts.org.au

The Australian hazelnut industry has changed significantly in the past decade, and is set for rapid expansion from a small base. At the turn of last century the majority of groves were small, clustered in high rainfall areas in Tasmania and Victoria, and grew principally local selections for local in-shell markets. Interest to supply the kernel market was spurred by funded research on five trial sites in NSW, Victoria and Tasmania, and, after 10 years of variety trials, have released 'Evaluation of Hazelnut Varieties for South-eastern Australia' by B. Baldwin.

Australia is currently seeing a major on-farm investment from a northern hemisphere confectionary manufacturer which confirms that the opportunities for Australian hazelnuts are large which is giving renewed confidence to Australian growers.

In 2014 there were approximately 130 ha planted, consisting of 80,000 trees of which 70 per cent are not bearing or early bearing. Annual production was 130 tonnes with a value of $1.0 million. Kernel imports (chiefly from Turkey) have been static at 2,500 tonnes per year since 2000.

Well managed irrigated groves come into production 3–4 years after planting and continue to crop every year for up to 50 years. Compared to other vine and orchard crops, hazelnuts are safe (low chemical), reliable (frost, hail, rain), non-perishable and provide healthy gross margins.

The Australian hazelnut industry is well aware of the existence of major diseases that exist outside Australia that have the potential to decimate the domestic groves if allowed to enter. As such, HGA identified biosecurity as an important focus for the future and was introduced to the membership via the Annual Conference agenda.

The hazelnut industry became a member of PHA during 2013 and is currently seeking to become a signatory to the EPPRD Deed. Biosecurity is a major industry portfolio for the recently appointed Hazelnut Growers of Australia Communications Officer with priority being given to the development of exotic pest and disease fact sheets, amending the Hazelnut sections within the Nut IBP, a Farm Biosecurity Manual for the Hazelnut Industry and industry training.

The hazelnut industry is covered by the Nut IBP Version 2.0, which identifies the HPPs of the industry.

Major developments or significant events in regards to plant biosecurity:

- Biosecurity has been made a regular item on the agendas for both the HGA Executive Committee to ensure that relevant discussions are undertaken by this Committee.
- HGA has undertaken a review of the relevant pest and disease lists in the Nut IBP Version 2 and this information has been forwarded to PHA through the Australian Nut Industry Council (ANIC). HGA is continuing to work with PHA and ANIC to undertake a full review of the Nut IBP in 2015.

- Through the HGA Communications Officer the Australian Hazelnut Industry is represented at all relevant Biosecurity Meetings including the PHA Member Meetings, EPPRD Meetings and the Department of Agriculture Biosecurity Roundtable.

- Through the HGA Communications Officer the Australian Hazelnut Industry has drafted an On-farm Biosecurity Manual. Discussions are being held with PHA to bring the manual to completion in 2015.

- HGA update the Hazelnut Industry Biosecurity Statement and included the updated copy in the 2014 Annual report presented at the Annual General Meeting held on the 18th October 2014.

- On-Farm Biosecurity Training was delivered by Trevor Ranford the HGA Communications Officer during April and May 2014. A total of twenty two growers participated in the training.

  One session was conducted on Saturday 12th April 2014 at Meander, Tasmania to eight growers. Another session was conducted on Saturday 3rd May 2014 at Orange, New South Wales to fourteen growers.

  The power point presentation utilised as part of the training program will be placed in the member's page of the Hazelnut Growers of Australia Inc website for use by all other hazelnut growers.

Appendix B: Communications Project Officer Report to the project team and the HGA Executive Committee (most recent report).

HAZELNUT GROWERS OF AUSTRALIA

COMMUNICATIONS OFFICER REPORT

The following is a report covering work undertaken during the period from the 11th June to 2nd September 2015.

a) Conference

I visited Goulburn on the 16th June 2015 to assist with the early planning for the 2015 Conference.

Since then I have assisted with

1) Sponsorship – currently we have $5050 committed.
2) Draft program.

b) Chemicals.

1) Meeting with BAYER CROPSCIENCE PTY LTD.
   On Friday 12th June 2015 I met with Hugh Armstrong, the Business Development Manager from Bayer CropScience Pty Ltd and discussed the needs of the nut industries in relation to chemicals.
   Again I will report to each industry on the individual possibilities but the important aspect is that we have developed a point of contact with Bayer for ongoing discussions.

2) Permit Application
   I followed up the permit application for the pirimicarb / hazelnut permit that has been discussed between Lester Snare, Peter Dal Santo and Vanessa Cox.
   The permit expires in 2016 and it was one of those registered through RIDIC.
   The APVMA has indicated that the industry needs to generate two sets of residue results to support the continuation of the application.
   I have discussed this with Peter Dal Santo and he has come up with a suggested project.

   Activities:

   - AgAware prepares the protocol and report forms for the 2 residue trials.
   - You organise the field trial component to be run by two cooperative farmers.
   - The growers complete the residue study field report forms.
   - AgAware organises the residue analysis of the hazelnuts with an analytical lab.
   - The lab prepares the analytical report.
   - AgAware prepares the permit application + residue report for APVMA online.

   The anticipated cost is approximately $6,250.

   I have asked Peter Dal Santo to prepare protocol and report forms and after that HGA can better assess the situation.

   HGA needs to have discussions with RIDIC to see if they might assist in the funding of this.

c) ANIC.

I have continued to participate in supplying relevant material to ANIC on specific topics.
I attended the ANIC Board meeting on the 26th August 2015 and while there representing the Pistachio industry I was able to assist Darren Baguley when required

d) General Communications.

Relevant material including technical and business related information will be distributed to the members either through the website or via direct e-mail.

e) Biosecurity.

HGA participated in a nut industry project to upgrade the Nut Industry Biosecurity Plan. Sallianne Faulkner and I were in attendance and had input into the listed exotic pests and diseases. Once the final work has been completed by PHA then I can finalise the OFB Manual.
Input into this project was funded through the CO project.

I participated in a Biosecurity Industry Liaison Officer training session conducted by the Victorian DPI as part of the Victorian Horticulture Industry Network. This was useful additional training that will assist if ever there is an industry pest/disease outbreak.

f) Newsletter.

The August edition of Cobnut newsletter has been prepared and distributed. The September edition is being put together at the moment. .
Any information that members find that could be added to future editions would be appreciated.

g) VOICE OF HORTICULTURE.

I have participated in the monthly teleconference of the Voice of Horticulture on Friday 12th June, 17th July and 14th August 2015.

h) Farm Walk

Attended the SA Farm Walk held on Sunday 12th July 2015.

g) Project report

I prepared Milestone reports for Sallianne Faulkner as Project Leader to edit and submit to Horticulture Innovation Australia in June 2015 in relation to CO Project

Copies of the milestone reports are attached to this report.

Trevor M Ranford
Communications Officer
Hazelnut Growers of Australia Inc

Mobile: 0417 809 172
E-mail: sahort@bigpond.com

2nd September 2015

Appendix C: Results from the grower survey seeking input into the most important issues facing the Hazelnut Industry and individual businesses

WHAT ARE THE MOST IMPORTANT ISSUES FACING YOUR HAZELNUT BUSINESS?

- Marketing nuts and/or kernel
- Machinery and equipment purchases
- Cost of labour
- Time at orchard against price received
- Chemicals used
- Whether to expand plantings (succession planning)
- How to process my crop after harvest
- Where can I sell my nuts
- What information do I need on my packaging?
- Where do I find suppliers of hazelnut equipment, packaging
- What are the best storage solutions for my hazelnuts
- Inability to produce enough hazelnuts to meet customer demand.
- Cost of irrigation- new water levies, licences and meter requirements, together with significantly increased electricity charges, make this the most expensive component of production costs.
- Need to establish more hazelnut plantings (relates to issue#1)- decisions need to be made regarding selection of suitable varieties, as existing plantation is > 28 years old and there have been many different varieties developed since then- sourcing accurate information to guide the decision making process is an issue. A varietal evaluation report would assist.
- Sucker control!!- Probably the most time-consuming component of orchard management & hazelnut production- also another ever increasing production expense as the cost of suitable chemicals (eg Basta, Spray Seed) is continually rising.
- Fertiliser costs-also an ever increasing production expense.
- We only sell in shell- need an efficient process or method of being able to identify blanks for quality control of the product. This is a very time consuming part of the production process as each nut has to be individually assessed by hand to ensure there is a kernel.

WHAT ARE THE MOST IMPORTANT ISSUES FACING THE AUSTRALIAN HAZELNUT INDUSTRY?

- Co-ordinated marketing and pricing
- Attracting more growers
- Climate change
- Educating public about Australian hazelnuts
- Centralised processing and marketing? Regionally?
- Research and development – new varieties.
- How to increase HGA membership base
- Economies of scale – how can hazelnut growers collaborate to ensure we can process our harvest economically
- Climate change – what areas will be capable of growing hazelnuts in the future
- How can we replace imported hazelnuts with our Australian grown product?
- It's size! Needs to be more growers/production.
- Funding for R&D-(also relates to #1)
- Need for ongoing sustainable funding for Communications Officer (also relates to #1 and #2)
- How to operate within the new HIAL model to access and maximise Government funding- statutory levy / voluntary 'levy' considerations to replace the old VC model. (also relates to all of above)
- How to ensure any large multi-national producers contribute to the development of the Australian Hazelnut Industry (the elephant in the room!)
- Need a well-informed & researched varietal evaluation to ensure growers are planting the best varieties which will promote the Australian Hazelnut Industry as a producer of premium, quality hazelnuts which are sought after in the market place.

Appendix D: 2015 Production Survey Form.

CONFIDENTIAL

Hazelnut Growers of Australia Inc - 2015 Industry Survey

Statistical Information Request

How Can HGA help you? What happens if a disease affects my orchard? Why don't hazelnuts get more publicity? Why didn't I hear about it? Is there someone who I can ask for advice? Where's my nearest processor? What varieties are grown in my area? Can I get more nuts from my orchard? Should I plant more hazelnuts?

The Australian Hazelnut Industry is developing at a rapid rate……is it? This simple question should be easy to answer but a lack of accurate industry statistics makes it impossible for this statement to be made definitively.

HGA needs your co-operation to compile industry data that can be used to assist the hazelnut industry. Knowledge of the industry we represent is critical for hazelnuts to have a voice in organisations such as ANIC, Nuts for Life, Plant Health Australia, Horticulture Innovation Australia not to mention all levels of government.

The attached survey has been developed to assist the compilation of data on the Australia Hazelnut Industry that will be used to accurately report and represent HGA members. This information will be used to protect the Hazelnut Industry particularly focused on disease and biosecurity but also on chemical permits and registrations.

HGA will be surveying all hazelnut growers and processors and thank you in advance for your input into helping the Hazelnut Industry grow and protect its members.

Industry data will be only ever be presented as industry data, never individual properties.

The Hazelnut Growers of Australia Inc collects and administers a range of personal information for the purposes of managing the affairs of the organisation and promoting the Australian Hazelnut Industry. The organisation is committed to protecting the privacy of personal information it collects, holds and administers.

The Hazelnut Growers of Australia Inc recognises the essential right of individuals to have their information administered in ways which they would reasonably expect – protected on one hand, and made accessible to them on the other. These privacy values are reflected in and supported by our core values and philosophies.

The Hazelnut Growers of Australia Inc is bound by laws which impose specific obligations when it comes to handling information. The organisation has adopted the principles as minimum standards in relation to handling personal information

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Hazelnut Growers of Australia Inc - 2015 Industry Survey

Participants with multiple properties please use one survey sheet per property.

1. GROWER IDENTIFICATION

Grower Name	
Orchard Address	
Town	
State	
Contact Number	
E-mail	

2. ORCHARD AREA

Orchard Name	Hectares Planted or	Acres Planted

3. VARIETIES

Variety Planted	Number of Trees Planted	Area Planted
TBC		
Ennis		
Barcelona		
Butler		
Lewis		
Casina		
Willamette		
Halls Giant		
Jemtegaard 5		
Epsilon		

Wanliss Pride		
Other -		
Other -		

4. AGE DISTRIBUTION

Average tree age (circle)

Average Tree Age	**Planted 2015**	**0-4**	**4-8**	**8-12**	**12-20**	**20-30**	**30+ years**
Number of Trees							

5. PRODUCTION

	2016 estimate	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**
Orchard Production **(KILOGRAMS)**							

6. NEW PLANTINGS

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Tree Numbers of planted or proposed new plantings						

7. SALES

	YES	**NO**	**KILOGRAMS**	**VALUE in $'S**
FARM GATE				
FARMERS MARKETS				
PROCESSOR				
WHOLESALE MARKET				
DIRECT TO RETAILER				
EXPORT MARKET				

8. PROCESSING

Do you undertake post-harvest activities such?

	Y/N	TOTAL KILOGRAMS
Hull removal		
Washing		
Drying		
Sizing		
Packaging		
Shelling		
Value adding (further processing)		

9. QUALITY ASSURANCE
Does the property run a quality assurance program (circle)?

FRESHCARE YES NO

SGF 1000/2000 YES NO

HACCP YES NO

GLOBAL GAP YES NO

BRC YES NO

OTHER: .....

10. ON-FARM BIOSECUTITY PLAN/PROGRAM
Does the property run an On-Farm Biosecurity program (circle)?

YES NO

Please return survey to HGA by any of the following methods:

Email: **sahort@bigpond.com**
Post: **27 Ludgate Hill Road, ALDGATE. SA. 5154**
Appendix E: DRAFT Borer Technical Bulletin.

FRUIT TREE BORERS IN HAZELNUTS

Scientific Name: ***Maroga melanostigma***

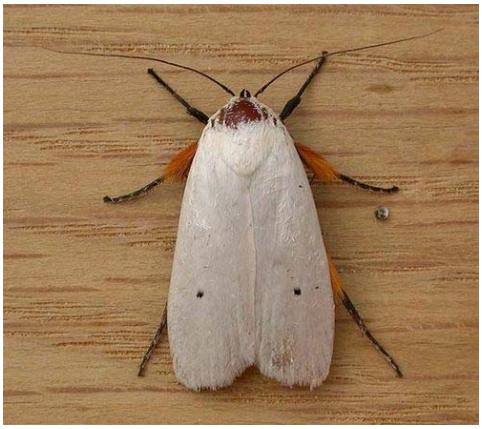
Synonym: *Cryptophasa melanostigma*

INTRODUCTION:
Over the past few years the incidence of Fruit Tree Borer (FTB) is on the increase on hazelnuts.

It appears that other growers may also be unaware of symptoms.
No Chemical treatment is currently approved for control of FTB on hazelnuts, though the Hazelnut Growers of Australia Inc is currently reviewing options.

Borers that successfully move across from another species into hazelnut, complete their lifecycle and mate are likely to select the soft bark of hazel to lay their eggs. It appears that small incursions have bred up over succeeding years, and now pose a major problem.

FRUIT TREE BORER:
The **Fruit Tree Borer** - *Maroga melanostigma* is a moth of the Oecophoridae family. It is native to Australia.
The wingspan is about 40 mm. The adults have satin white fore wings, with a black dot near the centre of the wing. The hind wings are grey. The body is black with yellow bands and a yellow tip. The upper part of the legs has orange hairs.
The moths confront threats by lying down on their back or side, extending the wings upwards and curling the abdomen to display the yellow tip.



The larvae feed on a wide range of trees, including *Acacia* species, especially *Acacia mearnsii*. The species is considered a pest on *Ulmus × hollandica 'Wredei'*, *Platanus orientalis*, various Maple species and Rosaceae species such as *Malus pumila*, *Prunus armeniaca*, *Prunus avium*, *Prunus persica* and *Rubus idaeus*. Other recorded food plants include *Cassia* species, *Wisteria sinensis*, *Carya illinoensis*, *Ficus carica*, *Citrus* species, *Lantana camara* and *Vitis vinifer*.

The fruit tree borer can cause severe damage to hazelnuts by ringbarking the tree, weakening laterals and boring tunnels into the wood. Infestation is usually in the fork of the tree and is evidenced by a fine sawdust-like frass on the surface. Control measures are limited to scraping away the sawdust-like material and flooding the entrance holes with a registered insecticide, or infiltrating the borer hole with a thin piece of wire and piercing the larva.

Evidence of borer in a tree trunk

Lester Snare, Technical Officer Production Research, Orange, NSW

Chemical control to prevent egg laying and damage from the new generation of insects may be an option. Effective control is difficult, because the borer is exposed to the insecticide only during the period when it hatches from the egg and before it bores into the tree. External trees in a block tend to be affected first and where infestation is high, entry points have been observed where larger pruning cuts have been made.

The use of small parasitoid wasp, *Trichogramma*, as a biological control agent is currently under investigation in Australia.

Any black wattle thickets in the immediate vicinity should be removed as they can harbour borers.

GROWER MANAGEMENT PROGAM:
Growers can achieve a level of control without chemicals but utilising the following program:-

- Patrol the entire hazel grove, windbreak and orchard trees for signs of new damage once a week during spring, summer and early autumn.
- Always carry secateurs or a knife and a piece of fine wire (MIG welding wire is the best).
- Inspect all sides of trunks and look for frass (saw-dust like droppings bound in silk) in the lower limbs of older trees. Frass is usually darker brown than healthy bark and slightly raised.
- The first sign of damage is a small patch of frass. The caterpillar bores into the bark and seals the hole with frass. It gradually circumnavigates the trunk or branch, consuming the soft under-bark and covering its path with frass. It also bores into the trunk, creating a tunnel in which hides, and where it will pupate.
- Remove the frass – carefully looking for the grub/s
- If a grub is not in the frass, pare away bark until the hole is located.
- Insert the wire and try to pierce the grub. If that fails, spray household quality insect surface spray into and around the hole.
- Do not assume there is only one grub. There can be multiple grubs in a single frass site, and multiple strikes on some trees.
- Return several days later to confirm kill.
- If trees or branches are treated before they have become ringbarked, they generally survive.
- Where the level of damage suggests the tree may not survive, retain one or more of the strongest suckers to become new bearing units. These grow fast from the surviving root mass. Consider moving from a single bearing unit to two or three trunks.

This link to a fact sheet outlines the general lifecycle.
http://www.elmsavers.com.au/wp-content/uploads/downloads/factsheet/fruit-tree-borer.pdf

Appendix F: DRAFT Scale Technical Bulletin.

SCALE INSECTS ON HAZELNUTS

Scales are

- Closely related to aphids, mealy bugs, and whiteflies, which have piercing sucking mouthparts that drain fluid and nutrients from tree tissues, which can cause dieback of leaves, twigs and branches.
- Tiny sucking insects that are immobile for most of their lives. They often lack wings or discernable legs and are typically covered by a hard or waxy coating that makes it difficult to distinguish them from the leaves, twigs, branches or trunks on which they live.

There are numerous species of scale that damage tree fruit crops and a range of scale like the San Jose scale (*Quadraspidotus perniciosus*) and Plum scale (Parthenolecanium corni) observed on hazelnut trees.

TYPES OF SCALE:

Scale insects are ranked into two categories these are soft and armoured. Considering the Soft Scale category, Pink Wax Scale is one of the examples and Citrus Red Scale this is considered to be an example for Armoured Scale category.

Did you know why such pests are called Scale insects? The reason for them being called scale is the scaly cover produced by the scale insect that helps it to add protection to its body.

Black Scale

Pink Wax Scale insects affect different type of board leaf plants. The insects live under the protected shell cover which is their pink waxy secretion. The insects suck the juice from plants.

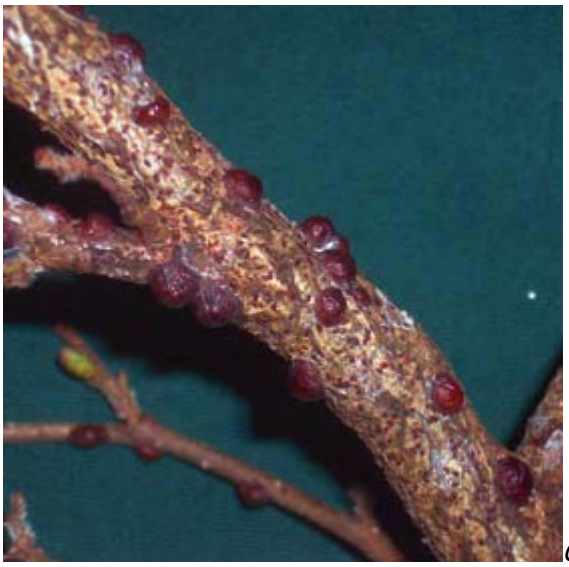
INFESTATION:
Large infestations can kill twigs, retard growth, and produce quantities of honeydew. Overwintering occurs as an immature scale or as a fertilised female on twigs and branches. The immature scales resume feeding in the spring, and newly mature female scales lay their eggs underneath the scale cover. These eggs hatch in early summer, and crawlers migrate to the undersides of leaves and begin to feed.

Two Scale types on Hazelnut stems
Photo by Clem and Vanessa Cox

Sooty mould development on the honeydew can give the tree a blackened, sticky appearance. Nuts and husks can be occasionally stained, and although the mould is not feeding on the plant it can restrict the light reaching the leaves.

Chemical control is timed to target the overwintering scales, using oil sprays while the trees are dormant in late August. Ornamental trees and neglected fruit trees can be alternative hosts, and infested trees should be treated.
Infested branches should be removed and burned before crawlers emerge.
Lacewings are aggressive predators of scale and can help with biological control.

BIOLOGY:
Female scales overwinter as nymphs on twigs. They mature to adulthood in early spring and lay eggs under their protective covering. The newly hatched nymphs, often referred to as crawlers because they have legs and are mobile, migrate to the underside of leaf midribs or veins to feed. In late summer, they move back to twigs or other more permanent plant parts, and settle there for the winter. The female scale will affix herself to plant parts, secreting a waxy, protective cover. As the scale moults, the legs and other parts become smaller until it is completely immobile. Like aphids and leafhoppers, scales are sucking insects

 *Over wintering scales*

Females of the San Jose scale, which sometimes occurs on hazelnut, are round and located beneath a covering consisting of rings of grey and brown wax, with a raised nipple in the centre. Males of the San Jose scale are observed earlier in the growing season and are small, winged and golden brown.

MANAGEMENT:
Where there is a history of damage from scale, monitor throughout the growing season. Look for honeydew, leaf dieback or the presence of scales along twigs or leaf under surfaces. It may be possible to detect movement of crawlers in late spring or early summer by placing sticky substances such as electrical tape in bands on trees. There are no established thresholds for scale on hazelnut, but scale populations rarely build to high enough levels on hazelnut to cause significant damage.

Lecanium scales on a hazelnut twig in Oregon.

Note the hard, convex reddish-brown waxy covering that makes them difficult to recognize as insects.

(Photo courtesy of D.K.B. Cheung).

Scales rarely warrant control on hazelnut, because naturally occurring predators and parasites keep populations in check. Minimise the use of broad spectrum insecticides in orchards to help preserve populations of these beneficial natural enemies.
Timing is very important to the efficacy of scale insecticides, as chemicals will not readily penetrate the protective waxy covering of the immobile stage. Sprays must be targeted against the mobile, "crawler" stage.

Soft Scale on Hazelnuts.
Photo by Clem and Vanessa Cox

For more information on Scale:

http://insect.pnwhandbooks.org/nut/hazelnut/hazelnut-scale-insect#sthash.q2UoGv9h.dpuf

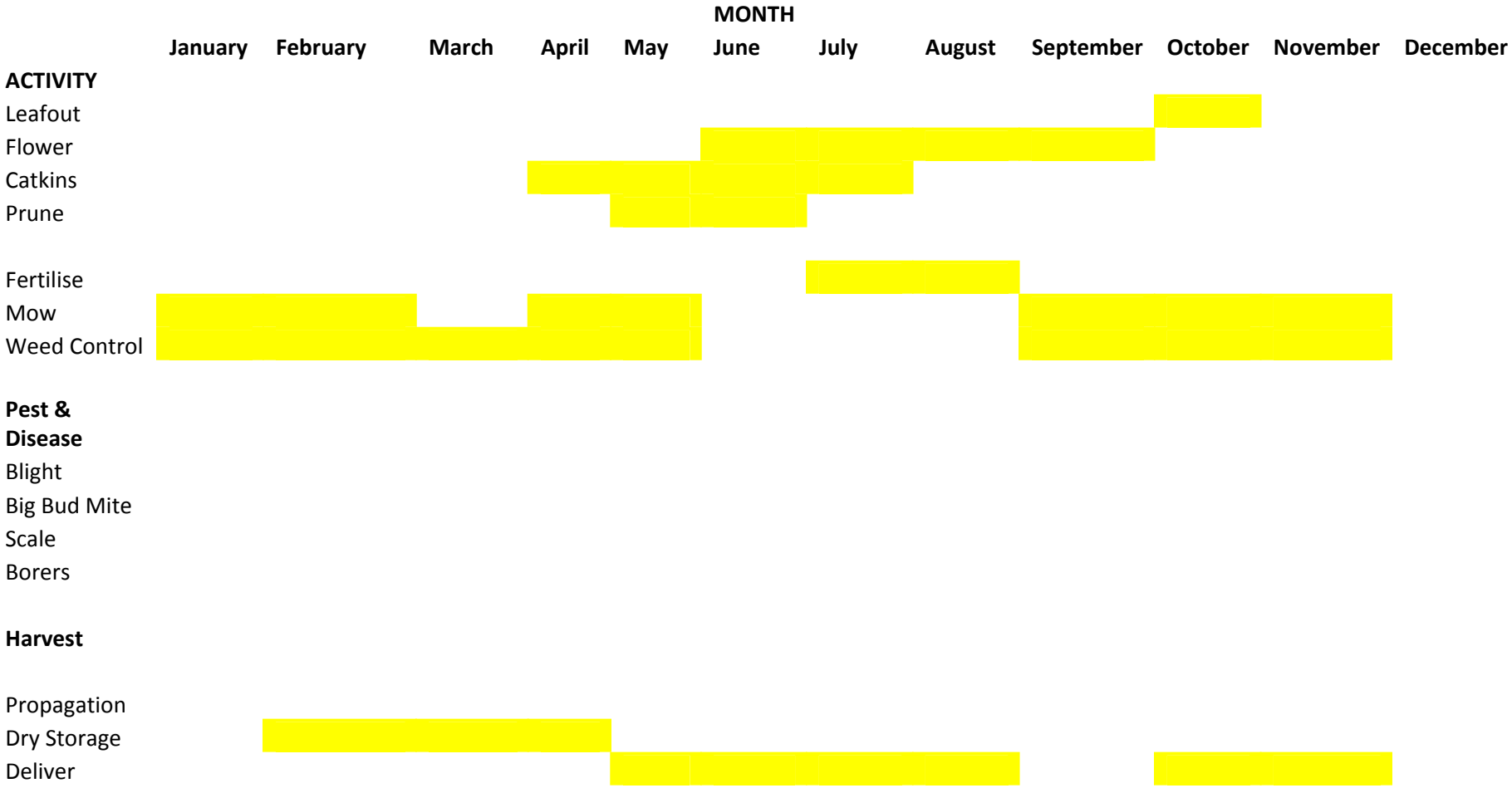
http://www.brisbaneinsects.com/brisbane_softbugs/ScaleInsect.htm

REFERENCE:

'Hazelnuts in Ontario – Pests'. Fact Sheet, Ontario Ministry of Agriculture, Food and Rural Affairs, January 2012

Appendix G: DRAFT Grower Yearly Calendar.

HAZELNUT GROWERS OF AUSTRALIA INC
ORCHARD PLANNING CALENDAR



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Appendix H: DRAFT Chemical List.

Priority Tanking	Pest /Disease/weed	Chemical Name (brand)	Organic/IPM	Mode of Action	Also wanted by
	Scale Insects and some mite species	Horticultural Oils (petroleum)	Yes Yes	Smother	*Macadamia, Pistachio, walnuts, hazelnuts*
	Aphids	Horticultural oils	Yes Yes	Smother	
	Aphids	Perimicarb	No Yes	Selective systemic aphicide, contact and stomach action	*shortlisted as priority by ANIC*
	Wingless grasshoppers, weevils, apple moth, heliothus sp, earwigs	Indoxacarb (avatar)	No Yes	Insecticide with contact and stomach action	
	Big bud Mite other mites	Sulphur	Yes ?		*Of no identified use to ANIC*
	Caterpillars,	Bacillus thurigensis	Yes Yes	Caterpillar gut specific bacteria, Stomach action	*Likely to be shortlisted as priority by ANIC*
	Fruit Tree Borers	Carbaryl,	No No	Contact insecticide with stomach action	
	Borers – emergency tool	Dimethoate (Rogor)	No No	Systemic insecticide. Strategic use in emergency.	*No residue detected in analysis on hazelnut.*
zero	Bacterial blight	Copper Oxychloride	Yes Yes	Protective fungicide-bactericide	*Registered for use on hazelnuts will not expire*
	Bacterial blight	Copper hydroxide (Kocide)	Yes Yes	Protective fungicide bactericide	
	Bacterial Canker				

	Powdery Mildew	Sulphur compounds – please suggest	Yes ?		
	General fungi including mildews	Imazalil	No Yes	Systemic fungicide, protective and curative action	
	Phytophthora (root and summer trunk rot), fungal diseases generally.	Phosphorous acid Agri-phosR , Aliette(R)	? ?	Systemic fungicide with protective and curative properties	*Chestnuts and walnuts have minor permits, ANIC priority*
	Blank for other fungi eg black leg, crown gall etc.				
	General weeds	Glyphosphate (roundup)	No N/A	Systemic – do not use on trees < 3 years	*All formulations Registered for use on weeds in orchards.*
	General weeds	Paraquat diquat (spray seed)		Contact desiccant to green material	*Priority for ANIC*
	General Weeds	Glufonsinate ammonium (Basta)		Works best in warm conditions	
	Sucker control	Paraquat Diquat Sprayseed		Preferred option for HGA. Sticks well but Users should protect selves	
		Glufonsinate ammonium (Basta)		Unreliable performance in cool conditions	
	Residual weed control	Simazine			*ANIC priority*
	Grass specific weeds	Fusilade			*Short listed ANIC priority*
	Harmful bacteria, fungi etc on nut shells	Post harvest sanitizer, Tsunami		Kills potentially harmful contaminants from animal and bird droppings.	*ANIC Priority*

Appendix I: DRAFT Nursery Tree Specifications.

Nursery Tree Specifications & Tree Types Description

PROPAGATION

A variety of techniques have been used for the vegetative propagation of hazelnut plants. Vegetative or asexual reproduction allows for reproduction of all the genetic information of the parent plant. This provides uniformity and potentially consistent performance in the orchard. Seedlings are an unacceptable means of propagating stock for the commercial hazelnut nut orchard, as they are a result of open pollination and will not reproduce the characteristics of the parent plant.
Production of grafted plants is not common in Australia, nor is micro-propagation commonly practised, although both methods are possible with appropriate equipment. Effective methods for micro-propagating hazelnuts in tissue culture have been developed in the USA. This method is helping breeding programs and commercial laboratories to fast-track new disease-resistant varieties.
This tree specification and tree type's description is provided as a "**guide**" to assist those involved in the Australian Hazelnut industry to establish final delivery specs for nursery trees***.***

General Requirements

Suppliers growing and providing hazelnut trees for Australian Orchards shall ensure that each tree that is delivered is:

- Produced from trees that are virus tested for and free of any known hazelnut viruses. Rootstocks used in the production of the nursery trees are to come from production areas that have been indexed for the above viruses.

- Produced from trees that are true to type, that is it meets the hazelnut specification of the variety.

- Budded/grafted onto the rootstock at a minimum of 200mm above the ground and not more than 300mm.

- A minimum calliper size (trunk diameter) of 12mm measured 100mm above the graft/bud union.

- A minimum height of 1.6 metres measured from the bud/graft union.

- Left with a root system following lifting that can adequately support the tree, where possible the main roots are to be a minimum of 250mm in length. The tree is to be free of residual soil.

- Has minimal damage from mechanical harvest or other operations.

- Free from obvious lesions, pests (aphid, mites) diseases (hazelnut blight). Treatment for pests and diseases can only be with chemicals registered for that purpose.

- Not treated with any chemicals to accelerate defoliation of leaves other than low biuret urea and copper formulations, hand striping of leaves can occur.

- Grown and supplied in accordance with the phytosanitary requirements of the state where the trees are grown.

- Bundled and transported to ensure that absolute minimal damage can occur and that tree roots remain damp.

These general requirements are to be used in conjunction with the following tree descriptions.

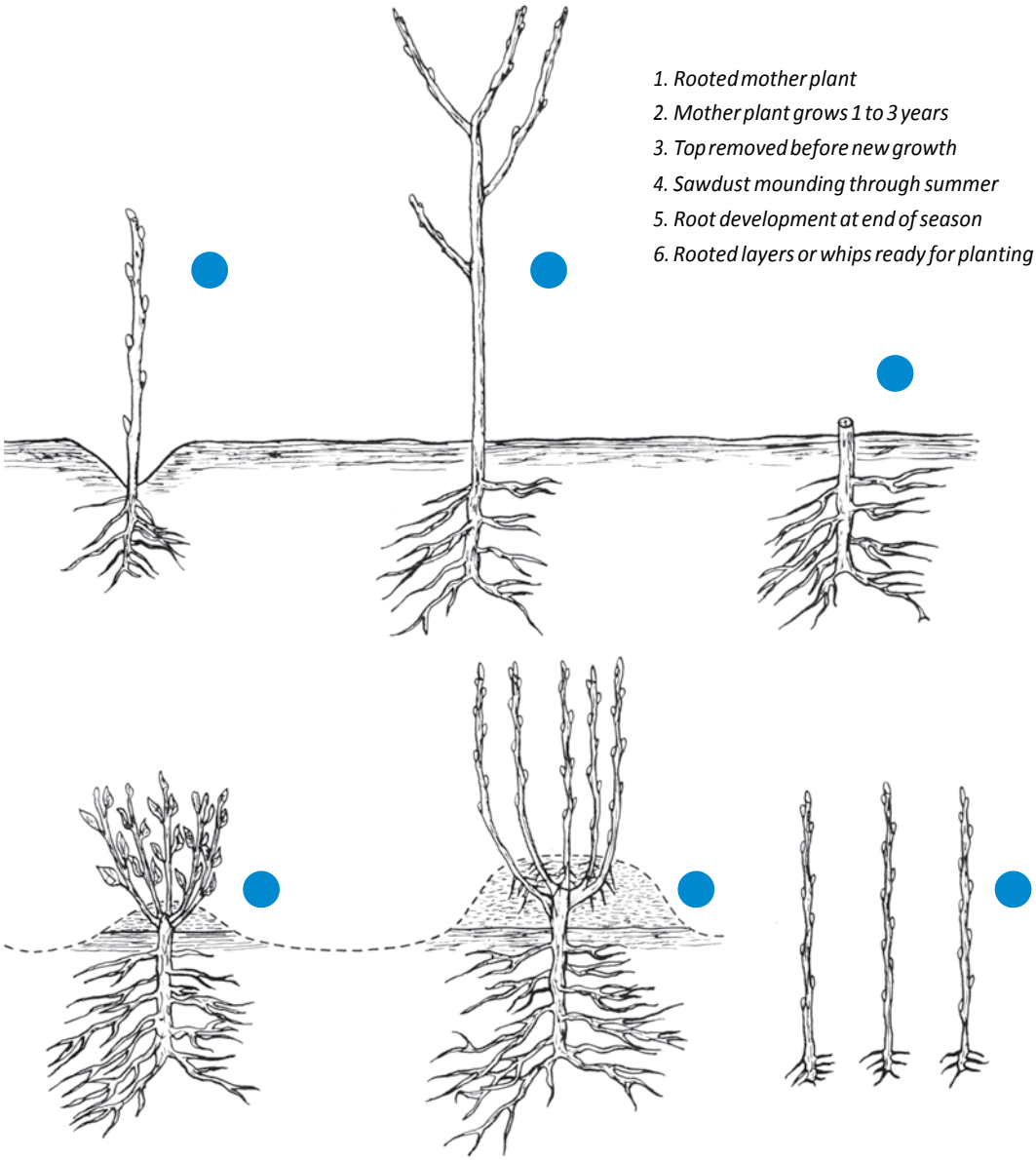
Mound (stool) layering

Mound or stool layering is the most common and successful way of propagating hazelnuts and producing whips (i.e. rooted suckers) for planting in Australia. This involves cutting a plant to ground level in the dormant season and mounding sawdust or other media around the newly developing shoots to encourage roots.

The majority of hazelnut trees in Australia are propagated vegetatively by mound (stool) layering. This process produces a rooted sucker, or 'whip' that is true to type and genetically the same as the parent. Very few nurseries produce grafted trees.

Dormant whips are normally supplied from early July through to mid to late August.

It is best to order material 1 year ahead to guarantee supply.



The whip

The following points are provided to help growers and nursery operators to select good quality stock:
Whips should be from stools that are true to type. This means meeting the specifications for the variety.
The whip should be supplied with a root system that can adequately support it and supplied free of residual soil.
Roots should be not damaged or deformed.
If possible, confirm that the whips are fully dormant before they have been cut from the stool, and confirm complete defoliation. Ideally, the wood should have hardened all the way to the tip.
The whip should be free from obvious lesions, pests and diseases. Bacterial blight, mildews and scale are most common. Many growers have unwittingly brought in disease with their plants.
A calliper-measured size of greater than 10 mm at the base of the whip and about 800 mm high is desirable.
If the whips are packaged in sawdust, avoid putting large pieces of wood in the mix that may carry wood rots.
Plants should be bundled and transported to ensure minimal damage, and tree roots must remain damp.
Dipping or spraying with a solution of winter oil and copper before shipping will help with management of pests and diseases (especially bacterial blight).
Nursery operators should comply with any State plant health import regulations when shipping propagation material interstate, in particular from regions where big bud mite is known to exist.

If delays are envisaged between the collection of plants from the nursery and planting, the whips should be 'heeled in' into moist friable soil or a heap of sawdust.

This reduces the chances of roots drying out, and planting may then be done over a number of weeks, as weather and time permits. Caution should also be taken to avoid freezing of roots before planting.

Hazelnuts, being deciduous trees, are planted in winter when they are dormant.

Planting earlier is preferable, although this is in part controlled by delivery time. Trees need to be settled in the ground before soil and air temperature start to increase.

This provides a buffer of time for unexpected delays or bad weather.

Early winter planting (July to early August) is preferable to allow the formation of a root system to cope with spring growth.

CONCEPTS FOR BUDDED TREES – THIS IS REQUIRING FURTHER DISCUSSION WITH INDUSTRY

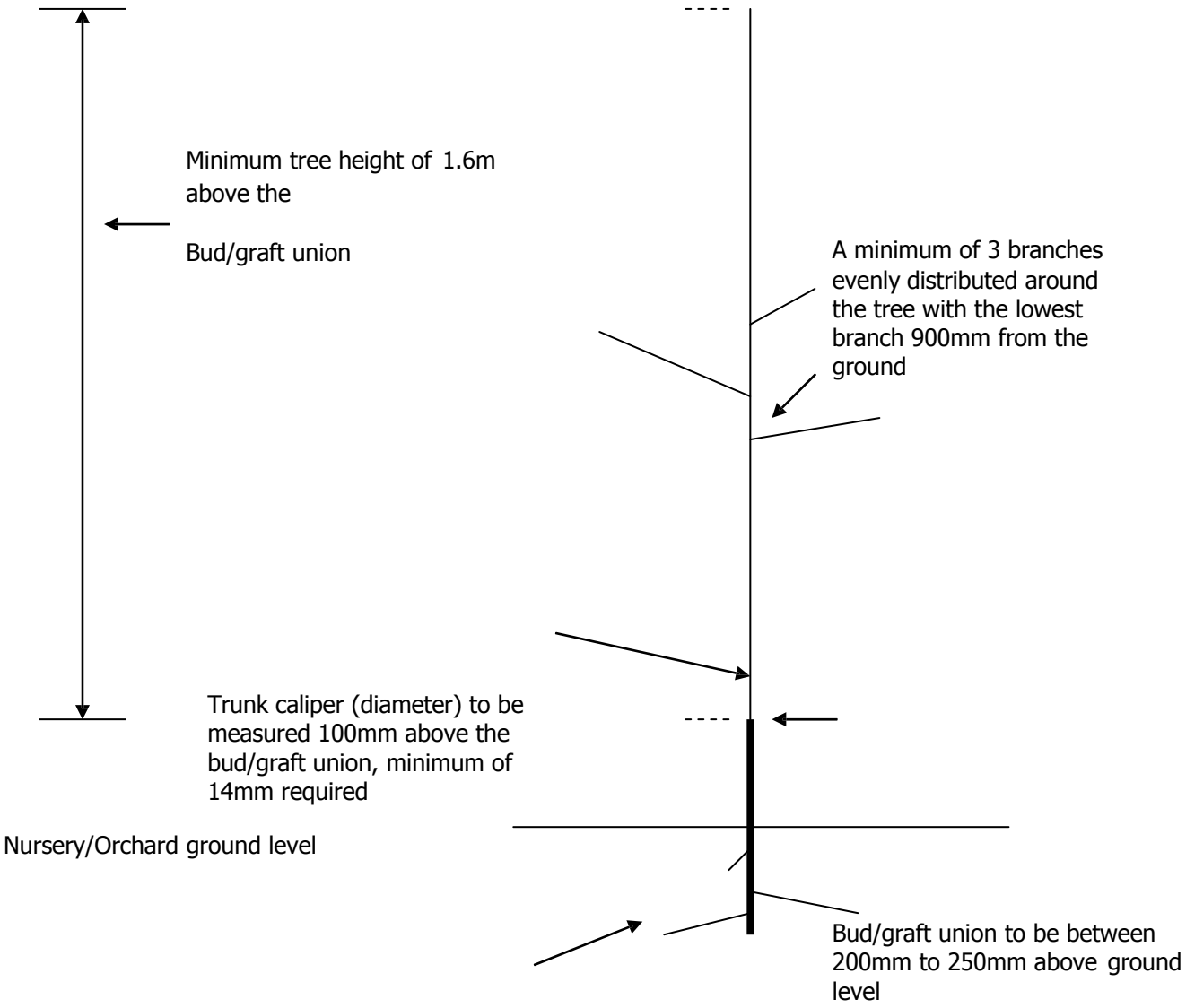
Summer Budded Trees Production and Description

This is a 2-season process. Rootstocks are planted in spring (September) and budded in summer (February). The stocks are left in the ground for winter and are headed off at the bud in the late winter (August). The bud is then grown into a tree in the second season.
Minimum tree specifications for summer budded trees in addition to the general requirements.
3 branches distributed evenly around the tree

The lowest branch is to be a minimum of 900mm from the ground; this will vary according to the growing characteristics of the variety.

Branches are to meet the 3 to 1 rule. That is branches have a diameter no more than 30% of the trunk diameter.

Tree Diagram (not to scale)



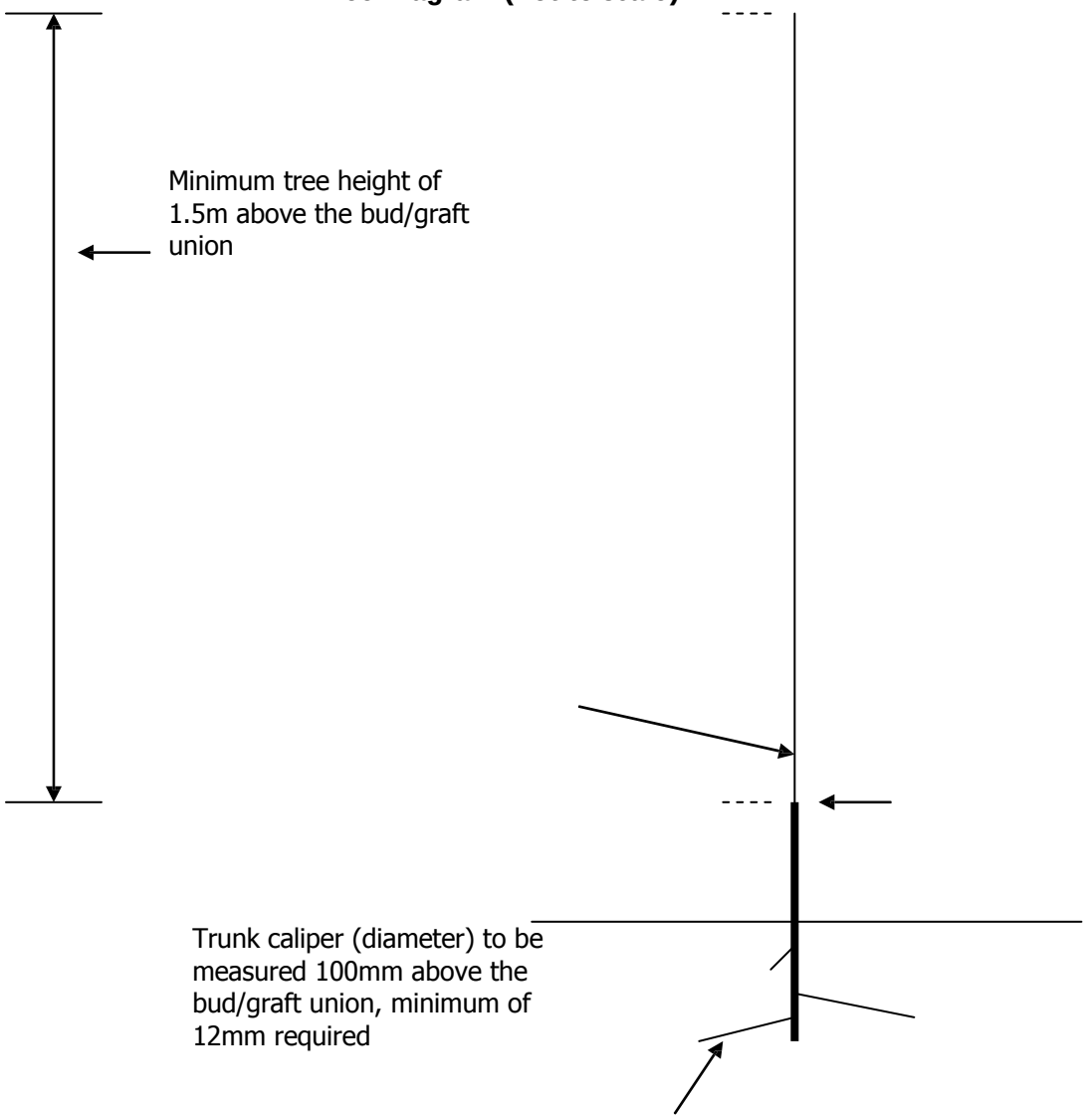
1-year-old Whips or Rods Production and Description

This is a 1-season process. Rootstocks are bench grafted in the winter and planted in the spring. The top or best shoot is encouraged and a tree with a single trunk is grown during the growing season. Trees are lifted in the next winter for delivery.

Minimum tree specification for 1-year-old whips or rods in addition to the general requirements

- Trees to be straight

Tree Diagram (not to scale)



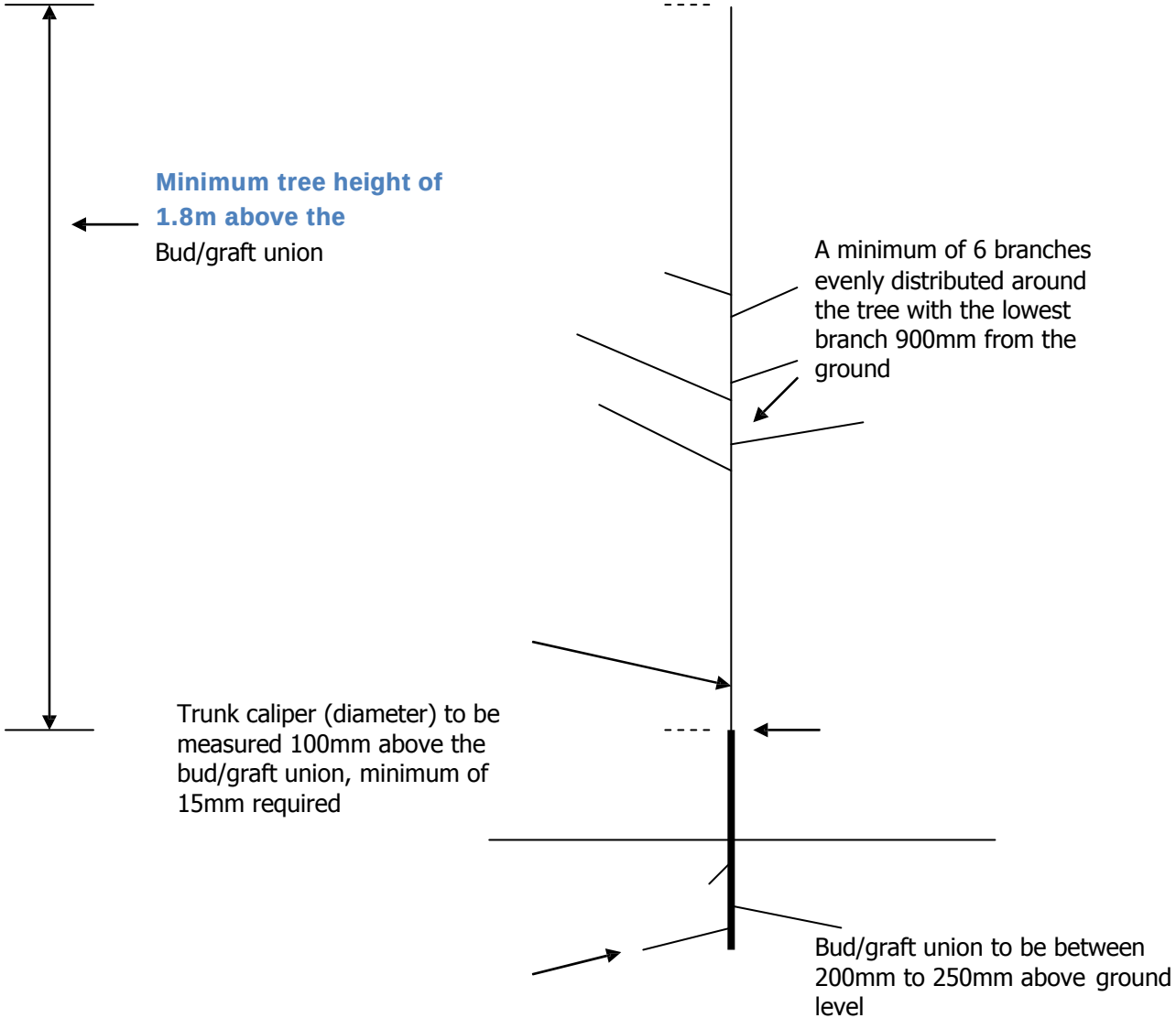
2-year-old KnipTrees (European style trees) Production and Description

This is a 2-season process. Rootstocks are bench grafted in winter and planted in spring. The best shoot it promoted to form a single stem during the growing season. The tree is left in the nursery and headed at the required height (approx 750mm above the ground depending on the variety) at the end of the second winter. The top bud is promoted and the tree branches are grown on the new growth. A number of techniques are practiced to encourage branching on the new growth. Trees need to be supported in the nursery for this process to be successful.

Minimum tree specifications for knip boom trees in addition to the general requirements.

- 6 branches distributed evenly around the tree
- The lowest branch is to be a minimum of 900mm from the ground; this will vary according to the growing characteristics of the variety.
- Branches are to meet the 3 to 1 rule. That is branches have a diameter no more than 30% of the trunk diameter.

Tree Diagram (not to scale)



Nursery/Orchard ground level →

Main roots to be a minimum length of 250mm

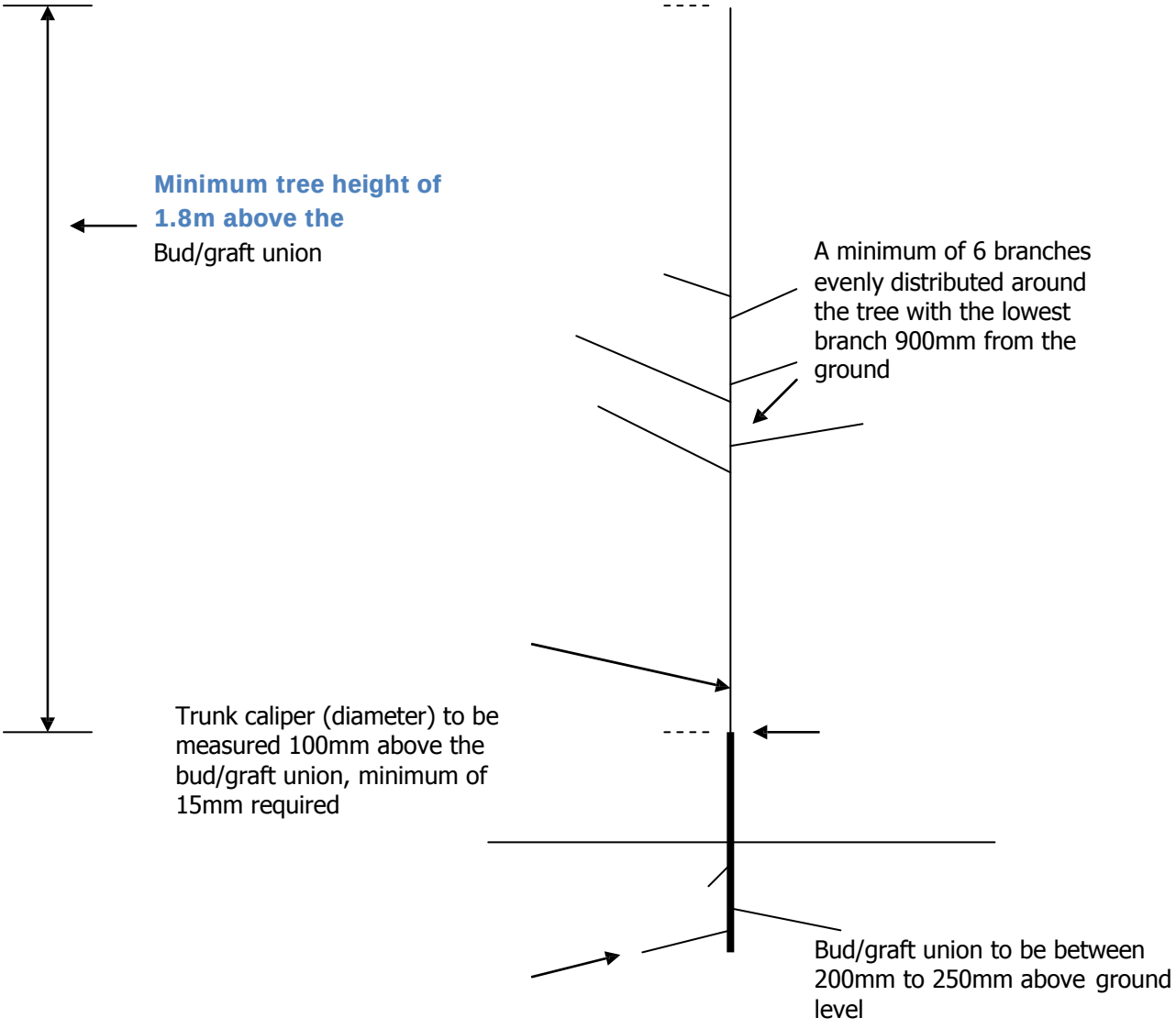
2-year-old KnipTrees (European style trees) Production and Description

This style of tree can also be produced via summer budding, which is a 3-season process. Small liner size rootstocks are planted in spring and budded in February. The rootstocks are then lifted as dormant buds in the winter sorted and replanted in the next spring the bud is promoted to form a single stem during the growing season. The tree is left in the nursery and headed at the required height (approx 750mm above the ground depending on the variety) at the end of the second winter. The top bud is promoted and the tree branches are grown on the new growth. A number of techniques are practiced to encourage branching on the new growth. Trees need to be supported in the nursery for this process to be successful.

Minimum tree specifications for knip boom trees in addition to the general requirements.

- 6 branches distributed evenly around the tree
- The lowest branch is to be a minimum of 900mm from the ground; this will vary according to the growing characteristics of the variety.
- Branches are to meet the 3 to 1 rule. That is branches have a diameter no more than 30% of the trunk diameter.

Tree Diagram (not to scale)



Nursery/Orchard ground level →

Main roots to be a minimum length of 250mm

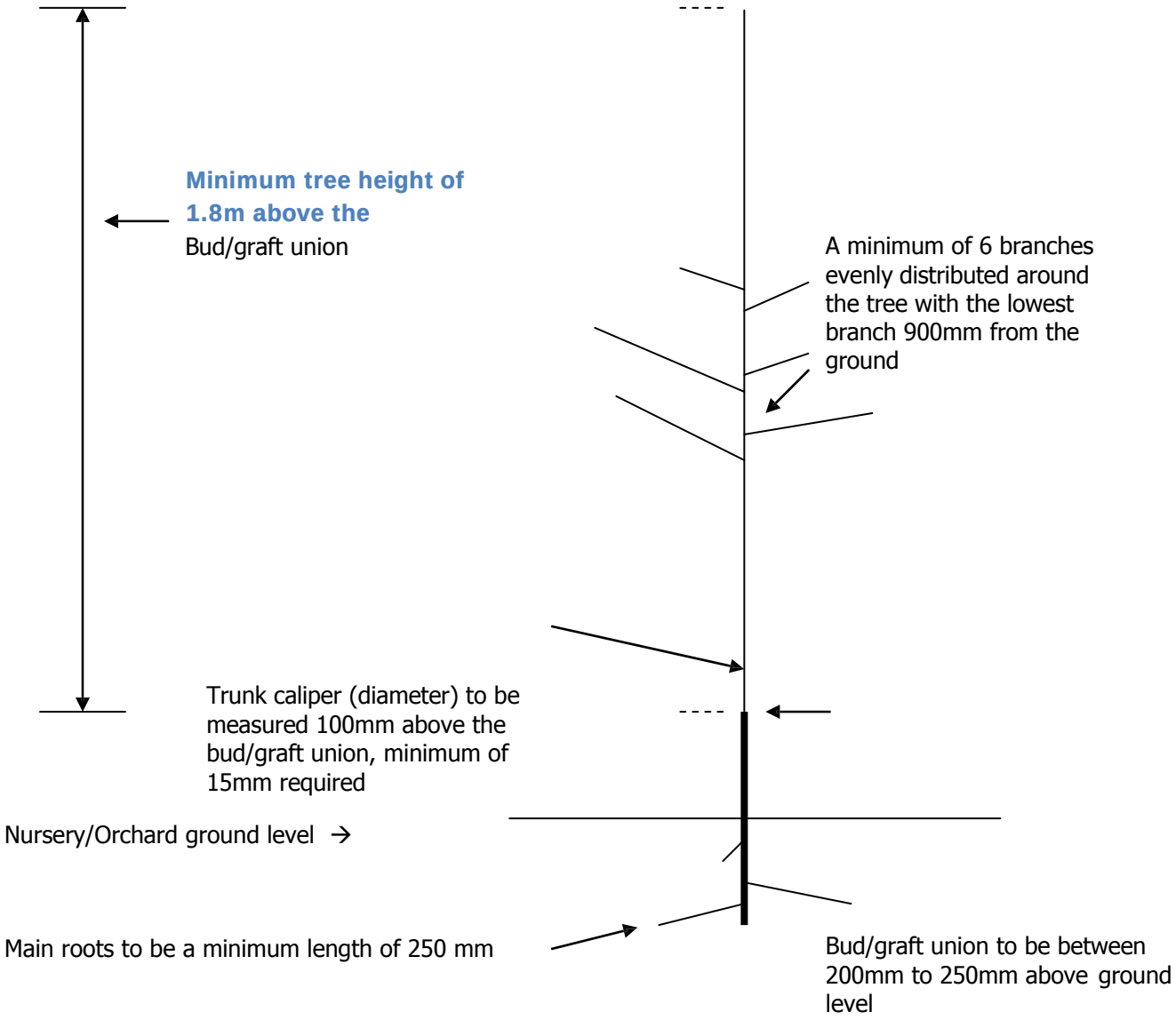
2-**year-old Spring Budded Trees Production and Description**

This is a 2-season process. Liner size rootstocks are planted in spring and budded in late November or early December. The bud grows almost immediately and is promoted to form a single stem during the remainder of the growing season. The tree is left in the nursery and headed at the required height (approx 750mm above the ground depending on the variety) at the end of the second winter. The top bud is promoted and the tree branches are grown on the new growth. A number of techniques are practiced to encourage branching on the new growth. Trees need to be supported in the nursery for this process to be successful.

Minimum tree specifications for 2-year-old spring budded trees in addition to the general requirements.

- 6 branches distributed evenly around the tree
- The lowest branch is to be a minimum of 900mm from the ground; this will vary according to the growing characteristics of the variety.
- Branches are to meet the 3 to 1 rule. That is branches have a diameter no more than 30% of the trunk diameter.

Tree Diagram (not to scale)



DRAFT TEMPLATE

QUALITY PARAMETERS

FOR

AUSTRALIAN HAZELNUTS

Developed by the

HAZELNUT GROWERS OF AUSTRALIA INC

DECEMBER 2015

QUALITY PARAMETERS

Contact:
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Communications Officer
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INTRODUCTION:

The rapidly increasing Australian Hazelnut crop will provide some interesting marketing challenges as production will greatly exceed the Australian domestic market demand.

Locally produced Hazelnuts have always had an edge on quality over most of the imported nuts. It will be important to maintain and improve this facet of the Australian crop to meet the forthcoming market competition on both the domestic and export markets.

Much of what affects Hazelnut flavour and quality is determined by the timing of the harvest and the subsequent drying and storage conditions. Timing, temperature and humidity are three vital factors affecting the eventual conditions of the kernel. Each of these factors will have a vital affect on the eventual nature of the oils in the kernel and the flavour either developed or destroyed.

The objective of the Quality Parameters for Australian Hazelnuts Manual is to ***'maintain and improve the quality of Australian hazelnuts to meet market competition in both the export and domestic markets'*** through the development and use of agreed qualities parameters by the broadest group of growers within the Australian Hazelnut Industry

The Hazelnut Growers of Australia Inc commends the concept of Quality Parameters for Australian Hazelnuts to ALL Australian Hazelnut Growers and encourages ALL growers to implement the Quality Parameters as detailed within this Manual.

CONTENTS:

Quality Parameters for Australian Hazelnuts.

The Hazelnut Growers of Australia Inc has developed a range of Quality Parameters for Australian Hazelnuts in an endeavour to build on the high quality of Australian Hazelnuts within the domestic and international markets. To maintain and improve the quality growers should implement the following Quality Parameters.

Measures for assessing hazelnut kernel attributes.

Interpretation for hedonistic attributes 5-8 are based on panel review, consensus and validation.

	Kernel Attribute	Quality	Scale	Scale source
1.	Colour	Physical		
2.	Scuffing	Physical		
3.	Halves	Physical		
4.	Oiliness	Physical		
5.	Texture	Taste		
6.	Taste	Taste		
7.	Rancidity	Taste		
8.	After Taste	Taste		
9.	Tip Shrivel	Physical		
10.	Fungal discolouration	Physical		
11.	Insect/rodent/ other damage	Physical		
12.	Contaminating material	Physical		
13.	Moisture content	Chemical		
14.	Acid Value	Chemical		
15.	Rancimat oil stability	Chemical		
16.	Aflatoxin level[£]	Chemical		
17.	Peroxide Value	Chemical		
18.	Oil level	Chemical		
19.	Lipase activity	Chemical		
20.	Composition*	Chemical		
21.	Plumpness	Physical		
22.	Kernel weight	Physical		
23.	Veining	Physical		

Measures for assessing hazelnut 'in shell' attributes.

	In Shell Attribute	Quality	Scale
1.	Colour	Physical	
2.	Smoothness	Physical	
3.	Crackout #	Physical	
4.	Suture strength @	Physical	
5.	Extraction ease @	Physical	
6.	Discolouration damage, adhering material	Physical	
7.	Empty shells	Physical	
8.	Insect/rodent/ other damage	Physical	
9.	Contaminating material	Physical	
10.	Moisture content	Chemical	
11.	Shape @	Physical	
12.	Size@	Physical	

* Attributes with gray fill not clear on whether there is a quality direction or quality optima or any benefit for determining 'fit for purpose'.

£ Other microbial contaminants are listed in the safety table in 2.4.1

These attributes are more important for intermediary customers' than final consumers' needs.

@ These attributes are of importance to both customers' and final consumers' needs.

Grower quality management stages and issues.

Stage / issue	Areas with major consequences	Management solutions	Major nut quality issue	Reference
HACCP				
Throughout	Safety	HACCP management system in place	Consumer safety	Daff, 2004, CODEX, 2005
Orchard establishment				
Location	Nut composition, filling, contamination, disease	Select location suited to growth (maximum growth/quality trade off)	PUFA value	
Variety	All operations and processes	Choose appropriate mix at planting. Manage orchard to variety specifications (e.g. pistillate flower abscission)	PUFA value	
Rootstock	Disease, vigour, nut quality directly	Choose appropriate mix at planting, manage tree vigour actively.	Nut colour, crackout	
Spacing layout	Harvest, machinery management, shading	Fit to optimal equipment solutions, prune to allow light entry	Colour, off types	
Irrigation	Orchard management, water availability, scheduling	Water security management	PUFA value, nut crackout, pinching, uniformity, aflatoxin	
Variety layout	Harvest, machinery management,	Fit to optimal equipment solutions, prune to allow light entry, manage harvest logistics (labour, machinery)	Harvest uniformity and delays caused by orchard blocks reaching PTB simultaneously	

Orchard management				
Irrigation	Nut and spur strength, ability to fill and survive other attacks	Well managed, limited to actual need, controlled deficit irrigation (CDI) where appropriate	Nut size, colour, mould, insect damage	
Light levels	Nut and spur strength, ability to fill and survive other attacks	CDI, pruning, load management	Yellowing, black shrivels, sunburn (excess sun)	
PGAs	Various including, uniform harvest, uniform bud break and flowering and vegetative control	Ethephon for uniform harvest	Darkening, degeneration due to non uniformity, slow drying, rots, shrivel, MRL	
Freezing of wet nuts	Rupture of cell walls	Maintain canopy, early harvest by PGA use, frost fight, reduce moisture content of nuts.	Rancidity, shell stain, flavour and texture degradation	
Time since PTB	Degradation of nuts, non uniform maturity	Ethephon, direct harvest, test hull maturity	Yellowing, mould, darkening	
Fertilizers	Nut fill, nut health and resistance to attack,	Nutritional testing, fertilizer needs estimation and application	Small, dark, low crackout, additional pest/disease	
Crop protection (disease)	Nut breakdown, low photosynthesis	Sprays, effective quarantine, well managed trees, cleanliness,	Rotten nuts, aflatoxin, adhering rotten vegetation, shrivels, darkening	
Crop protection (pests)	Damaged nuts, leaf loss, nut loss	Sprays, pheromones, well managed trees, quarantine, cleanliness, practices that promote beneficial arthropods	Chewed nuts, disease entry, fallen nuts, shrivels, wormy nuts	
In orchard nut management				
Harvest	Contamination, non uniformity, degradation, staining	Rapid, PGR, keep off ground, timing, cleaning rapidly	Darkening, spoilage, rots, shell weakening	

Drying and cleaning	Rot progression and degradation, insect infestation	Rapid, remove rubbish, dry using appropriate temperatures	Darkening, shrivels, rot, rancidity	
On farm storage	Degradation, rotting and infestation, staining	Cool, 60% RH, secure from water, pests, heat, O_2, light, keep in shell, short period	Darkening, rancidity, aflatoxins insect bites	
Transport	Degradation, rotting, breakage	In shell, dry, soft handle, as for storage	Darkening, rancidity, aflatoxins, insect bites, breakages	

PART 1:

CROP DETAILS
AND
RISK MANAGEMENT

Part 1 of this document should be used by the grower to record relevant information in relation to

a) The property
b) Applications of fertilisers, pest/disease sprays and irrigation
c) Challenges to crop and crop management.

1. Business details to be recorded

Item	**Add details below**
Name of orchard	
Address of orchard	
Latitude & longitude of orchard (e.g. Google Maps)	
Details of nearest BOM weather station (if representative)	

2. Crop details to be recorded

Name of block	
Planned product type (e.g. premium in-shell hazelnuts)	
Cultivar	
Rootstock	
Age of trees	
Distance between rows	
Distance between trees within rows	
Area of block contributing to the bin of hazelnuts being studied (e.g. x rows with y trees)	
Irrigation method (e.g. natural rainfall supplemented by drip irrigation)	
Where do nuts fall? To bare ground or grass?	
Is the area grazed by native animals or domestic livestock?	
Date of budburst assessment and budburst percentage (from above – Section 1.2)	
Harvest date (in due course)	

3. Questionnaire about crop and risk management

a. Were there any particular challenges in producing the crop this season? E.g. lack of water, extreme heat, severe blight, frost damage.

If so, give details of events and when they occurred.

b. Do you have a system for the control of hazards to an acceptable risk level? E.g. HACCP for food safety hazards.

If so, name the system/s you use and the extent to which it is implemented.

c. Did you have a plan for your pest & disease spray program at the start of the season?

YES NO (Circle or tick one)

If so, how did you design your spray program?

(E.g. design it myself, obtained it from the chemical reseller, or received advice from a consultant or expert)

d. List or attach your pest/disease spray program or spray diary (list what was actually applied: date, crop stage, target pest/disease, material applied, rate per 100 L, water volume etc)

e. List or attach your herbicide spray program or spray diary (list what was actually applied: date, crop stage, target weed, material applied, rate per 100 L, water volume etc)

f. Was fertiliser applied to the crop in the last 12

months?

YES NO (Circle or tick one)

If yes, describe any tools you used to determine what fertiliser to apply?

g. List or attach information about fertilisers applied to the crop in the last 12 months (date, material, amount etc)

h. Was water applied to the crop during the

season?

YES NO (Circle or tick one)

If yes, describe how you determined the timing and frequency of irrigation

i. List or attach information about irrigation events (if available)

j. Do you have a plan and process for preventing the entry of quarantine pests or pathogens to your property?

If so, describe the plan and process.

Appendix K: DRAFT Risk Assessment for Hazelnut Industry June 2015

DRAFT Risk Assessment for Hazelnut Industry June 2015						
ISSUE	RISK	WORST CASE	MOST LIKELY CASE	RAMIFICATIONS	MITIGATION	PREVENTION
Microbial contamination	H/E	Consumer deaths and associated really bad PR	Multiple foodborne illnesses and associated bad PR	Rapid decline in sales Loss of consumer confidence in product	Traceability/QA	Grower guide packing guide grower education
Chemical residue contamination	M/H	Illness/death and associated really bad PR	Bad PR	Public outrage and associated loss of confidence and sales decline	Freshcare Chemcert Residue testing Good record (evidence?)	Grower education Chemcert QA/residue testing
Natural disasters	M	Individual growers go under financially Industry size reduction	Disruption to supply – probably not huge as industry is geographically diverse	Disappointed consumers and retailers Possible price spike deters regular purchasers	Geographical diversity Use good trellising and netting	Geographical diversity Use good trellising and netting
Irradiation	L/M	Very bad PR Public perceives hazelnuts to be bad for health	Very bad PR	Rapid decline in sales Loss of consumer confidence in product	Defer to FSANZ Get an expert onside	Commence positive PR with advocates before going to market Be proactive
Supply & demand	L	Huge oversupply leads to unsustainable returns and growers leave industry	Oversupply leads to temporary very low prices Not enough fruit – high prices	Industry contraction	Run promotions and PR to encourage demand Try to get growers not to forward product to market for less than cost of production	Better information on plantings, costs of production, supply and demand Communicate this to industry regularly
Biosecurity issues	R/U E	Devastating pest or disease wipes out industry	New pest or disease gets established	Cost of production increases Interstate quarantine could cause havoc	Industry Biosecurity Plan Industry communication	Surveillance Communication PHA relationship Industry Biosecurity Plan

COBNUT

Hazelnut Industry Technical e-Newsletter

Volume 6
August 2015

GEORGIAN HAZELNUTS, HOME AND ABROAD

Georgian nuts company Georgian Products Renaissance (GPR) exports its products - roasted and salted hazelnuts in shells - to England, Bulgaria and Poland.

This is the first certified nut factory, located in Khobi, Samegrelo - Zemo Svaneti region. The factory is placed over 8000 square meters and is equipped with modern and imported machinery. The company's main products are: In-shell Hazelnuts, Raw Hazelnut Kernels, Snacks of Roasted & Salted Hazelnuts with Shell, and Hazelnut Shells.

GPR created a new technological process in hazelnut manufacturing and recently launched a new salty snack product of roasted and salted hazelnuts in shells for both Georgian and international markets. A 125g packet costs 3-4 Lari, making it affordable for locals.

GPR is now attempting to sell its products in Georgia's hypermarkets following its success in exporting abroad.

According to head of Georgian Products Renaissance, Temur Bolkvadze, they are planning on exporting around 440 tons of GPR products abroad.

"GPR was founded in 2013. This year the price of nuts was the highest on record and we were able to buy 1kg nuts for 7 Lari from locals. There were several cases when the highest price for 1kg nuts was 12 Lari," Bolkvadze said.

Nino Ioseliani

AUSTRIA: FIELDEYE® - THE GOOD BIG BROTHER THAT SUPERVISES FIELDS

Following the growth of crops can be very complicated and affect the economy of commercial farms. Technology can now provide some help, enabling you to follow what is happening on the fields even when far away. This can be achieved thanks to Fieldeye® 3.0, a specific video camera developed by an Austrian company.

Fieldeye® 3.0

Once it has been installed and set up, Fieldeye® films fields in high-resolution. The images are available at any time and on any device - computers, laptops, tablets or even smartphones. This way, growers can check how plants are growing and compare data. An infrared camera also measures the 'stress level' of plants.

Fieldeye®'s user-friendly interface

An additional series of functions monitors temperature and rainfall and the high resolution of images (2x13 Megapixel) enables you to zoom in not to miss one single detail. Pictures taken over time enable you to analyse how plants grow so as to take important decisions such as how and when to irrigate or when to use fertilisers.

The high resolution of images enables you to zoom in to discover the smallest details.

Last but not least, Fieldeye® is powered by a small photovoltaic panel.

BASF Austria and BASF Czech Republic, Syngenta, Bayer Croatia and Bayer Slovenia, NuSeed, RWA, Tisma Zmajevo and many more are already using Fieldeye®.

Hazelnut Growers of Australia Inc.

Communications Project Officer: Trevor Ranford

T: 0417 809 172

E: sahort@bigpond.com

hazelnuts.org.au

DIARY DATES:

2015 HAZELNUT CONFERENCE

23rd to 25th October 2015.
GOULBURN, NSW.

NEW TECHNIQUE CUTS USE OF PESTICIDES FOR HAZELNUT FARMERS

EUGENE, Ore. - Eugene-area hazelnut farmers are starting to use pheromones to save crops and reduce pesticide use.

Moth larvae ruin hazelnuts by burrowing inside and farmers are trying to reduce pesticides use by making it harder for male moths to mate, *The Register-Guard* reported.

Oregon State University's research lasted three years and was funded by Eugene's water board and the Oregon Hazelnut Commission as part of an effort to reduce pesticides that can end up in the city's only water source, the McKenzie River.

Oregon State University entomologist Vaughn Walton says filling the orchard air with female pheromones in a process called mating disruption keeps males from finding females and prevents mating.

The study found farmers using the alternative technique had to use pesticides about half as much.

"It's costing more or less the same as chemical control," Walton said.

Hazelnuts are an increasingly in-demand commodity that about doubled in value from the 2013 to 2014 season, reaching $3,600 per ton.

Garry Rodakowski has been growing hazelnuts for 45 years and says he hasn't seen a similar growth period for the crop in three or four decades. He said moth larvae can cause a farmer to lose an entire crop if three out of 100 hazelnuts fail a "crack test" and open up to reveal wormy insides.

He said he's always willing to try a new technique.

"I've lived on the McKenzie all my life so I want to see it kept clean," he said.

ACKNOWLEDGEMENT: *The Associated Press*, July 6, 2015

CREATING ORCHARDS FOR THE FUTURE

Hazelnut growers look to expand production in an innovative way

While the Oregon hazelnut industry represents 99 percent of the United States market, that's only 3 to 5 percent of the world's production. For the hazelnut industry, that translates to one message: there is plenty of room for growth.

GARY ALLEN - Industry growth - Hazelnut prices were at record levels last year, partially due to a drop in production from Turkey, the world's largest hazelnut grower. Newberg hazelnut grower Michael Severeid expects prices to remain strong this year, but hopes to have a larger crop and has come up with some creative efforts toward securing more orchard land.

"Even if we plant double or triple, we're not going to oversupply the market and the trend is that demand for tree nuts and hazelnuts in particular is going up," said Michael Severeid, president of Flying Feather Orchards in Newberg. "We're supplying a growing market."

So throughout 2015 the goal has been to have a larger crop than before but to retain the same record-high prices that hazelnuts went for in 2014. Those prices were largely due to a major drop-off in imports from Turkey, the world's largest exporter of hazelnuts, which exported a low number because of both a smaller crop and some quality issues, Severeid said.

Convincing new growers to get into the business should not be difficult when presented with the profit margins, which Severeid said can yield as much as 10 times what farmers with good soil make off their crops that rotate every few years.

So why aren't more landowners planting hazelnut orchards? It all comes down to a time issue.

"Hazelnut orchards don't require much labor, once established they are pretty straightforward to maintain," Severeid said. "But you have to wait six years to get a crop and you have a lot of capital on the front end."

The rotating crops, while yielding lower profits, have a much quicker return. That's why Flying Feather Orchards created a program to help new growers get started in production.

The New Heights Initiative began three years ago, working with interested landowners who own vacant land appropriate for hazelnut orchards.

"We'll establish the orchard, take care of it, raise the orchard and when we're done they'll have a producing orchard they can make money off of," Severeid said.

Not every piece of land is ideal for hazelnut growth, so Flying Feather evaluates potential properties for soil type - well-draining valley soils are the best - before committing to growing an orchard on the land. There also needs to be enough acreage for it to make economic sense, with at least 10 acres generally penciling out well.

The basic plan is that Flying Feather will get the orchard off the ground and use the land for roughly 15 years, all the while paying rent to the landowner. That gives Flying Feather a chance to recoup its costs of creating the orchard after the 6-year establishing period. The startup costs are significant, Severeid said, but it's more of an investment in the future.

A full-on orchard, which the landowner will have at the end of the 15-year period, can bring in between $700 and $800 per acre per year on rent. Compared to some of the current crop uses of farmland that can be a tenfold increase. Plus, the landowner is receiving rent all the while.

And it's beneficial for Flying Feather as well, as the orchard always wants to make use of more property but land prices are a barrier to that option at this time. The orchard will bear some large costs in the beginning, but since it already has a skilled crew and the right equipment the burden is less than it would be on a newcomer to the industry.

Once the orchard is turned back over to the landowner they can either maintain the operation themselves or opt to continue renting it to Flying Feather. Either way, the land has increased markedly in value by producing a versatile product that, Severeid said, is just increasing in popularity.

"I think it's really a win-win for the landowners because of the value," he said. "There's not anything else you can do to make farmland two or three times the value of the farmland next to it."

ACKNOWLEDGEMENT: Written by Colin Staub

SKYROCKETING HAZELNUT PRICES CONTINUE TO BURDEN SECTOR

Turkey's struggle with inflation and attempts to regulate prices has drastically affected the price of hazelnuts, which have shot up from TRY 60 to TRY 120 in a week.

While Turkey by far is the largest hazelnut producer on the globe, consumers are struggling to cope with the unreasonable prices.

Producer Mehmet Ekici like many others notes that the prices, which were at a mere TRY 30 in 2012-2013, has much to do with the free market sector in 2009 - specifically the emergence of intermediary traders who view hazelnuts as a mere investment to buy in bulk and keep in stock, causing the market supply to drop while waiting for the prices to go back up for a better sale.

"As a result of the free market policy implemented in the hazelnut sector in 2009, prices go up every time the supply is low. What can we say, except that if the consumer finds the prices too high than they should not buy them," Ekici said.

His sentiments were echoed by the Black Sea Hazelnut Exporters Association (KFİB) Chairman Edip Sevinç, "The hazelnut farmer who used to sell his crop directly to the state now has to sell to traders. Traders who kept their hazelnuts in stock have proceeded to sell once they saw the prices rise."

Sevinç also added that while 300,000 tons were lost last year due to frost, a 600,000 ton yield was expected this year.

ACKNOWLEDGEMENT: Sümeyra Kırca, BGNNews.com, Istanbul

ENERGY MADE EASY WEBSITE

Now it's even easier to compare offers from energy providers.

The Australian Energy Regulator's *Energy Made Easy* website has been redeveloped (energymadeeasy.gov.au).

Changes include improvements to the comparator function and creating a separate small business area on the website to help small business customers make more informed choices about electricity and gas offers.

SMALL BUSINESS SCAMS & CYBERCRIME FORUM - VIDEO NOW AVAILABLE

In May 2015, the ACCC and the Institute of Public Accountants hosted a small business scams and cybercrime forum in Melbourne. The aim of the forum was to help small business operators and stakeholders understand the scam and cybercrime risks small businesses face, and how they can best protect themselves. The event featured three expert speakers and a question-and-answer panel discussion.

A video of the webinar is available here.

ICC RELEASES SMALL BUSINESS COMPLIANCE TOOLKIT

The International Chamber of Commerce (ICC) has released a guide on competition law compliance for small and medium-sized enterprises (SMEs). Designed by business for smaller businesses, this guide aims to ensure that SMEs and their employees understand why complying with competition law makes good business sense.

The toolkit covers danger areas, elements of compliance, a checklist to help identify competition law risks and examples of basic dos and don'ts.

The SME toolkit can be downloaded for free on the ICC website.

Small Business team,
Australian Competition and Consumer Commission (ACCC)

FUNDING GRANTS FOR WOMEN IN THE RETAIL AND WHOLESALE SECTOR

In 2015 Women & Leadership Australia is administering a national initiative to support the development of female leaders across all sectors.

From July 1 2015 the initiative will provide women in the retail and wholesale sector with grants for leadership development. More specifically, grant applications are open to women employed in the retail and wholesale sector at two levels. Please click on the preferred program link for details.

1. **Senior Management** and executive level women leaders can apply for $12,000 individual grants to undertake the Advanced Leadership Program.
2. Women Managers can apply for $4,500 individual grants to undertake the Accelerated Leadership Performance Program.

Expressions of Interest

To request a scholarship grant application form or additional information click here.

Should you wish to discuss the initiative in more detail please contact Ian Johnson at the office of the National Industry Scholarship Program, Australian School of Applied Management on 03 9270 9000 or via ijohnson@asam.edu.au

Summer 2015

Volume 48

The Hazelnut Log

The Official Newsletter of Hazelnut Growers Of Australia Inc.

Hazelnut Growers of Australia Inc. PO BOX 214 LOBETHAL SA 5241

What's Inside

Appendix M: Summer 2015 'Hazelnut Log'.

A Note from our President

During this very busy period, can I please take this opportunity to wish all our members and families a wonderful Christmas and happy New Year. The 2016 Committee is already working hard on the strategies for next year as we develop the Australian Hazelnut Industry for the benefit of all growers and consumers.

Enjoy this Christmas newsletter full of photos and current articles from overseas and at home.

Safe and joyous holidays to all.

Kind regards,

Darren

President

2016 HGA Committee

A wonderful mix of new and old faces...(not old as in age!)

Left to right.Paul McNamara, (NSW), Sallianne Faulkner (NSW), Stephanie Hodge (NSW), Nathan Bracken (Tas), Greg Jaensch (SA), Peter Beggs (Vic), Darren Baguley (NSW), Vanessa Cox (NSW) and Colin Carter (Vic).

The Locust Bulletin for December 2015 is available on the Department of Agriculture website at:
http://www.agriculture.gov.au/pests-diseases-weeds/locusts/bulletins

Outgoing President's Report as presented at Annual General Meeting on 24 October, 2015 GOULBURN, NSW by Sallianne Faulkner.

Following a successful Conference in Hahndorf in October 2014, the newly elected Hazelnut Growers of Australia Inc launched into a busy and eventful period in the industry's development in 2015.

As an industry, we watched the awareness of Australian Hazelnuts grow in the domestic market due to a global shortage caused by unseasonal Turkish weather. Further, we engaged with many seeking supply of hazelnuts in tonnes and undertook many conversations explaining that the Australian supply was simply not yet ready to match demand.

In April, I presented our industry update to the Australian Nut Industry Council conference – our thanks to Chaseley Ross of ANIC for her ongoing support and mentoring of our industry. I congratulate our own Vice President, Darren Baguley, on his position of ANIC Vice President, taking up this role in April 2015. Darren sits alongside Jolyon Burnett from the Australian Macadamia Society and in my opinion, could seek no better role model going forward for our industry – one of the very real benefits of being at the ANIC table is the resources and knowledge at our finger tips from those that have walk our path with their industry development prior.

We continue to watch over the changes made via the revamping of Horticulture Australian Limited into Horticulture Innovation Australia Limited and have endeavoured to understand and have input into these changes that will take funding away from this industry; given that we are not levy payers in the clinical sense of the word. Darren has presented a paper with our opinions that we will seek guidance from members on throughout the course of the AGM. Thank you Darren for this valuable input.

To summarise the last 12 months, as an industry,

- we have considered our input in the Agricultural Competitiveness White Paper developed by Minister Joyce;
- we have engaged with the NSW DPI Temperate Nut Officer to further understand the best locations to grow our hazelnuts
- we have signed the Plant Health Australia Biosecurity deed which will enable the industry to be at the table should an incursion present- in this day, this is a very real concern and has the potential to crucify our industry – I commend the Committee for their insight into making this decision.
- We have participated in Voice of Horticulture activities/meetings. The VOH is a newly formed group to take the interests of the wide and various horticultural industries to the Government for further and fair representation.
- We have continued the employment, with HIAL funding assistance, of our Communications Project Officer – can I at this time, say a huge thank you to Trevor Ranford who brings such vast experience and resources to this role – Trevor, your assistance and understanding of industry knows no bounds and I am very grateful to have had the opportunity to watch you in action.
- We have continued to provide insightful Newsletters featuring local and international news articles and information to our members.
- The Committee, under the guidance of our terrific secretary, Greg Jaensch, has improved the membership renewals process. Thanks also to the secretary's first lady, Janet, who added phone call follow up to her assistance role with terrific results.
- Vanessa Cox, Victoria's Colin Carter, Tasmania's Greg Taylor and South Australia's Sally Robbins- as State Representatives, you have assisted the industry in a wonderful fashion this past 12 months. Thank you.

Con't onto Page 3

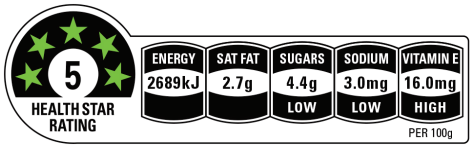
- We have undertaken Farm Walks in NSW, Victoria, Tasmania and South Australia. These walks give new and existing members the opportunity to come together locally and discuss, socialise and have any questions thrown around for best answers.
- We represented our industry in Canberra at Minister Joyce's briefing about the future of horticulture – again enabling us to have a seat at the table to hear first hand the changes afoot.
- Thanks to Carol Bracken who has managed the website during this period – Carol has updated the valuable Member Only area and has enabled members to further access information to assist them in their groves.
- As I touched on previously, we have fielded many, many enquiries this year for high volumes of Australian hazelnuts and increasingly processors and retailers are seeking to understand and acknowledge the source of their supply. This is an exciting time in our industry as many growers groves begin to increase their yields via maturity of the grove.
- Congratulations to Carol Bracken who was awarded the Tasmanian Rural Woman of the Year earlier in 2015. It was my great pleasure to attend the Great Hall of Parliament House with Carol and Nathan in September to see Carol be awarded with the runner up of the National Rural Woman of the Year award and to hear her detail her thoughts about our industry and her plans for development of rural women in Tasmania- congratulations Carol.
- We continued to liaise with Ferrero to encourage their membership and their input into our industry with the knowledge that they will be the biggest player in our industry at some point in the future. This remains a work in progress.
- We have continued to have input in the Nutgrower – an essential element of our industry communication and can I say thank you to editor Youna for her patience and encouragement. Youna, you have continued to develop the Nutgrower as a valuable industry resource and we appreciate this greatly.
- We have watched as members have entered new products into shows with great success – congratulations to Vanessa and Clem from Australian Gourmet Hazelnuts and to Christie from Hazelbrae on our awards for your hazelnut oil and nuts quality.

It is my regret that I have not undertaken the Strategic Plan review for our industry as was planned, time did simply not allow this to be completed - I do however encourage everyone to consider the strengths of our industry and continue to focus on taking big steps forward for the betterment of all.

And finally thank you to the members of the Committee – you willingly volunteer to set aside time throughout the year, the season, alongside the work you do in your business for everyone's good, to drive the industry…without your support, I know most of our plants would continue to grow but our industry would not – thanks to you all for your input and your resources. Aside from the sheer work addition, I am proud to work alongside such a dedicated group.

I present my report to the 2015 Annual General Meeting of the Hazelnut Growers of Australia Inc with the motion that it be accepted.

Cheers, Sallianne



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PMA A-NZ Produce Executive Program

April 17th - 22nd

JOIN US AT Mt Eliza Executive Education Campus, Victoria

The 2016 PMA A-NZ Produce Executive Program is now available. PEP is a personal and professional development opportunity for top leaders and key decision makers in the Australian and New Zealand produce industry.

A mix of skill enhancement, industry forum and practical application of learning, PEP provides a rare opportunity to access knowledge and insights across the supply chain by networking with industry peers and through interactive discussions with industry leaders.

This year's guest speakers come from Coles, Woolworths, Harris Farm Markets, Bidvest, Monsanto, Costa Group, Fresh Select and Perfection Fresh.

Early Bird Offer:

Register by the 30th of December to receive 10% off the registration fee.

Italy: Ferrero to pilot Indian hazelnut project

Hazelnuts from India's Himachal Pradesh state could soon be the main ingredient in Ferrero Rocher brand names like Nutella, as a trial for commercial production gets underway.

A pilot project has been given the green light in the northeastern region close to the Himalayas to grow hazelnut cultivars supplied by Ferrero, a leading Italian manufacturer of chocolate and confectionery.

Although it is not yet clear exactly which locations in Himachal Pradesh will be best suited to production of the tree nut, field experiments will begin soon, overseen by Italian growers who will visit India regularly as part of the collaboration.

Although there is currently no hazelnut production in Himachal, apart from some wild crops, the state is thought to have good potential with ideal growing conditions and climate.

An official from the regional State department of Horticulture told *www.freshfruitportal.com* farmers were excited about being involved with such a high-profile brand.

“It's early days but there is a good buzz about the farmers who are happy to be growing hazelnuts for a company of this magnitude,” the spokesman said.

“The Himachal climate will be a good friend to the hazelnuts and I think this has been recognized by the Italians who want to see how well they grow here and have been searching for production outside of Italy for a while now.

“Cultivars from Italy will be imported and trialed here in Himachal as part of the pilot project, and hopefully this will be successful and lead to larger quantities being produced in the future.”

If successful, a fully fledged project will be set up and more Indian farmers will be encouraged to diversify crops to grow hazelnuts for Ferrero.

The Indian pilot follows another Ferrero deal in the summer when a Memorandum of Understanding was signed to increase hazelnut production in the Piedmont growing region of Italy.

ACKNOWLEDGEMENT: ***Photo:*** ***Wikimedia Creative Common***
ARTICLE: www.freshfruitportal.com

December 11th, 2015

HGA 2016 CALENDAR

When	Where	What	Who
May/June	Australia	Membership Renewals due	Everyone
3 & 4 September	Tasmania	HGA Annual Conference	Conference Committee; Carol Bracken

OVERSEAS NEWS:

Spain: Galicia studying hazelnut cultivation

In addition to Nutella and other chocolate spreads, hazelnuts are an ingredient for numerous products.

Hazelnut trees, which are native to Asia Minor, spread firstly across the Mediterranean and then to the rest of the world. Turkey is the major producer, accounting for almost three quarters of the world's hazelnuts. Italy is the second largest producer in Europe and Spain dances between the third and fourth position, depending on how the harvest comes.

The growing demand for nuts, especially in Europe and the United States, given their nutritional qualities, has made hazelnuts a very interesting crop, preferred because of its high profitability. The trend has arrived to Galicia and there are already experimental plantations in A Estrada studying whether the climate and different soils in Galicia are suitable for the cultivation of this profitable crop.

Hazels are present in many gardens and private orchards in Galicia, but there is no extensive cultivation. The tree is rustic, withstands humid weather conditions, prefers permeable soils and tolerates cold winters, even though late frosts can spoil the flowering and damage the production for the next harvest.

Chestnut and walnut trees, which produce an annual harvest of fruits in great demand, while ensuring the supply of highly prized wood by the furniture industry, are already a part of the Galician landscape. Almonds, pistachios and hazelnuts are arriving in a second wave in view of the high prices that these nuts are reaching in the international markets and how easy it is to find buyers.

Extremely healthy
Just like almonds and walnuts, hazelnuts are considered extremely healthy; their high content of vitamin E and other nutrients make them an ideal nut to be consumed on a daily basis. It is worth noting, however that they must be consumed in small amounts, since 60 percent of their composition is fat, supplying an average of 675 calories per hundred grams.

Acknowledgement: laregion.es

"I stopped believing in Santa Claus when I was six. Mother took me to see him in a department store and he asked for my autograph." – Shirley Temple

Make healthier choices this holiday season

Did you know? Australians gain on average 0.8-1.5kg over the Christmas period.

To help combat this statistic keep an eye out for HSR-labelled products to help choose a healthier option for Christmas and New Year's celebrations.

Hazelnut chips, a natural alternative to potato version

Food engineers at Hazelnut Research Institute (FAE) in Giresun have produced chips made of hazelnuts. The institute used hazelnut and wheat flour along with some spices in chips. Gökhan Kızılcı, the head of the FAE, said that they have initiated the project on producing hazelnut chips this year. "We have applied a different formulation. It is possible to make chips from hazelnut flour. The institute is currently working on producing chips with hazelnut pulp brought from hazelnut oil factories," he said, adding that they have achieved good results so far. Saying that parents are concerned about children's chips consumption, Kızılcı said hazelnut chips might be an alternative.

"Potato chips at supermarkets are generally considered unhealthy and many parents do not allow their children to consume chips frequently. Without any additives, the institute has produced hazelnut chips. It contains natural ingredients. We only used spices and hazelnut," he continued. Kızılcı called the attention of chips companies to introduce hazelnut chips to the market. "We are planning to increase revenue generated from hazelnut. Children can also consume more healthy chips in this way," Kızılcı concluded.

ACKNOWLEDGEMENT: ***ANADOLU AGENCY, GIRESUN, Turkey***

2014/15 Hazelnut Growers Of Australia Inc Management Committee

President |	Sallianne Faulkner, NSW	0419474623
Vice President |	Darren Baguley, NSW - *also ANIC Vice Chairman*	
Secretary |	Greg Jaensch, SA	
Treasurer |	Nathan Bracken, TAS	
State Reps |	Greg Taylor, TAS	
	Colin Carter, VIC	
	Sally Robbins, SA	
	Vanessa Cox, NSW	
Committee Members |	Peter Beggs VIC	
	Andrew Cook, VIC	

We meet via teleconferencing once a quarter at present so if you have anything you would like discussed please just let us know. We look forward to working together for the good of our industry and our growers.

Communication Project Officer | Trevor Ranford

"One of the most glorious messes in the world is the mess created in the living room on Christmas day. Don't clean it up too quickly." – Andy Rooney

PLANT HEALTH AUSTRALIA MEETINGS:

The following is a report from the round of Plant Health Australia meetings held on the 24th and 25th November 2015.
Trevor Ranford, Communications Officer with Hazelnut Growers of Australia Inc attended and represented the Hazelnut Industry at the meetings.
Trevor Ranford, as a member of the PHA Industry Members forum executive committee, also attended a meeting with the new Secretary of the Department of Agriculture and Water Resources, Daryl Quinlivan and other senior staff members involved with components of biosecurity. The DAWR representatives showed a strong desire to develop an open and transparent consultation process with industry.

Joint Industry Forum: - 24th November 2015

The third Plant Health Australia–Animal Health Australia Joint Industry Forum was held on 24 November at Eastlake Football Club, Canberra.
The audience was briefed by the joint chairs, Kevin Shiell and Matt Kealley, on meetings held early in the day with the Secretary of the Department of Agriculture and Water Resources (DAWR), Daryl Quinlivan. They were also updated on the *Biosecurity Act 2015*, activities of the National Biosecurity Committee Weeds Taskforce, progress on plant and animal biosecurity RD&E strategies, and recent changes to the EPPR levy arrangements for industries to meet deed requirements. The latest two videos produced by the Farm Biosecurity Program were also launched at the forum (see article below).

PHA members meetings: - 25th November 2015

On 25 November, PHA held a series of meetings for members: the Plant Industry Forum, an Emergency Plant Pest Response Deed (EPPRD) signatories meeting, and the 15th Annual General Meeting.

Plant Industry Forum

Led by the chair Matt Kealley, industry members discussed the –PHAAHA Joint Industry Forum held on the previous day, PHA's engagement with non-signatories and non-signatory attendance at meetings.

Greg Fraser, Executive Director and CEO of PHA, gave an overview of activities in the area of fruit flies, and an update on the selection process used to identify new PHA directors.

Sarah Hilton from DAWR, on behalf of Plant Health Committee, discussed the process of prioritising pests, including criteria that could be used to prioritise pests; projects (by CSIRO and CEBRA) underway to develop a detailed prioritisation model; identification of 30 interim national priority pests until a model(s) is finalised and endorsed; and seeking advice from the industry members present about how they would like to participate in the process.

Tony Callan, also from DAWR, talked about the current Rapid Response Team purpose, funding, and governance, going on to say that there was an opportunity to review its purpose and structure to generate a cross-sectoral Rapid Response Team. A proposal for such a team could be put before the National Biosecurity Committee for consideration.

Cont'd from Page 8

EPPRD signatories meeting

Dr Susanna Driessen, General Manager Emergency Response and Preparedness at PHA, guided discussions on EPPRD related matters, including proposed changes to PLANTPLAN and supporting documentation.

Members voted to admit the Australian Melon Association as a new signatory to the EPPRD, and Sallianne Faulkner signed the Emergency Plant Pest Response Deed on behalf of Hazelnut Growers of Australia.

Fiona Macbeth from Blackwood and Kemp Pty Ltd, an independent contractor undertaking the 5-year review of the EPPRD, facilitated a workshop on the purpose, methodology and key findings from the EPPRD review, which commenced in August 2015. The workshop highlighted areas of concern related to the Consultative Committee on Emergency Plant Pests and the National Management Group, maintaining corporate knowledge of the EPPRD within their organisations, the development of a response plan and its management, cost-benefit analysis, the principles of cost-sharing and funding a response, and financial management and accounting.

Members were reminded about Biosecurity Online Training (BOLT) modules on the PHA site, including a new module about the Consultative Committee for Emergency Plant Pests and the National Management Group.

15th Annual General Meeting

The gathering ended with the 15th Annual General Meeting of members, which included the presentation of the Plant Health Australia Annual Report 2015; progress towards meeting the objectives in the 2015-16 Annual Operational Plan; the budget forecast for 2015-16; the 'Chairmans Address; and the appointment of new directors.

Launch of new Farm Biosecurity videos

The latest two videos produced by the Farm Biosecurity Program in the 'biosecurity essentials' series were launched at the PHA-AHA Joint Industry Forum on 24 November.

One of the videos is on the importance of training staff, biosecurity planning and keeping records. The other is about the biosecurity risks associated with feral or wild animals and weeds. They feature crop and livestock producers who use simple steps to improve biosecurity in their day-to-day activities. The most recent videos add to the information included in four earlier ones that highlighted the importance of managing the biosecurity risks associated with people, vehicles and equipment, and moving anything on or off a property.

PHA's National Manager, Horticultural Cropping, Alison Saunders, talked about ways in which the resources produced by the program can be used by industry groups to assist their members to implement biosecurity on-farm. She encouraged industries to use both the videos and the Farm Biosecurity Action Planner during training sessions with their members to create tailored plans to implement biosecurity on-farm.

The activities of the Farm Biosecurity Program for the next few months were previewed, including advertising the availability of the videos, filming footage for the final video in the series, and the release of an app.

The Farm Biosecurity Program is run by Plant Health Australia and Animal Health Australia. Practical advice and information to assist producers to implement biosecurity on-farm – including a monthly e-newsletter, videos, biosecurity manuals and templates for records – is available through the program website.
To view the videos go to www.farmbiosecurity.com.au/videos or the FarmBiosecurity YouTube channel.

PEST AND DISEASE INFORMATION BULLETIN

HAZELNUT BACTERIAL BLIGHT

Appendix N: Hazelnut Blight Technical Bulletin

DISEASE:

Hazelnut Bacterial Blight

IDENTITY:

Name: *Xanthomonas arboricola* pv. *corylina* (Miller *et al.*) Vauterin *et al.*

Synonyms: *Xanthomonas campestris* pv. *corylina* (Miller *et al.*) Dye
Xanthomonas corylina (Miller *et al.*) Starr & Burkholder

Taxonomic position: Bacteria: Gracilicutes

Common names: Bacterial Blight (English)

MORPHOLOGY:

X. arboricola pv. *corylina* is a Gram-negative rod with a single polar flagellum. It is strictly aerobic. Like other *Xanthomonas* bacteria, it produces a yellow carotenoid pigment in the culture medium. For more details on diagnostic characters, see Bradbury (1987).

HOSTS:

The main host of *X. arboricola* pv. *corylina* is the European Hazelnut (*Corylus avellana*), but *C. colurna*, *C. maxima* and *C. pontica* are also susceptible.

INTRODUCTION

Bacterial Blight is a widespread disease affecting many species of hazelnut around the world. The disease causes lesions, twig and branch dieback, reduction of leaf photosynthetic area and may mark the crop.

The disease seldom causes death of mature trees, but results in significant loss of fruiting wood, immature nut clusters and potential yield.

Mortality and/or major deformation of the bearing platform is common in trees aged under six years.

The economic impact of Bacterial Blight to the Australian hazelnut industry has not been quantified, but it is expected that losses are more significant than most growers realise.

It is likely that the incidence and economic significance of the disease is greatly under-rated by the young Australian hazelnut industry. The 2010 survey conducted by Hazelnut Growers of Australia showed only five percent of growers identified Bacterial Blight as a problem; 33% identified it as a problem in the 2012 survey.

This fact sheet provides technical information on the disease, descriptions of symptoms on plants at different ages, control, and management tips to assist control and improve operational hygiene both in orchards and in nursery beds.

OVERVIEW

The disease is caused by *Xanthomonas arboricola* pv. *corylina* or *Xanthomonas corylina*, a bacterium that affects the buds, leaves, branches and trunk. Occasionally it attacks the nuts and chartacteristic spotting is observed on the husks. Varieties that leaf out early - an event often associated with late frost and early spring rains - are often affected by early blight strikes.

Figure 1. Bacterial blight lesions on hazelnut leaf.
(Photo courtesy of Marco Scortichini, atlasplantpathogenicbacteria.it)

Hazelnut Bacterial Blight is most injurious to trees up to 6 years old as succulent tissue can be badly affected by lesions which girdle the shoot. Trees more than 6 years old rarely die following infection, but nut yields are reduced through the loss of immature nut clusters, small fruiting wood, and nut-bearing branches.

Losses due to this disease are higher in stressed trees, with environment and husbandry both playing a part. Poor environmental conditions such as poor soil drainage, high acidity, moisture stress, cold injury and orchards exposed to buffeting high winds increase risk, however, many of these factors can be ameliorated - for instance, liming, windbreaks. Poor husbandry including mechanical equipment damage, pruning cuts, clumps of suckers and weeds and general cultural neglect, can contribute to making trees susceptible to blight.

The first infection on current-season stems consists of dark green water-soaked areas on the bark, turning to reddish brown lesions. One- and two-year old twigs are attacked, girdled and killed. Infection enters through wounds (including abscision leaf scars), blighted buds and young shoots of the current season's growth. Dead leaves often cling to diseased stems for longer periods than in a normal leaf fall.

Protective copper-based sprays in late summer, autumn (three-quarter leaf fall), winter and early spring are the current means of control. Copper applications create a protective coating that destroys spores that come into contact with it. A number of copper products are registered for hazelnuts.

Effective containment of this disease revolves around securing disease-free planting material, using appropriate copper-based sprays and maintaining good sanitation in the orchard. Removal and destruction of infected plant material, including dead trees, will decrease the chances of inoculums spreading.

BIOLOGY AND INFECTION

- During the cold months of winter Bacterial Blight bacterium persists outside infected plants as dormant spores. These require a specific range and duration of temperature and moisture (Dr Pablo Grau, Chile) in order to become active and infective in spring.
- The bacterial pathogen enters through open stomata (on leaves) and wounds on the plant. It survives from one season to another in cankers and infected buds, surviving better in the large branch and trunk lesions than in the smaller twig lesions (less than 8 mm in diameter).

  Trunk lesions develop from pruning wounds or migration of the bacteria from adjacent infected buds or shoots.
- Bacterial Blight is 'vascular' but not systemic. Infection moves downward through the plant's vascular system, and infected shoots have a dark core. Infection appears to not move upward, new season shoots growing above an infection site/lesion have clean white cores and may grow vigorously until the blight lesion girdles the parent stem restricting sap/water exchange, yellowing of leaves and eventual death. This is particularly easy to spot during summer.
- Bacterial Blight has not been identified in the roots of hazelnut trees, possibly because of its aerobic need - but a plant barrier between stem and root tissue may exist. Suckers arising from the roots or below the crown are free of bacterial blight, but may be subsequently infected.
- Bacterial Blight is commonly introduced into an orchard or nursery on infected planting material, and spreads from plant to plant on pruning tools, equipment or by rain splash. Multiplication occurs on the leaf surface (epiphytic phase), 103-106 bacteria occurring per leaf throughout the growing season. The bacterium penetrates through stomata into buds, leaves and new shoots.
- Rainfall is considered one of the most influencing factors on Bacterial Blight disease occurrence. Since *Xanthomonas arboricola* pv. *corylina* has the epiphytic phase on hazelnut plants, probably, it becomes airborne in splash droplets during the rainfall, as other epiphytic bacteria.

  In addition, the importance of rainfall in triggering the multiplication of the epiphytes and the consequence for the epidemiology of bacterial diseases of plants has been demonstrated. Once bacteria multiply on the phylloplane high levels of bacterial populations can be reached. As a consequence, during the rainfall period the bacterial pathogen spreads at a rate that might cause severe infection, as bacteria within lesions are released very readily from wet leaves
- Hail storms can create wounds and often 'barking' of trees which may result in infection of the tree after such events.
- Within a research paper there was a suggestion that bacterial blight may be transmitted by pollen to female flowers, BUT further research is required to confirm if this is scientifically correct.
- Although *X. arboricola* pv. *corylina* can survive in cankers from one year to the next, this has little epidemiological importance. One grower has reported seeing 'ripe' cankers that swell and are full of inoculum that drips out, prior to the canker splitting and drying out (*Vanessa Cox, Pers Comm*)
- Infection of buds occurs during vegetative growth and they provide the main source of inoculum in the spring. The bacterium can survive over 4 months on fallen leaves but does not overwinter in the soil (Gardan, 1982; 1983).
- Researchers in Oregon, USA could not isolate the pathogen from soil under severely infected trees in trials. This suggests that the pathogen does not survive in soil.
- It does not appear that insects have an important role in disease spread.
- **Wet, warm weather (>20°C) favours infection.** Overhead spray irrigation, and conditions that delay tissue drying out e.g. clumps of weeds or suckers around the base of young trees are also known to favour infection. Temperatures over 20°C are more favourable to leaf infections and the incubation time is shorter than at lower temperatures. The disease may be more severe in years of heavy rainfall, followed by periods of high humidity, or late frosts where freezing injury has occurred.
- In culture, the optimum growth temperature is 28°C.

DETECTION AND IDENTIFICATION

Detection

Although Bacterial Blight is widespread in Australia, it can be managed.

Identification is the first step in controlling this disease. Sometimes Bacterial Blight can be confused with other diseases such as Sunscald and winter damage, but laboratory tests can confirm the presence of the bacterial pathogen. It is easiest to test for the bacterium during the spring.

Buds can be infected but not show symptoms for over 200 days. This means that healthy looking trees can be infected. All young trees (planting stock) should be handled as though they were infected.

Symptoms

Symptoms of Bacterial Blight appear different in orchards and in propagation nurseries due to differing age of plant material and cultural methods.

In orchards, hazel is grown like other fruit trees, and basal suckers are pruned away or 'burned off' using a dessicant or steam several times a year.

In nurseries, on the other hand suckering is encouraged on the mother plants, to produce shoots for layering. The mother plant bears densely crowded long young shoots, on which the disease can spread very readily.

The bacteria enter through natural openings or wounds on buds, leaves, branches or trunks, first infecting the outer bud scales, then moving into the inner bud and the plants vascular system. Buds may be completely killed (Figure 2) or partially damaged. Shoots that emerge from infected buds generally become infected from the bud scales as they grow past them.

Figure 2. Showing infected necrotic bud. If left, the dieback can spread down the stem. Also if not removed the disease over-winters within the dead bud and is a source of re-infection the following growing season.

In Nurseries

Shoots more than a year old show bud dieback, necrosis of the shoot tips and spots on leaves, in spring after bud-burst. Shoots may dry out entirely as the bacterium spreads downwards, either girdling the base and causing dieback of the distal portion, or causing cankers 10-25 cm long with longitudinal surface cracks. Brownish-black necrosis may appear on the convex side of the layered shoots. This necrosis can spread to the stump and girdle the shoot, resulting in its complete dieback.

The new growth shows oily lesions starting at the tip and spreading rapidly back: buds form limited necrotic cankers at which the shoots are liable to break. Buds below the necrotic zone then develop abnormally, giving a characteristic bushy appearance.

The underside of leaves show numerous oily polygonal lesions which may run together to cause a general chlorosis of the lamina and premature leaf fall.

International observations in nurseries indicate that hazelnut cultivars react differently to to *Xanthomonas arboricola* pv. *corylina* attacks:

- Fertile de Coutard (syn Barcelona) is highly susceptible (Luisetti et al., 1975; Prunier *et al.*, 1976),
- Ronde de Piemont shows an intermediate level of susceptibility,
- Imperatrice Eugenie is slightly susceptible, and
- Negret, Merveille de Bollwiller *syn Halls Giant) and Segorbe are almost resistant (Prunier *et al.*, 1976).

Of the cultivars mentioned only Barcelona and Halls Giant are commonly propagated in Australia.

Observations within Australia suggest that early leafing varieties may be more susceptible (that is more prone) to infection. The point for consideration is whether they are more susceptible or is it really the conditions at the time and their timing of leafout that plays the larger part.

In Orchards

While bud cankers, necrosis and dieback of new lateral shoots and cankers are seen, leaf symptoms are less obvious. Where infection is active, and particularly in humid weather, oily polygonal lesions which coalesce can be observed on the underside of infected leaves.

Figure 3. Swollen lesion on stem. Requires removal by pruning, then disposal of the prunings by burning. The wound left on the unaffected clean wood should be treated with a pruning paint or copper spray. The secauters must be sterilised before and after use.

Cankers on twigs, branches and trunks may girdle these organs, including trunks of young trees, thus killing the parts of the tree above the lesions.

The bacteria can overwinter in cankers on branches and buds, and the spores spreads to other parts of the tree in wet weather. Limited spread from tree to tree takes place by rain water splash - however overhead irrigators will excacerbate lateral infection.

Fruits show 'black heel' symptom with browning of the shell and corresponding part of the involucre, which are covered with bacterial slime (Figures 4a and 4b). Oily lesions 3-7 mm long are sometimes seen on the involucre and shell before lignification.

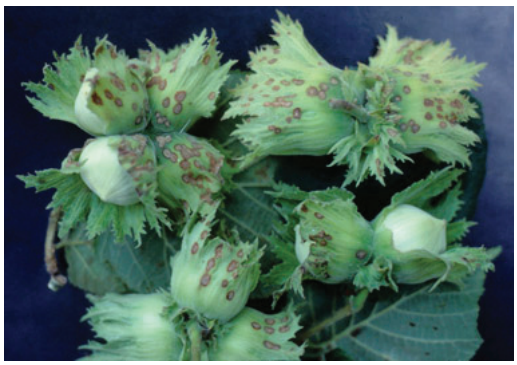

Figure 4a. **http://photos.eppo.org/albums/pests/Bacteria/Xanthomonas_corylina/XANTCY_03.jpg.** Typical spots induced by *Xanthomonas arboricola* pv. *corylina* on the husk of hazelnuts. *M. Scortichini, Istituto Sperimentale per la Frutticoltura, Ciampino Aeroporto, Roma (IT)*

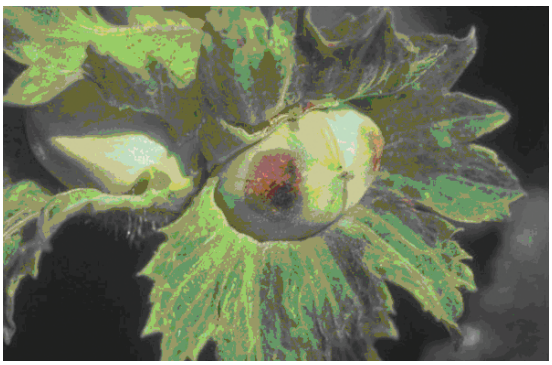

Figure 4b. Typical spots induced by *Xanthomonas arboricola* pv. *corylina* on the nut of hazelnuts.

In seasons of heavy winter rainfall, two or three applications may be required. Use of a suitable spreader/wetting agent will make these treatments last longer.

DISEASE SIGNIFICANCE

Economic Impact

Greatest losses are seen in orchards 1 - 6 years old, in which up to 10% mortality has been recorded (Figure 6). Older plants are rarely killed, but numerous buds and fruiting shoots are destroyed, losses in yield can vary from 1 to 10%.

Monitoring and Control

Inspect young orchards regularly. Symptoms are most evident in spring as small, angular, reddish-brown spots that are surrounded by a yellow-green circle (Figure 1). Leaf lesions eventually coalesce at the tip of the leaf. Infections on developing nut husks are less common but can appear as dark brown or black spots (Figure 4a & 4b). Water-soaked lesions may also appear on current-season stems followed by lateral shoot dieback and development of cankers as longitudinal bark cracks on twigs, branches, and main trunks.

In late spring and summer the contrast between healthy green leaves and yellowing leaves on infected branches is evident. Tracing down the stem will identify cankers on branches which can be more difficult to detect. Cankers are slightly sunken and reddish-purple with darkened underlying tissue and a sticky bacertia-rich liquid oozing from them when humidity is high. Leaves on dead twigs turn brown and cling to the branches (Figure 5).

Figure 5. Dieback of hazelnut leaf due to bacterial blight.
(Photo courtesy of L. Gardan, INRA, Angers, Bugwood.org)

Brown necrosis of the cambium can be observed when bark tissue is removed. By late summer, necrosis can extend down main branches to the trunk, causing complete girdling of branches (Figure 6).

Figure 6. In orchard, on a 3-year-old hazel tree, dieback of several 1- and 2-year-old shoots starting from localized necrosis on buds or new lateral shoots. *INRA, Angers (FR)*

Management

Management is an important agent of bacterial dissemination, especially by pruning young trees with contaminated cutting tools and is also responsible for the introduction of the disease into new areas with infected planting material (Bradbury, 1987; Anonymous, 1996). Bacterial Blight is now widely dispersed throughout Australian hazelnut regions. Experience from Bhutan (Dr Sean Watson, pers comm) suggests that even disease-free planting material propagated by tissue culture may eventually become infected.

Compact soil in the orchard due to the lack of soil breaking up practices may also be a factor in the disease development. The consequences of compact soils are that soil aeration, drainage and root elongation did not occur. Root asphyxia phenomenon is very frequent during the major raining seasons, causing general plant suffering. All these stress conditions predispose plants to bacterial attacks.

Magnesium is one of the essential elements for plant growth and production and its deficiency renders plants susceptible predisposing them to Bacterial Blight.

The role of soil aluminium content associated with lower pH values might play an important role in disease occurrence. Previous research studies showed the presence of acidic soil (pH,5) across some orchards which are much lower than the optimal pH values (5.5 – 7.8), for hazelnut crop.

Soils with lower pH values can increase the susceptibility of fruit tree species to bacterial diseases, especially to those caused by pseudomonads. In addition, lower pH values can have fatal results in association to higher aluminium in soil.

The negative effect of rainfall and temperature extremes is not easily manageable. The potential effects (direct and indirect) of climate change should not be overlooked. Increased atmospheric CO^2, heavy and unseasonal rains, increased humidity, drought, cyclones and hurricanes and warmer winter temperature are the major climate change factors influencing disease occurrence, severity and spread.

Changes to any one of these climatic factors can affect the distribution and biology of plant pathogens with very serious economic consequences.

Other strategies to manage this disease are to:

- Plant only nursery stock known to be free of the pathogen,
- Prune infected branches well below cankers (until the dark core is white) in the winter and/or summer to reduce sources of inoculum.
- Sanitize pruning tools in a dip of bactericide or diluted bleach ideally between working on infected branches and working on each tree.
- Remove infected material from the orchard or nursery.
- Burn or bury infected material, and
- After harvest and leaf-fall, mulch the orchard floor and apply urea to promote breakdown and decay of infected material and innoculum.

The spread of the disease can be controlled by:

- Removing and destroying affected shoots
- Avoiding mulching with infected foliage under trees (remove and burn)
- Avoid returning separated foliage and twigs to under the tree canopy, especially if the disease is prevalent. This may be difficult with current harvesting equipment but as part of orchard sanitation any potentially effected material should be collected and burnt.
- Avoiding harvesting equipment (e.g. vacuum harvesters) that blow infected leaves and husks up into the canopy, especially if the disease is prevalent.
- Disinfecting pruning tools,
- Spraying with copper-based products, and
- Use cultivars with some resistance when planting new orchards. Information on the level of resistance of Australian varieties appears to be lacking within the scientific papers and should be viewed as a research opportunity. Halls Giant (known as Merveille de Bollwiller) is one variety that can grow in Australia that has a level of resistance to Bacterial blight.
- Spraying after rain and hail events.

Production of healthy planting material is the major preventive measure. Young tender suckers are prone to infection, particularly where grown around the base of a mother tree in the orchard. Infection rates can be reduced by thinning suckers - removing short or spindly suckers. This not only results in better growth of the remaining suckers, but improves airflow and speeds drying after dew, rain or irrigation.

The most important factor for reducing mortality from Bacterial Blight in newly established hazelnut plantings is an adequate irrigation in the first 2-3 years after planting (Moore *et al.*, 1974).

Benefit of splitting nitrogen applications/dressings - reduced soft sappy growth prone to infection.

Maintain an open centre to tree - speeds drying out and avoids damp micro-climates that favour Blight activity and infection.

CHEMICAL TREATMENT

Some fungicides containing copper have bactericide action and are registered against bacterial blight in hazelnut.

Pest Name	Actives	Product	WHP	Chemical Group
Bacterial Blight	Copper Oxychloride	Copper Oxychloride	14	Group M1 Fungicide
Hazelnut Blight	Copper Hydroxide	PER13162 - Copper Hydroxide	1	Group M1 Fungicide

Cupric Hydroxide

Dupont Kocide Blue Xtra Fungicide plus other registered products containing 350g/kg **copper** present as **cupric hydroxide** as their only active constituent.

Restraints:

DO NOT apply when temperatures exceed 35°C, or when frost prone conditions prevail

DO NOT apply if rain is imminent

DO NOT apply when slow drying conditions prevail

DO NOT apply to wet crops

Rate:

150g product per 100L water

Critical Use:

- Read the product label carefully and adhere to all restraints and instructions on application
- Apply after harvest at 10, 30 and 75 - 100% leaf fall. Repeat application in mid-winter and again in spring before bud swell. Apply after pruning in winter to provide protection to new exposed cuts. If heavy rains occur soon after spraying, re-application will be required to maintain protective treatment.
- Apply a maximum of 6 spray treatments each year, with a minimum re-treatment interval of 7 days between consecutive applications
- Apply to the point of run-off, ensuring thorough coverage of all foliage
- Use a recommended spray volume of between 1,500 - 1,800L per hectare for mature plantations. Select suitable spray volume to match tree maturity and expansiveness of canopy.

Withholding Period:

DO NOT harvest for **1 DAY** after final application.

Avoid Host Damage:

The sensitivity of foliage of all hazelnut cultivars to be treated under this permit has not been fully evaluated. It is advisable, therefore to only treat a small number of hazelnut trees to ascertain their reaction before treating part or the whole of a plantation. It is important to adhere to the restraints and conditions of use listed on the permit and on the product label to minimise any potential risk of host damage

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Appendix O: Sucker Technical Bulletin

ORCHARD MANAGEMENT

Regular removal of suckers from the base of hazelnut trees is essential for profitable production of nuts, but is one of the more onerous and often neglected jobs in a hazelnut production orchard. This document introduces growers to the natural tendencies of hazelnut trees followed by discussion of suitable options for various management options:

- Evolution from wild colonisers, to major producers of 'wood' by coppicing, gradual evolution post-industrial revolution and more recent developments for nut production.
- The evolutionary trait for suckering in hazelnut trees, with illustrations of wild, untended and unproductive trees,
- 300-year-old semi-wild ancient hazels managed by discretionary grazing of suckers by livestock - but still yielding nuts.

Australian growers have access to a number of cultivars. Many are relatively recent imports from USA, Middle East and Europe. Other 'selections' appear to have derived from nuts brought home by diggers as far back as the Boer War.

Due to the diversity of origin of planting stock available in Australia, there is no one perfect tree shape or cultural method.

This document seeks to inform growers of the consequences of failing to control sucker growth; reduced vigour of cropping wood, reduced nut yield, increased pest/disease risk, physical barriers for efficient orchard operation, and nut pick up.

Pollen counts in many parts of Northern Europe and the Americas indicate the hazel family was the dominant plant at the end of the last Ice Age.

Hazelnut trees naturally grow as a multi-stemmed shrub/tree, due to the prolific production of basal shoots, or suckers, that arise at and below the soil line.

Figure 1. Multiple stems of hazelnut

In many countries including Australia most cultivated hazelnut trees are trained to a single trunk to facilitate mechanized cultivation and harvest. This training requires multiple removal of young basal shoots (suckers) every year and has recurrent costs associated with it.

Figure 2. Hazelnuts trained to grow as a small tree

The presence of suckers is undoubtedly a generic character linked to the cultivar. Nevertheless it can be supposed that the amount of suckers is also connected with climatic and soil factors or with propagation and cultural systems.

Hazelnut growers have limited choices to create a single-stemmed tree. Growers of certified organic hazelnuts have even fewer choices, as conventional chemical control is not an option. Non-suckering rootstocks or manual removal of suckers are the only other proven methods available to growers.

Figure 3. Single stem tree with multiple suckers.

It is well known that suckers in the cultivated hazelnut (*C. avellana*) are produced from adventitious buds which form throughout the year from the basal part of the trunk and from the roots. Cultivated plants must be periodically suckered and this is a costly practice.

Beside the traditional mechanical cutting of suckers, other methods for eliminating or avoiding suckers are employed. Non-suckering rootstocks derived from *C. colurna* or from *C. colurna x C. avellana* hybrids are used in some countries (Lagerstedt, 1975, 1993; Ninic-Todorovic, 1997). But it is mainly with chemical herbicides that the current day control of suckers is performed.

Research work suggests that:

> *"Plants obtained by rooted suckers showed a suckering aptitude significantly higher than the plants obtained from a simple layerage. These differences can be explained by the fact that the suckers, cut back in the first and in the second year in the nursery, produce an enlargement at the stump which subsequently origins several adventitious buds.*
>
> *The size of the stump (mainly depending on the propagation method) seems to be a factor influencing suckering. In fact the plants from rooted suckers averaged a higher amount of suckers. The vase form having a smaller stump than the bush form, probably could reduce the sucker emission, although this effect was not confirmed by the statistical analysis.*
>
> *12-year-old plants (cv Tonda Gentile delle Langhe), obtained from mound layerage produced yearly a significantly lesser amount of suckers than same aged plants obtained from rooted suckers (Radicati et al, 19??)."*

Suckers are non-fruit bearing vegetative growth and are undesirable for several reasons:

- Suckers negatively influence the plant physiology by diverting growth from the main tree structure. Energy is wasted on a shoot that will need to be removed.
- An abundance of suckers at the base of the plant traps fallen nuts, which can contaminate harvest the following year.
- Excess sucker growth interferes with the shaping of the tree.
- Young fleshy suckers can be attractive to insect attack.
- Suckers act as a site for undesirable herbicide uptake which can affect tree health, especially with fully systemic herbicides combined with side-boom application.

Leaving suckers around the tree base not only creates a visual barrier to easy observation of pest or disease (such as frass indicating fruit tree borer activity), but their ability to trap grass from mowing and create a moist environment can pre-dispose development of bacterial blight.

Figure 4. Sucker mask borer

As the orchard natures and trees settle into cropping, de-suckering becomes less of a task.

Occasionally the suckering habit of the hazelnut, apart from the role played in nursery production is used to advantage in the orchard block. If the main nursery whip has failed or succumbed to disease or dieback for whatever reason, the original whip can be cut back and a healthy sucker selected to become the new tree. This applies only to those plants originally planted on their own roots and not grafted.

The Turkish tree hazel *Corylus colurna* has particular value as a non-suckering rootstock. The rootstock selections Newberg and Dundee have been imported into Australia as rootstocks as have a number of interspecific hybrids that may have potential as rootstocks. These stocks are not used widely in commercial production in Australia but may be useful for use as ornamental hazelnuts.

There are a range of techniques that can be used to manage suckering including chemical and mechanical controls. Additionally there have been other techniques that have been subject to international research that are detailed within this information bulletin.

Hand Removal:

Removal of suckers by hand, through the use of cutting tools (scissor, hatchet, hoe) requires a lot of work and is uncomfortable and tiring for workers. Advantages are that work can be completed in only one pass per year and also the selection of suckers can be done for renewing the fruit-bearing branches of multi-stem trees. Hand operation overall has a very negative impact on crop income due to the high cost of labour.

Figure 5. Suckers after a few months growth. Past time to prune!

Mechanical Removal:

If suckers around the base are pruned two or three times per year to leave a single tree trunk, all the energy goes into the mature wood, which equals more flowering and sooner bearing. Single-trunked trees are also easier to maintain for weed control, mowing the orchard and harvesting.

Larger suckers that have become woody will need to be cut out with secateurs. Use of long handled limb loppers can be effective to reduce the degree of bending required by the operation.

Mechanical de-suckering is speedy and can be repeated during the year. It does not allow sucker selection and can cause trunk injury if not well done. The main tools used are: the string trimmer with cutting nylon line or metal disk; the flail mower with a lateral rotary cutter on a swing-arm linkage; the orchard-vineyard de-suckering machine, with horizontally rotating drum having a whipping brush of nylon strings

Chemical Removal:

Chemical control involves spraying the suckers with a knockdown registered herbicide such as paraquat. This is normally applied when the suckers are 5 to 10 centimetres tall; best results are achieved in overcast weather. Correct timing is important and any application should occur when the sucker is fleshy and has herbaceous consistency to give optimum control. Care is necessary not to over-spray on the trunks of young plants.

Chemical herbicides, single or multiple applications, are very useful on herbaceous suckers but may have residue problems and an environmental impact.

Figure 6. Suckers after a few weeks

Repetition at least three or four times during spring and summer may be required.

Figure 7. Suckers treated with Spray Seed

Figure 7 highlights that the suckers had developed well past the ideal stage of development. The contact herbicide has desiccated the leaves, but the stem was too developed to wither and the suckers now require manual removal.

CHEMICALS FOR USE BY HAZELNUT GROWERS

Hazelnut Growers of Australia Inc holds the following minor use permit for herbicide use to manage suckers.

Permit Number: PER13021

The permit is in force from 7th March 2012 to 31st March 2017 and is for:

SPRAY SEED 250 HERBICIDE AND OTHER REGISTERED PRODUCTS
Containing: 135 g/L PARAQUAT and 115 g/L DIQUAT as their only active constituents.

CROPCARE SIMAZINE FLOWABLE HERBICIDE AND OTHER REGISTERED PRODUCTS
Containing: 500 g/L SIMAZINE as the only active constituent.

Directions For Use:

Restraint: DO NOT expose foliage or fruit to spray during treatment application. Use suitable nozzle type and shields around nozzles to target spray and minimise drift.

Crop/Situation: Hazelnut plantations; plantation floor management only

Purpose: Annual broadleaf and grass weeds (as listed on current product labels)

Rate: *Spray Seed 250 Herbicide*
High volume spray: Apply at 2.4-3.2L product/ha
Spot spray: 240-320mL product/100L

Simazine 500g/L products
Light soil: Apply at 1.7L product/ha
Heavy soil: Apply at 3.5 L product/ha

Purpose: Sucker management

Rate: *Spray Seed 250 Herbicide*
Spot spray, handgun application: 240-320mL product/100L

Critical Use Comments:

Diquat & Paraquat:

- Apply directed spray treatment, as required, to soil and to pest weeds around base of trees.
- Use higher application rate for dense, more established weeds.
- May require addition of a wetting agent: use as per label directions.

Simazine:

- Apply directed spray treatment to bare soil immediately after cultivation and before weed emergence.
- DO NOT spray more than 2 applications per season.

Withholding Period:

Diquat & Paraquat:

Do not graze or cut spray treated vegetation for stock food for at least 1 DAY after application, or graze horses for 7 DAYS after application.

Remove stock from treated areas 3 DAYS before slaughter.

Jurisdiction:

ACT, QLD, NSW, NT, SA, TAS, WA

(**Note:** Victoria is not included in this permit as their Control-of-Use legislation means that an APVMA permit is not required to legalise this off-label use in that state. Certain chemical products, however, require state approval. Paraquat is a Schedule 7 Poison and a 'Restricted Use Chemical' under Victoria's Control-of-Use legislation. Restricted Use Chemicals must be used in accordance with the approved label unless a permit has been issued by the Victorian Department of Primary Industries. For further information on applying for an Agricultural Chemical User Permit please contact Chemical Standards Branch, DPI).

Additional Conditions:

PERSONS who wish to prepare for use and/or use products for the purposes specified in this permit must read, or have read to them, the details and conditions of this permit.

THIS PERMIT provides for the use of a product in a manner other than specified on the approved label of the product. Unless otherwise stated in this permit, the use of the product must be in accordance with instructions on its label.

OTHER CHEMICALS WITH LABEL REGISTRATION

SPOTLIGHT PLUS®
HERBICIDE
ACTIVE CONSTITUENT - 60g/L CARFENTRAZONE-ETHYL
Group G Herbicide
For desuckering Tree Nuts

SITUATION
Other Tree fruits (including Pome fruit, Stone fruit & Citrus fruits), Tree Nuts and Associated Tropical and Sub-tropical fruits.

WEED CONTROL:
Control of unwanted suckers (water shoots) arising from the main stem or trunks.

TIME OF APPLICATION:
Apply to suckers before any lignifications (brown bark) is present

CRITICAL COMMENTS:
Several applications may be needed throughout the season depending on the growth conditions.

Do not allow spray mist of Spotlight Plus® to come in contact with green stem tissue, foliage, blooms or desirable fruit.

DISCLAIMER:
For more information and before using this product refer to the label and MSDS.

Plastic Mulch:

The control of suckers by plastic mulching or plastic padding has shown to be only partially effective, particularly in one-stem trees, but does not appear to be commonly used. The cost of putting such material in the orchard may make it a prohibitive alternative.

Tree Guard and Herbicide:

Tree guards, such as this spring-roll 'snap-on' model, protect the trunks of younger trees against mechanical and chemical damage. In this instance the sward was invaded by paspalum which the owners wanted to suppress using systemic herbicide.

The tree guard was removed and the bark checked to confirm lack of symptoms of borer damage or lesions from disease. If the tree shows signs of setback or disease, the strongest sucker can be selected to be trained as a replacement.

All other sucker growth should be removed manually flush with or just below ground level. The tree guard is then replaced (with an additional one around the replacement sucker as necessary) and the paspalum sprayed using 'Roundup' with a handgun.

Figure 8. Tree guard and herbicide treatment

Grafting:

Plants devoid of suckers can be obtained by grafting the cultivars onto suckerless rootstock

SUMMARY OF INTERNATIONAL RESEARCH OF DIFFERENT CONTROL METHODS

Control of Sucker Growth with New Esters of 1-Naphthylacetic Acid:

The well known plant growth regulator 1-naphthylacetic acid (NAA) has been employed for sucker control in many fruit tree species. Esters of NAA are also active in sucker control.

In the hazelnut (*Corylus avellana* L.), which is known to have a strong suckering tendency, the elimination of suckers is performed either mechanically (at a high cost) or with chemical herbicides.

None of the compounds caused phytotoxic effects on the plants or changed nut quality or the yield of the trees. (Dolci et al 2005)

Among the reports the following active principles have been experimented with over the years:

- Chlorthiamid (2,6-dichlorothiobenzamide),
- Aminotriazole (1H-1,2,4-triazol-3-ylamine),
- Bromacil (5-bromo-3-sec-butyl-6-methyluracil),
- Dichlobenil (2,6-dichlorobenzonitrile),
- Paraquat (1,1'-dimethyl-4,4'-bipyridinium), dinoseb (2-sec-butyl-4,6-dinitrophenol)

In more recent years chemical suckering has been performed mainly in Italy with:

- Gluphosinate-ammonium (4-[hydroxy(methyl) phosphinoyl]-DL-homoalanine),
- Esters of NAA (1-naphthylacetic acid),
- 2,4 D (2,4-dichlorophenoxyacetic acid) (Dolci et al., 1987; Mozzone et al., 1995).

Elimination of Hazelnut Suckers by Disbudding:

Hazelnut (*Corylus avellana* L.) grows naturally as a multi-stemmed shrub. In Oregon, most cultivated trees are trained to a single trunk to facilitate mechanized cultivation and harvest. This training requires multiple applications of either gramoxone or a 2,4-D amine herbicide to the young basal shoots (suckers) every year and has recurrent costs associated with it. An experimental procedure has been developed to eliminate suckers by thorough disbudding of the hazelnut tree during its propagation by layerage.

Hazelnut trees totally free of suckers can be produced by removing pre-formed buds and all primary meristematic tissue at nodes on the trunk below the point at which scaffold branches will be developed (Smith et al, 2001).

The research detailed the following points:

> *"The multi-stemmed growth habit can be converted to single trunk by grafting a desirable variety onto a rootstock that has low suckering potential.*
>
> *Two hybrid rootstock clones - Dundee and Newberg - were released by the U.S. Department of Agriculture (USDA) in 1990. Both selections, when grafted with 'Ennis' scions, resulted in trees that were larger than self-rooted trees, that produced few or no suckers and that were consistently high yielding.*
>
> *Unfortunately Dundee and Newberg have limited use in Oregon as both are susceptible to Eastern Filbert Blight caused by Anisogramma anamola [Peck] E. Müller, a deadly fungal disease now infesting the major growing areas in the Willamette Valley (Johnson et al., 1996).*
>
> *Also, the Oregon hazelnut industry has long been based on self-rooted trees and little information exists on the long-term performance of grafted trees. Many growers will not plant grafted trees until more yield data is available. Grafted trees also cost more than trees from layerage."*

These sets of circumstances led to the conducting of two experiments to determine if hazelnut trees could be made non-suckering by disbudding the lower portion of the trunk, similar to what is done to grape (*Vitis* spp.) rootstocks to eliminate suckering (Winkler et al., 1974).

> *"Disbudding appears to have promise as a method of eliminating hazelnut suckers, but many more variables need to be examined than were looked at in these two experiments. The ability to repeatedly produce similar good results and additional cost of performing the disbudding are two major factors that remain to be determined.*
>
> *The biggest drawback to the procedure used was that it was too easy to leave a viable bud on the layer. If we had not examined the disbudded layers and removed the missed buds that we inevitably found, the excision treatment probably would not have been so completely successful. The buds at the base of a sucker are very small and the internode length is short, increasing the difficulty of finding the buds. The phyllotaxy at the basal portion of a sucker is less orderly than in the medial and apical sections of the shoot, again making it more difficult to anticipate the occurrence of buds. Just one missed bud can become a sucker, and once one sucker shoot grows, it produces a reservoir of buds that will become additional suckers. Disbudded layers will require follow-up inspection and diligent quality control prior to field planting if there is to be any assurance that the treatment will be effective.*

The assumption underlying this technique is that hazelnut suckers arise from primary meristems and not adventitious buds. If this hypothesis is true, then it should be possible to produce non-suckering trees of any cultivar.

Initial findings indicate that disbudding did indeed eliminate the trees latent ability to produce suckers. If suckers arise adventitiously, then the disbudding treatment should not have altered the tree's ability to sprout from stumps."

The researchers indicated that they had seen non-suckering trees of Barcelona, which normally produces many suckers, but their occurrence has always been a random event.

As shown by the results in the second experiment the researchers were able to produce non-suckering trees intentionally by excising the buds.

Mechanical and Physical Control of Hazelnut Suckers:

The emission of basal shoots is a characteristic of hazelnut (*Corylus avellana* L.). Their presence causes problems both to plants and to crop management. Cultivated trees require many applications, manual or mechanical, to eliminate suckers every year. De-suckering can be done on herbaceous or lignified suckers. Different methods can be used ranging from mechanical to physical and chemical ones.

Physical methods principally make use of two thermal control procedures: water steam and open flame (Colorio et al., 2006). A short blast of intense heat is directed onto the suckers, keeping a short distance from the target. Both treatments cause tissue scalding and in a few days the treated vegetation will wilt and die (Storeheier, 1994).

The effectiveness of the thermal control techniques was studied through de-suckering tests carried out, at the commencement of the vegetative phase, in a hazelnut field. The purpose was to establish the feasibility, both technically and economically, for the use of these thermal de-suckering techniques, considered to be very interesting because they are environmentally-friendly.

The growth stage of suckers is a key factor that heavily affects the result of the treatments. The particular growth stage of suckers adopted in the trials was a good compromise between treatment precociousness and the need to avoid re-growth of suckers.

A thermal control management is a recently investigated procedure (Tomasonea et al, 2009):

"To establish the effectiveness of thermal control techniques, de-suckering tests with steam and flame were performed in a hazelnut orchard, with cv. 'Tonda Gentile Romana' at a 5×5m plant spacing.

A short blast of intense heat was directed on the target, scalding sucker tissues so that, in a few days, vegetation wilted and died.

A small steam generator-applicator machine was used. Steam flows at approximately 300°C out of the boiler and can be directed through a hand-held outlet pipe, with or without a special application device.

Flaming was carried out with two models of tractor-drawn equipment, the first with handheld torches and the second with a flame-head torch assembly for automatic application.

Parameters for heat contact-time were: 60 seconds, 30 seconds for the first three, and 6 seconds for the automatic flaming. Steam and flame were compared for de-suckering effectiveness, evaluated after 15 days.

Results suggest that flame is more efficient, especially with handheld torches, steam gave a good result but vapour cooling through rapid condensation may reduce effectiveness. Flaming is easy to use, has low cost equipment and low fuel consumption. Steam application has slow speed, big amounts of water and fuel, and expensive equipment, but collective ownership of devices may be an option. No damage to plants was observed.

The effectiveness of the treatments was in general good with both thermal control techniques and no damage to plants was observed.

The use of steam, even though considered interesting from various aspects, is more complicated. Working speed is low, big quantities of water and fuel are needed, and equipment is more expensive. From this last aspect, a solution could be the use of collective ownership of equipment or the use of rental services.

The general evaluation for the flaming machines is positive. Flaming is an easy-to-use technique, the purchase cost of equipment is low and fuel consumption, per year and per hectare, is low. The hand-operated equipment could be too slow and too demanding for labour (a tractor operator and two field workers). This could represent an obstacle to the execution of at least two applications during the annual crop cycle."

Effect of Spacing and Sucker Removal on Precocity of Hazelnut Seedlings:

Research in the USA suggests that:

> *"Sucker removal increased both the percentage of seedlings bearing nuts and the number of nuts per seedlings, but the difference was not significant until the 5th year. Sucker removal reduced the length of the juvenile phase by 3 months. The use of precocious parents was more effective than sucker removal in shortening the juvenile period, while sucker removal and wide spacing within seedling rows increased the number of nuts produced by seedlings in the 5th year. Selection of seedlings for early initiation of bearing will shorten the breeding cycle, and the resulting new cultivars will be precocious when planted in commercial orchards.*
>
> *The natural growth habit of hazelnut is that of a multi-stemmed shrub, but in commercial orchards in Oregon, plants are forced to grow as trees with a single trunk by repeated removal of basal sprouts (suckers) to facilitate mechanization.*
>
> *Sucker removal increased the percentage of seedlings that bear nuts by the 5th year, as well as the number of nuts produced, and shortened the juvenile phase by 3 months.*
>
> *However, sucker removal differs from pruning in that it increases rather than reduces growth of the main stem, and rapid growth of the main stem would be expected to allow a seedling to enter the adult phase more quickly. Although laborious if done by hand, sucker control with herbicides is possible, particularly on older seedlings."* (Shawn et al, 1992)

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Effect of Spacing and Sucker Removal on Precocity of Hazelnut Seedlings
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Appendix P: DRAFT Hazelnut Best Management Practice/Environmental Management Systems Plan.

Best Management Practices/Environmental Guidelines for

Perennial Horticulture

DRAFT FOR STAKEHOLDER COMMENT AND FEEDBACK

What is this document?

These draft guideline summaries have been prepared as part of the Hazelnut Best Management Practise Pilot Project. They are based around the structure developed by DPI Victoria as part of their Code of Best Practice for Viticulture – Sunraysia Region. Hazelnut growers have reviewed and updated these guideline summaries to reflect national issues and will add any local issues and practices.

How will it be used?

These guidelines are intended to summarise and communicate best management/environmental management options to growers to either:

- provide confidence that their practices align with expectations of key external stakeholders, especially within the local region, OR
- help identify areas of potential improvement in their current management practices.

The HGA Communications Officer is now seeking feedback from external agencies in relation to the content of these summaries. Ultimately the aim is to have the guidelines endorsed by relevant agencies to add a further level of confidence in their use, whilst at the same time avoiding further regulation.

Where do they fit in an BMP/EMS cycle?

This document would best used in the planning phase of Best Management Practice (BMP) and/or an Environmental Management System (EMS), to help with understanding and prioritising issues, then developing action plans relevant to individual properties. The guidelines can also be used as the basis of developing a regionally-relevant self assessment tool for growers as an entry-level option to formal best management/environmental management.

The structure explained…

This document is broken into ten sections, each focussed on a different management activity. Each section follows the same format as explained below. The final guideline document will also contain technical detail for each section to assist in implementing the best practice options. The aim is to firstly obtain in-principle support from key agencies for these summaries, and then finalise the detailed technical sections as a separate step (to minimise re-working).

Potential Detrimental Environmental Impacts – The title is fairly self-explanatory, however note that only detrimental impacts have been discussed. The positive environmental impacts associated with horticulture will be communicated via other documents (eg Regional NRM Strategy for Horticulture).

Relevant Legal Requirements – Again, fairly self explanatory. Knowledge of environment-related legislation is a key component of sound environmental management.

'Other' Requirements – This provides information about regional-scale natural resource management (NRM) goals relevant to the given management area. The aim of this is to raise awareness of the links between property-level management and regional-level environmental outcomes. This will need to be updated when there are changes to regional NRM/CMA plans are released.

Managing Potential Detrimental Environmental Impacts – This section provides ideas to support the development of property-level action plans including:

- Suggestions of property-level goals which growers may wish to adopt as theme of an action plan for their business.
- Suggestions of management options which would help to achieve the goals. NB The terminology 'best environmental practice options' has been used to avoid being too prescriptive. The guidelines encourage an 'outcomes' focus rather than a 'process' focus so that growers can develop solutions to best suit their circumstances.
- Options for property-level performance measures that can be incorporated into existing recording and monitoring activities to track progress against an action plan.

Further Information – As described above, each section of the guidelines will be backed up with further technical information to help with implementation.

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IRRIGATION MANAGEMENT

Potential Detrimental Environmental Impacts

Irrigation is important to the long term health and productivity of orchards in most Australia water catchment areas. However, if not properly managed, irrigation can lead to a range of environmental impacts that have direct links to long-term business sustainability. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate irrigation management.

Potential Detrimental Environmental Impacts related to Irrigation Management
◆ Use of surface water or groundwater for irrigation is a demand on local water resources. This demand may impact on ***environmental flows, local watertable levels, stream recharge rates, water quality*** and the ***health of aquatic flora and fauna***.
◆ Excessive irrigation or poorly maintained infrastructure can lead to surface runoff. This runoff may cause ***soil erosion*** as well as ***water contamination*** and ***harm to aquatic flora and fauna*** from any nutrients, pesticides and sediments picked up in the water.
◆ Excessive irrigation can cause ***local watertable rises***, increased ***soil salinity*** from rising groundwater, ***waterlogging*** of soils, ***crop damage*** and ***harm to nearby native vegetation***.
◆ Irrigation with poor quality water can lead to increased ***soil salinity***, ***soil structural damage***, ***harm to soil organisms***, ***crop damage***, and ***harm to nearby native vegetation***.
◆ ***Community disturbances*** caused by the generation of noise from pumps.

If you have not done so already, strategies may need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to irrigation management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth
◆ Environment Protection and Biodiversity Conservation Act 1999
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION**
◆ Water Resources Act 1997
◆ Irrigation Act 1994
◆ Development Act 1997
◆ Environment Protection Act 1993 & Environment Protection (Water Quality) Policy, 2003
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION**
◆ Adelaide Hills Council Bylaw No 3 Local Government Land

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of irrigation management. For example, do you need to provide any information about your irrigation practices to your customers or other external parties?

Within each Australian Water Catchment area, managing water for improved quality and sustainability is an important issue. Every land manager in the region has a role to play in managing water resources for the future. Below is a summary of the current regional objectives that are linked to irrigation management practices.

Regional Environmental Objectives related to Irrigation Management

The current regional goal related to ***achieving sustainable water supplies*** is:

- Water use in balance with requirements of natural ecosystems while also supporting urban use and production reflecting land capability

The current regional goal related to achieving ***water quality improvement in terrestrial systems*** is:

- Water quality of sufficient standard to support natural ecosystems and to meet the needs of human consumption with minimal treatment

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Irrigation Management Goals

- Minimise water losses by ensuring the irrigation system applies water precisely, efficiently, and appropriately over the vineyard/orchard.
- Maximise water use efficiency by matching water applications to the crop water requirements, the water-holding capacity of soil in the rootzone, and any amount required for leaching.
- Minimise negative impacts on surface and ground water health (as a result of water interception/extraction) in balance with production requirements.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Irrigation Management

Knowledge of site properties

- Obtain a good knowledge of the soil characteristics in the orchard.
- Have a soil survey conducted by a registered soil surveyor.

Irrigation system development and re-development

- Have the irrigation system designed by an accredited specialist.

- Ensure irrigation system design and soil moisture monitoring sites match soil types and soil variation as much as practically possible.
- Ensure bores and dams are sized, designed, constructed and maintained in accordance with local requirements.

Irrigation scheduling and application

- ***Schedule*** irrigation applications:
  - according to the defined yield and quality objectives of the crop;
  - taking into account recent and forecast weather conditions;
  - using irrigation scheduling aids; and
  - to integrate with other orchard management practices (eg chemical applications, fertiliser applications).
- Determine the ***amount*** of water to apply by considering:
  - the yield and quality objectives of the crop;
  - management practices (eg. summer pruning);
  - the growth stage and water requirements of the hazelnut trees;
  - the water holding capacity of the soil;
  - the depth of the root zone; and
  - the weather.
  - any relevant water allocations or current restrictions

Irrigation system maintenance

- Conduct comprehensive system and dam maintenance prior to and during the irrigation season.
- Check and maintain system as necessary at each irrigation application.
- Check system operating pressure and distribution uniformity annually.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with irrigation management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Water use per hectare (ML per ha or per tree or per vine)
◆ Gross return per megalitre ($/ML)
◆ Yield (t/ML)
◆ Irrigation application efficiency (%)

Further Information

For further information on Irrigation Management, refer to "BMP/*Environmental Guidelines for Perennial Horticulture*".

NUTRITION

Potential Detrimental Environmental Impacts

Crop nutrition is a key management issue for horticultural and viticultural producers. However, it is important that nutrients and amendments are applied appropriately to avoid Potential Detrimental Environmental Impacts. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate nutrition management.

Potential Detrimental Environmental Impacts related to Nutrition Management
◆ Runoff and erosion from areas where nutrients have been applied can cause ***surface water contamination*** and ***eutrophication*** (nutrient enrichment). ◆ ***Groundwater contamination*** may occur if applied nutrients are flushed below the crop rootzone by irrigation or rainfall. ◆ Inappropriate nutrient applications can adversely impact on ***soil health***. ◆ ***Noise*** generated by the machinery used to apply nutrients may cause inconvenience to nearby landholders. ◆ The use of nitrogen-based fertilisers can contribute to ***atmospheric pollution*** by the generation of greenhouse gases. ◆ Changes to soil nutrient levels can lead to biodiversity decline through the harm/destruction of nearby native vegetation. (Growers unsure on this statement - check with State/Federal Agencies)

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to nutrition management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Not known – to be completed
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Environment Protection Act 1993 ◆ Agricultural and Veterinary Chemicals (South Australia) Act 1994 ◆ Agricultural and Veterinary Products (Control of Use) Act 2002 ◆ Agricultural Chemicals Act 1955
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION** ◆ Adelaide Hills Council Bylaw No 3 Local Government Land

'Other Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet

in terms of nutrition management. For example, do you need to provide any information about your nutrition management to your customers or other external parties?

Within Australian Water Catchment areas, managing water for improved quality is an important issue. Biodiversity management is another key issue, as is soil acidity in some parts. Every land manager in the region is able to contribute to the overall management of these issues for the future. Below is a summary of the current regional objectives and/or targets that are linked to on-farm nutrition management.

Regional Environmental Objectives related to Nutrition Management
The current regional goal related to achieving ***water quality improvement in terrestrial systems*** is: ◆ Water quality of sufficient standard to support natural ecosystems and to meet the needs of human consumption with minimal treatment The current regional goal related to achieving ***maintenance, improvement and reconstruction of ecosystems*** is: ◆ Ecosystems protected and managed to provide security and viability for all native species. The current regional goal related to ***managing soil acidity*** is: ◆ Soil acidity no longer impacting significantly on soils used for agricultural production.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Nutrition Management Goals
◆ Minimise the need for nutrient inputs to the property. ◆ Minimise nutrient losses through leaching, run-off, and volatilisation by selecting and applying nutrients in an appropriate and timely manner. ◆ Ensure that water systems (eg creeks, dams and reservoirs) are not contaminated. ◆ Ensure that soil health (structure, pH and soil flora / fauna) is maintained or improved.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Nutrition Management

Knowledge of soils

- Obtain a good knowledge of the soil characteristics and condition.
- Conduct tests regularly to monitor the condition and nutrient status of the soils.
- Understand the baseline soil characteristics of comparable virgin (undisturbed) sites.

Assessing nutritional requirements

- Conduct soil tests and/or tissue analyses on a regular basis.
- Seek expert interpretation and advice based on analysis results.
- Assess the performance of the crop at harvest.
- Use results of nutritional assessments to develop and modify nutrition program.

Nutrient selection

- Select fertilisers or amendments that match the nutritional requirements of the crop and soil.
- Take into account the environmental performance characteristics of different fertilisers or amendments.
- Consider soil characteristics when selecting fertilisers to prevent/reduce the potential for environmental degradation as a result of nutrient leaching, soil acidification, and volatilisation.
- Select fertilisers suitable for the application method and time of the year.

Timing of fertiliser applications

- Time fertiliser applications by considering:
  - the periods of nutrient demand and uptake by the plants;
  - the type of fertiliser applied and when nutrients will be made available;
  - the irrigation schedule; and
  - likely rainfall.

Record keeping

- Keep detailed records relevant to the nutrition program. Refer to these records when making decisions relating to the nutrition program.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with nutrition management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements

- Soil health status (eg compaction tests, soil food web test)
- Crop health status (visual assessment, packout figures)

Further Information

For further information on nutrition management, refer to "BMP/*Environmental Guidelines for Perennial Horticulture*".

FLOOR MANAGEMENT

Potential Detrimental Environmental Impacts

Soil and weed management (floor management) is important to the long term health and productivity of hazelnut orchards. However, if not properly managed, practices can lead to a range of environmental impacts that have direct links to long-term business sustainability. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from poor management.

Potential Detrimental Environmental Impacts related to Floor Management
◆ ***Soil degradation*** including: ▪ soil compaction associated with the use of cultivation and heavy machinery; ▪ soil erosion by wind and water; and ▪ a reduction of soil organisms as a result of chemical persistence and decreased oxygen levels in the soil. ◆ ***Water contamination*** (including groundwater, creeks, dams and reservoirs with agricultural pest control agents, nutrients, and sediments. ◆ ***Biodiversity decline*** including: ▪ a reduction in flora and fauna populations as a result of ingestion of or contact with agricultural pest control agents; and ▪ harm to native vegetation and wildlife habitats. ◆ ***Community concern*** and harm associated with spray drift into neighbouring properties/roadways. ◆ ***Generation of dust*** as a result of cultivation (if used).

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to irrigation management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Environment Protection and Biodiversity Conservation Act 1999 ◆ Agricultural and Veterinary Chemicals Act 1994 ◆ Agricultural and Veterinary Chemicals Code Act 1994 ◆ National Environment Protection (Assessment of site contamination) Measure 1999
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Natural Resources Management Act, 2004 ◆ Environment Protection Act, 1993 ◆ Native Vegetation Act, 1991

Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION**

- Adelaide Hills Council Bylaw No 3 Local Government Land

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of floor management. For example, do you need to provide any information about your soil and weed management practices to your customers or other external parties?

Within Australian Water Catchment areas, managing water sustainably, protecting ecosystems, managing soil erosion and pests and diseases are all important issues. Every land manager in the region has a role to play in natural resource management. Below is a summary of the current regional objectives that are linked to floor management practices.

Regional Environmental Objectives related to Floor Management

The current regional goal related to achieving ***water quality improvement in terrestrial systems*** is:

- Water quality of sufficient standard to support natural ecosystems and to meet the needs of human consumption with minimal treatment

The current regional goal related to achieving ***maintenance, improvement and reconstruction of ecosystems*** is:

- Ecosystems protected and managed to provide security and viability for all native species.

The current regional goal related to ***managing soil erosion*** is:

- Areas subject to soil erosion rehabilitated and contributing significantly to profitable production, biodiversity conservation and or landscape amenity.

The current regional goal related to ***managing pests and diseases in natural systems*** is:

- Existing plant and animal pests and diseases controlled to the stage that they no longer impact significantly on ecosystem function and prevention of new introductions to the region.

The current regional goal related to ***managing pests and diseases of terrestrial primary production systems*** is:

- Pests and diseases controlled to the stage that they no longer impact significantly on primary production.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Floor Management Goals

- Use an effective soil and weed management strategy that:
  - avoids/minimises chemical use;
  - maintains or improves soil structure, nutrition, organic matter and soil biota;
  - prevents the contamination of water systems; and
  - avoids the development of weedicide resistance.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Floor Management

Soil Management

- Knowledge of soil type, available rooting depth, soil organic content, soil structure, water holding capacity, pH and fertility.

Weed Management

- All potential problem weeds identified (including noxious and environmental weeds).
- Control measures developed for the problem weeds identified.

Herbicide Use

- Select herbicides for minimum environmental impact by considering:
  - weed type;
  - chemical type (eg pre-emergent, post-emergent, systemic, contact); and
  - Potential Detrimental Environmental Impacts (eg toxicity, persistence in soil, leaching from soil).
- Time herbicide applications by considering:
  - weather conditions
  - crop growth stage;
  - the life cycle of the weed; and
  - the label directions.
- Prevent herbicide resistance by:
  - having a developed herbicide resistance strategy;
  - rotating herbicides by chemical mode of action group; and
  - referring to label directions.

Cultivation

- Limit the number of cultivations per year.
- Avoid cultivation when soil is too wet/too dry.

Vegetative cover

- Maintain a healthy midrow sward of suitable species to improve trafficability, prevent erosion and surface runoff and provide a habitat for beneficial organisms.

Midrow Management Strategy

- Develop a midrow management strategy which considers:
  - environmental impacts related to site conditions; and
  - integrates weed, irrigation, nutrition, swards and soil management.

Chemical storage and handling

- Prevent the contamination of the environment by having storage and mixing areas:
  - with an impermeable floor and spill containment provisions; and
  - located away from water ways.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with floor management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Level of soil compaction.
◆ Herbicide use per hectare.
◆ Number of cultivations per year
◆ Mowing/slashing management practices
◆ Percentage ground cover in midrow
◆ Earthworm populations

Further Information

For further information on Floor Management, refer to "BMP/*Environmental Guidelines for Perennial Horticulture*".

PEST AND DISEASE MANAGEMENT

Potential Detrimental Environmental Impacts

The control of pests and disease is vital to the ongoing productivity of commercial hazelnut orchards. Pest and disease control takes time, costs money and can potentially cause environmental impacts if not managed properly. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate pest and disease management.

Potential Detrimental Environmental Impacts related to Pest and Disease Management
◆ ***Soil contamination*** from the application, incorrect disposal and/or storage of pest control agents. ◆ ***Water contamination*** (including groundwater, creeks, dams and reservoirs) via leaching, chemical drift, surface runoff from treated areas and/or soil erosion from treated areas. ◆ ***Biodiversity decline*** including: ▪ reduction in native flora and fauna populations through ingestion of, or contact with pest control agents; ▪ reduction in soil organism populations as a result of chemical persistence in soil. ◆ ***Community concern*** and harm associated with spray drift into neighbouring properties/roadways. ◆ ***Generation of noise*** from audible bird scaring devices and other pest control activities. ◆ Community ***visual amenity*** concerns due to use of bird and hail netting.

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to pest and disease management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Environment Protection Biodiversity Conservation Act 1999 ◆ Agricultural and Veterinary Chemicals Act 1994 ◆ Agricultural and Veterinary Chemicals Code Act 1994 ◆ National Environment Protection Council Act 1994 ◆ National Environment Protection (Assessment of site contamination) Measure 1999
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Environment Protection Act, 1993 ◆ Agricultural and Veterinary Chemicals (South Australia) Act, 1994 ◆ Agricultural and Veterinary Products (Control of Use) Act, 2002
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL**

INFORMATION

- Adelaide Hills Council Bylaw No 3 Local Government Land

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of pest and disease management. For example, do you need to provide any information about your pest and disease practices to your customers or other external parties?

Within Australian Water Catchment areas, managing water for improved quality and sustainability is an important issue. Biodiversity management is another key issue. Every land manager in the region is able to contribute to the overall management of water quality and biodiversity for the future. Below is a summary of the current regional objectives and/or targets that are linked to on-farm pest and disease management.

Regional Environmental Objectives related to Pest and Disease Management

The current regional goal related to achieving ***water quality improvement in terrestrial systems*** is:

- Water quality of sufficient standard to support natural ecosystems and to meet the needs of human consumption with minimal treatment

The current regional goal related to achieving ***maintenance, improvement and reconstruction of ecosystems*** is:

- Ecosystems protected and managed to provide security and viability for all native species.

The current regional goal related to ***managing pests and diseases in natural systems*** is:

- Existing plant and animal pests and diseases controlled to the stage that they no longer impact significantly on ecosystem function and prevention of new introductions to the region.

The current regional goal related to ***managing pests and diseases of terrestrial primary production systems*** is:

- Pests and diseases controlled to the stage that they no longer impact significantly on primary production.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Pest & Disease Management Goals

- To use an effective pest and disease management strategy, which minimises the use of chemicals and maintains or increases populations of beneficial organisms.
- To apply chemicals at the correct dose, at the correct timing and to minimise off-target

contamination, whilst ensuring effective control of the target pests and diseases.

- To minimise the nuisance to neighbours as a result of pest control processes and equipment
- To minimise effects on non-target flora and fauna.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Pest & Disease Management

Monitoring

- Pest and disease monitoring occurs regularly during the growing season.
- Action thresholds are determined for all major pests and diseases and incorporate assessments from previous years.
- Records are kept of each monitoring activity.
- Professional/external assistance obtained as required to assist with monitoring and disease prediction.

Overall control strategy

- Take specific measures to prevent pests and diseases being introduced and becoming established.
- Take specific measures to encourage and prevent harm to beneficial organisms.
- Use pest control agents only after carefully assessing the need (eg by considering presence of pest/diseases, actions thresholds, weather conditions).
- Use biological control agents where suitable.
- Keep records of all control measures and refer to them when making decisions.

Pest control use

- Pest control agents selected:
  - based on the identification of pest/disease;
  - considering the potential impact to beneficial organisms and the environment; and
  - considering the chemical resistance strategies.
- Time applications by considering:
  - the pest/disease populations and action thresholds; and
  - the life cycle of the pest/disease and beneficial organisms.
  - any potential for off-target application
- Apply pest control agents after:
  - considering weather conditions; and
  - setting-up and calibrating the spray equipment to suit application target (eg canopy size and density).

Chemical storage and handling

- Prevent environmental contamination by having storage and mixing areas:
  - with an impermeable floor and spill containment provisions; and
  - located away from water ways.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with pest and disease management. Documenting your procedures will help to provide proof of your responsible

management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Fruit quality assessments at harvest and packing. ◆ Proportion of unsaleable or downgraded fruit. ◆ Crop loss assessments ◆ Populations of beneficial species recorded ◆ Populations of pest species recorded ◆ Disease incidence ◆ Pesticide use details

Further Information

For further information on Pest & Disease Management, refer to "BMP/Environmental Guidelines for Perennial Horticulture".

SITE DEVELOPMENT

Potential Detrimental Environmental Impacts

Development of a new block of trees or even an entirely new property involves careful planning. If not properly managed, site development can lead to a range of environmental impacts that have direct links to long-term business sustainability. Below is a summary of the Potential Detrimental Environmental Impacts that may occur from inappropriate site development.

Potential Detrimental Environmental Impacts related to Site Development
◆ ***Biodiversity decline*** including the loss or degradation of vegetation and wildlife habitats as a result of the development ◆ ***Soil degradation and water contamination*** due to: ▪ inappropriate application of pre-planting ameliorants (incl. fertilisers). ▪ soil erosion from land disturbance and loss of vegetative ground cover. ▪ localised increases in salinity through rising groundwater as a result of the removal of deep-rooted vegetation, and the introduction of water-storage dams and irrigation. ◆ ***Atmospheric pollution*** as a result of greenhouse gases produced through the consumption of fossil fuels burning of unwanted vegetation. ◆ Impacts on ***regional amenity*** from noise, changes to the local landscape, and dust.

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to site development. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Environment Protection and Biodiversity Conservation Act 1999
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Development Act, 1993 ◆ Native Vegetation Act, 1991 ◆ Aboriginal Heritage Act, 1988 ◆ Heritage Act, 1993 ◆ Natural Resources Management Act, 2004
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION** ◆ Adelaide Hills Council Bylaw No 3 Local Government Land

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of site development. For example, do you need to provide any information about your site development processes to your customers or other external parties?

Within Australian Water Catchment areas, careful and strategic development is crucial for the long term sustainability of both communities and the environment. There are many NRM issues associated with hazelnut orchard development. Below is a summary of the current objectives that are linked to site development practices.

Regional Environmental Objectives related to Site Development
The NRM goals that relate to water quality, water quantity, salinity, soil erosion, ecosystem maintenance, watercourse management, biodiversity management and land use/capability are: ◆ Water quality of sufficient standard to support natural ecosystems and to meet the needs of human consumption with minimal treatment ◆ Water use in balance with requirements of natural ecosystems while also supporting urban use and production reflecting land capability ◆ A halt in the rise of saline groundwater and areas subject to salinity rehabilitated and contributing significantly to profitable production, biodiversity conservation and/or landscape amenity. ◆ Areas subject to soil erosion rehabilitated and contributing significantly to profitable production, biodiversity conservation and/or landscape amenity. ◆ Ecosystems protected and managed to provide security and viability for all native species. ◆ Wetlands and watercourses recognised and managed as ecological and community assets for the benefit of present and future generations. ◆ No further species or communities extinctions or additional threatened species in the specific water catchment region. ◆ Recovery of those species and communities that are currently threatened in the specific water catchment region. ◆ Land put to uses that reflect land capability and that also have long-term benefits in sustaining the natural resources of the region. ◆ Existing primary production land that has significant value or potential for primary production retained for primary production use and protected from urban and peri-urban expansion. ◆ Mechanisms and processes incorporated into NRM actions and programs to sustain and enhance landscapes and other social values associated with Natural Resources.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Site Development Goals
◆ To apply land capabilities when configuring new hazelnut orchard layouts. ◆ Consider the potential impacts on adjacent land (eg residents, neighbours, native vegetation etc) when planning a new hazelnut orchard ◆ Be aware of and comply with current planning criteria ◆ Take into account potential changes to land use planning criteria ◆ To successfully establish or redevelop a hazelnut orchard with minimal disruption to the existing natural environment. ◆ To undertake measures to protect and enhance the surrounding environment. ◆ To establish a hazelnut orchard which requires minimal resource inputs (eg water, nutrients, fuel) while encouraging optimum plant health.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Site Development
◆ Actively investigate and analyse potential sites prior to selection. ◆ Select a site so that effects on biodiversity (flora and fauna), water resources, the community, and surrounding land uses are minimised. ◆ When developing/redeveloping the site, contact the relevant authorities prior to preparing a detailed plan. ◆ Design the development to prevent/reduce potential impacts on the environment. ◆ Plan to retain or revegetate the land to allow for the enhancement of native flora and fauna. ◆ When selecting the materials for the development, consider the life of the material and the Potential Detrimental Environmental Impacts associated with the manufacture, use, recyclability and disposal of the item.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with site development. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Compliance with hazelnut orchard development approval processes. ◆ Development is designed according to land use capabilities and adjacent land uses. ◆ Appropriate controls put in place to minimise Potential Detrimental Environmental Impacts. ◆ Level of resource inputs. ◆ Crop yields and health, and other outputs.

Further Information

For further information on Site Development, refer to "BMP/*Environmental Guidelines for Perennial Horticulture*".

NATIVE VEGETATION MANAGEMENT

Potential Detrimental Environmental Impacts

Most Australian Water Catchment areas are well-renowned for their biodiversity assets, including the native vegetation throughout the region. If not appropriately managed, horticultural enterprises may have detrimental impacts on nearby native vegetation. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate management of adjoining productive land or bushland (native vegetation) on or near your property.

Potential Detrimental Environmental Impacts related to Native Vegetation Management
◆ The failure to protect areas of native vegetation from threatening processes may cause biodiversity decline (quantity and quality) including: ▪ the loss of and/or degradation of native vegetation; ▪ fragmentation of areas of native vegetation; ▪ restricted natural regeneration of native vegetation which affects its long-term sustainability. ▪ reduced species diversity and altered species composition; and ▪ degradation or destruction of wildlife habitats and wildlife populations ◆ Inappropriate land management practices can lead to the spread of soil-borne diseases (eg Phytophthora), which may lead to production losses and degradation of native vegetation.

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to native vegetation. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Environment Protection and Biodiversity Conservation Act 1999 ◆ National Environment Protection Council Act 1994
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Development Act 1993 ◆ National Parks and Wildlife Act 1972 ◆ Native Vegetation Act 1991 and (misc.) Amendment Bill 2002 ◆ Pastoral Land Management and Conservation Act 1989 ◆ Soil Conservation and Landcare Act 1989 ◆ Natural Resources Management Act 2004
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION** ◆ None known – to be completed

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of native vegetation management. For example, do you need to provide any information about native vegetation management to your customers or other external parties?

Within Australian Water Catchment areas, biodiversity is a key asset. Every land manager in the region has a role to play in managing native vegetation resources for the future. Below is a summary of the current regional objectives that are linked to native vegetation management practices.

Regional Environmental Objectives related to Native Vegetation Management

The current regional NRM goals which relate to native vegetation management include:

- Ecosystems protected and managed to provide security and viability for all native species.
- No further species or communities extinctions or additional threatened species in the specific Water Catchment region.
- Recovery of those species and communities that are currently threatened in the specific Water Catchment region.
- Existing plant and animal pests and diseases controlled to the stage that they no longer impact significantly on ecosystem function and prevention of new introductions to the region.
- Fire prevention measures that lead to progressive improvement in the condition of biodiversity assets.
- The incidence of wildfire kept to a minimum.
- Fire used in appropriate situations to achieve planned biodiversity outcomes.
- Mechanisms and processes incorporated into NRM actions and programs to sustain and enhance landscapes and other social values associated with Natural Resources.
- An aware community adopting practical and reasonable steps to protect the developed assets of the region from fire while at the same time protecting natural resource assets.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Native Vegetation Goals
◆ To retain areas of native vegetation. ◆ To protect and manage areas of native vegetation from threatening processes. ◆ To protect and manage orchards and native vegetation from the effects of soil borne diseases (eg Phytophthora). ◆ To enhance and restore the quality, quantity and value of areas of native vegetation. ◆ To restore/revegetate areas using local native species.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Native Vegetation Management
◆ Areas of native vegetation on the property protected by: ▪ a fence; (to exclude grazing animals) ▪ having a pest animal and weed control program; ▪ controlling vehicle and pedestrian traffic from the areas of native vegetation; and ▪ ensuring buffer zones and management practices are in place to protect from pesticide and fertiliser movement. ◆ Measures are taken to enhance and restore areas of native vegetation on the property. ◆ A management plan is established to prevent the spread of weeds, soil-borne diseases and insect pests.

If you already use all of the above practices, you can be confident that you have a high level of management in place to control any potential environmental risks to your native vegetation. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Quantity and quality of native vegetation, with appropriate monitoring tools. ◆ Extent of spread of weeds, insect pests and soil-borne diseases within native vegetation and on productive land.

Further Information

For further information on Irrigation Management, refer to "BMP/Environmental Guidelines for Perennial Horticulture".

WASTE MANAGEMENT

Potential Detrimental Environmental Impacts

Waste materials are produced as part of the day-to-day running of hazelnut orchards. If not properly managed, waste products can lead to a range of environmental impacts that have direct links to long-term business sustainability. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate waste management.

Potential Detrimental Environmental Impacts related to Waste Management
◆ ***Atmospheric pollution*** caused by the burning of solid wastes (eg treated timber posts, used tyres, tree guards, nut boxes, polypipe, vegetative wastes) releasing smoke, toxic fumes, and greenhouse gases (Note: The burning of certain wastes is illegal). ◆ ***Soil contamination*** as a result of: ▪ the poor storage of waste sump oil; ▪ the use of waste sump oil as a dust suppressant (Note: This is an illegal practice); ▪ the poor storage and disposal of waste chemicals and containers; and ▪ the leaching of heavy metals from treated timber post stockpiles. ◆ ***Water contamination*** (surface and groundwater) as a result of: ▪ the poor management of wash down water; and ▪ inappropriate storage of used chemical containers. ◆ Effects on ***regional amenity*** as a result of the storage of waste on site, the generation of odours and harbouring of pests and vermin. ◆ ***Impact on landfill capacity*** with further potential for ***soil contamination*** due to the disposal of solid wastes ◆ ***Impact on native flora/fauna*** from inappropriate dumping of vegetative and other solid wastes..

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to waste management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ National Environment Protection (Assessment of Site Contamination) Measure 1999 ◆ National Environment Protection (Ambient Air Quality) Measure 1998
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Environment Protection Act 1993 ◆ Water Resources Act 1997 ◆ Water Quality Policy 2003

- Agricultural and Veterinary Products Act 2002
- Public and Environmental Health Act 1997
- Development Act 1993
- Local Government Act 1934

Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION**

- Adelaide Hills Council Bylaw No 3 Local Government Land

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of waste management. For example, do you need to provide any information about your waste management practices to your customers or other external parties?

Within Australian Water Catchment areas, there are significant water and biodiversity resources which can be detrimentally impacted upon by through poor waste management practices. Every land manager in the region has a role to play in managing these resources for the future. Below is a summary of the current regional objectives that are linked to waste management practices.

Regional Environmental Objectives related to Waste Management
Current regional NRM goals that are relevant to waste management practices include: • Water quality of sufficient standard to support natural ecosystems and to meet the needs of human consumption with minimal treatment. • Ecosystems protected and managed to provide security and viability for all native species.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Waste Management Goals
• To avoid/minimise the generation of waste. • To re-use and recycle waste where possible. • To prevent/reduce impacts on the environment associated with waste storage and disposal.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Waste Management
◆ Materials/items purchased on the basis of: ▪ the potential for re-use / recycle; ▪ how waste will be managed and disposed of; ▪ if a recycled product can be used; and ▪ ways in which the amounts of packaging can be reduced. ◆ A waste management plan has been developed and includes: ▪ waste types and quantities identified; ▪ waste issues prioritised; and ▪ waste management solutions developed based on the cleaner production hierarchy (avoid, reduce, re-use, recycle, treat, dispose).

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with waste management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Total waste generated. ◆ Percentage of waste that is re-used/recycled. ◆ Amount of waste stockpiled.

Further Information

For further information on Waste Management, refer to "BMP/*Environmental Guidelines for Perennial Horticulture*".

BIOSECURITY

Potential Detrimental Environmental Impacts

Biosecurity measures are usually associated with protection of commercial crops from exotic pests, diseases, plants and animals. In reality, several species that pose biosecurity risks to hazelnut orchards can also impact detrimentally on other aspects of the environment. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inadequate biosecurity management.

Potential Detrimental Environmental Impacts related to Biosecurity
◆ ***Biodiversity decline*** including: ▪ disruption of ecological processes as a result of the introduction of exotic pests, diseases, plants and animals; and ▪ a decline in the condition and extent of native flora and fauna and primary production areas as a result of the introduction of exotic pests, diseases, plants and animals, and the existence of derelict orchards. ◆ ***Soil degradation*** through contamination with soil borne diseases or decreased vegetation effects.

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to biosecurity. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Environment Protection and Biodiversity Conservation Act 1999 ◆ Quarantine Act 1908 ◆ Export Control Act 1982
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Fruit and Plant Protection Act, 1992 ◆ Phylloxera and Grape Industry Act, 1995
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION** ◆ None known – to be completed

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of biosecurity management. For example, do you need to provide any information about your biosecurity measures to your customers or other external parties?

Within Australian Water Catchment areas, there is a wide range of different land uses. Horticulture may make up a substantial proportion of the region, contributing significantly to the local economy. Adequate biosecurity measures are critical to protect these industries, as well as the region's natural biodiversity assets. Every land manager in the region has a role to play in managing biosecurity issues.

Regional Environmental Objectives related to Biosecurity
Below is a summary of the current regional objectives that are linked to biosecurity: ◆ Ecosystems protected and managed to provide security and viability for all native species. ◆ Existing plant and animal pests and diseases controlled to the stage that they no longer impact significantly on ecosystem function and prevention of new introductions to the region. ◆ Pests and diseases controlled to the stage that they no longer impact significantly on primary production. ◆ Existing primary production land that has significant value or potential for primary production retained for primary production use and protected from urban and peri-urban expansion.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Biosecurity Goals
◆ To maintain and enhance ecological processes in the hazelnut orchard and surrounding environment by protecting against the introduction of exotic pests, diseases, plants and animals. ◆ To prevent/minimise environmental impacts associated with the introduction and control of exotic pests, diseases, plants and animals.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Biosecurity
◆ A formal documented biosecurity plan prepared which identifies measures for: ▪ preventing the introduction of exotic pests, diseases, plants, and animals (into the nation, state, and region); ▪ preventing the movement of exotic pests, diseases, plants and animals between properties and from hazelnut orchards into sensitive areas (such as areas of native vegetation); ▪ detecting the presence of exotic pests, diseases, plants and animals in the hazelnut orchard and surrounding environment; and ▪ responding to and controlling outbreaks of exotic pests, diseases, plants, and

animals.

- Risks associated with the introduction and movement of exotic pests, diseases, weeds and animals for the following potential contaminant sources have been assessed:
  - soil;
  - wind and air;
  - water (inc hail);
  - machinery and equipment;
  - personnel and visitors;
  - animals and insects
  - organic products;
  - planting material.
- Measures in place to control the movement of:
  - soil and plant material;
  - machinery and equipment; and
  - personnel and visitors.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with biosecurity management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Populations of exotic pests, diseases, plants and animals in the hazelnut orchard and surrounding environment.

Further Information

For further information on Biosecurity, refer to "BMP/Environmental Guidelines for Perennial Horticulture".

MACHINERY OPERATION

Potential Detrimental Environmental Impacts

Commercial horticultural production typically involves the use of machinery and mechanisation to perform key tasks. However, if not properly managed, farm machinery can lead to a range of environmental impacts that have direct links to long-term business sustainability. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate machinery operation.

Potential Detrimental Environmental Impacts related to Machinery Management
◆ ***Non-renewable energy consumption*** resulting in the production of greenhouse gases. ◆ ***Soil compaction/erosion*** ◆ ***Community disturbances*** caused by the generation of noise, light and/or dust. ◆ ***Biodiversity decline*** including the destruction of or damage to native vegetation by machinery.

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to machinery management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ Road Transport Reform (Heavy Vehicle Standards) Regulations 1995 ◆ Environment Protection and Biodiversity Conservation Act 1999 ◆ National Environment Protection Council Act 1994 ◆ Road Transport Reform (Vehicles and Traffic) Act 1993
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Environment Protection Act, 1993 ◆ Environment Protection (Air Quality) Policy ◆ Environment Protection (Industrial Noise) Policy, 1994 ◆ Environment Protection (Machine Noise) Policy, 1994
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION** ◆ None known – to be completed

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of machinery management. For example, do you need to provide any information about

your machinery operations to your customers or other external parties?

Within Australian Water Catchment areas, residential and community areas are frequently located near to commercial horticulture properties, making responsible machinery operation an important issue. Below is a summary of the current NRM objectives that are related to machinery operation.

Regional Environmental Objectives related to Machinery Operation
◆ Ecosystems protected and managed to provide security and viability for all native species.

NB THIS MANAGEMENT ASPECT HAS FEW DIRECT LINKS TO NRM GOALS. It may be more appropriate to quote any Planning or local government strategies as the most relevant external stakeholder here.

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Machinery Management Goals
◆ To avoid and minimise: ▪ the generation of greenhouse gas emissions; ▪ inadvertent damage to native vegetation; ▪ the generation of noise, light and dust; and ▪ soil erosion and soil structure damage.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Environmental Practice Options for Machinery Management
◆ Match the tractor size and power to the implements and tasks being carried out. ◆ Conduct regular maintenance on all tractors and machinery. ◆ Do not use machinery on wet soil where practical. ◆ Do not use machinery in a manner that could damage native vegetation. ◆ Take measures to distribute the load evenly over the largest area possible. ◆ Take measures to prevent/reduce disturbances caused by noise, dust and light.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with machinery management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Fuel usage (litres/ha). ◆ Degree of soil compaction or erosion ◆ Vehicle maintenance records ◆ Complaints register.

Further Information

For further information on Irrigation Management, refer to "BMP/*Environmental Guidelines for Perennial Horticulture*".

HARVESTING

Potential Detrimental Environmental Impacts

If not properly managed, harvesting operations can lead to a range of environmental impacts that have direct links to long-term business sustainability. Below is a summary of the Potential Detrimental Environmental Impacts that could occur from inappropriate harvest management.

Potential Detrimental Environmental Impacts related to Harvest Management
◆ Nuisance caused by: ▪ the generation of noise associated with the operation of harvesters and the dropping of bins/crates ▪ lights associated with harvesting activity during the night ▪ the generation of odours as a result of waste nuts washed from harvesters. ▪ the generation of dust ▪ the generation of litter/waste as a result of increased number of workers on-site ◆ Also refer to 'Machinery Operation' section.

If you have not done so already, strategies need to be put in place to address the potential impacts that are relevant to your situation, taking into account the resources ($s, time) available to you. By completing a **risk assessment**, you can identify which impacts are priority issues for you.

Relevant Legal Requirements

Below is a list of the main environmental legislation related to harvest management. You should be aware of what this legislation means for your business.

Relevant Environmental Legislation
Commonwealth ◆ National Environment Protection Council Act 1994
South Australia **EXAMPLE ONLY – EACH GROWER WILL ADD OWN STATE INFORMATION** ◆ Environment Protection Act, 1993 ◆ Environment Protection (Air Quality) Policy ◆ Environment Protection (Industrial Noise) Policy, 1994 ◆ Environment Protection (Machine Noise) Policy, 1994
Local **EXAMPLE ONLY – EACH GROWER WILL ADD OWN LOCAL INFORMATION** ◆ None known – to be completed

'Other' Requirements

In addition to relevant legislation, there may be other requirements your business needs to meet in terms of harvest management. For example, do you need to provide any information about your harvest practices to your customers or other external parties?

Within Australia Water Catchment areas, residential and community areas are frequently located near to commercial horticulture properties, making responsible harvest management an important issue. Below is a summary of the current regional NRM objectives that are related to harvest management.

Regional Environmental Objectives related to Harvest Management
◆ *NB THIS MANAGEMENT ASPECT HAS FEW DIRECT LINKS TO NRM GOALS – research your Planning Goals to see if any further links exist.*
◆ Check EurepGAP

Managing Potential Detrimental Environmental Impacts

After considering the Potential Detrimental Environmental Impacts, legal and other requirements relevant to your situation, it is in the interest of your property's long-term sustainability to develop action plans outlining how you will address them. An action plan should describe ***what*** you are trying to achieve (your goals), ***how*** you are going to achieve your goals, and how you will ***measure*** or demonstrate your progress.

The table below provides examples of the ***goals*** you might adopt for your property.

Property-Level Harvest Management Goals
◆ To minimise the generation of noise, odours, dust, light and litter.
◆ To prevent the contamination of waterways.
◆ To minimise the effect of soil compaction.

Below are some examples of ***how*** you can work towards achieving these goals.

Best Management Practice Options for Harvest Management
◆ Take measures to prevent/reduce disturbances caused by noise during harvesting: ▪ by locating bin loading areas away from residential areas and public areas (eg road reserves) if possible; ▪ by establishing buffer zones between the hazelnut orchard and any residential or community areas (preferably vegetated buffers to double as wind breaks and spray drift barriers); and ▪ by maintaining a good relationship with neighbours.
◆ Locate machinery wash down areas a suitable distance from water bodies, residential and community areas to prevent contamination.
◆ Provide bins for use by contract labour teams to prevent littering at meal breaks etc.

If you already use all of the above practices, you can be confident that you have a high level of controls in place to manage any potential environmental risks associated with harvest management. Documenting your procedures will help to provide proof of your responsible management practices to external parties.

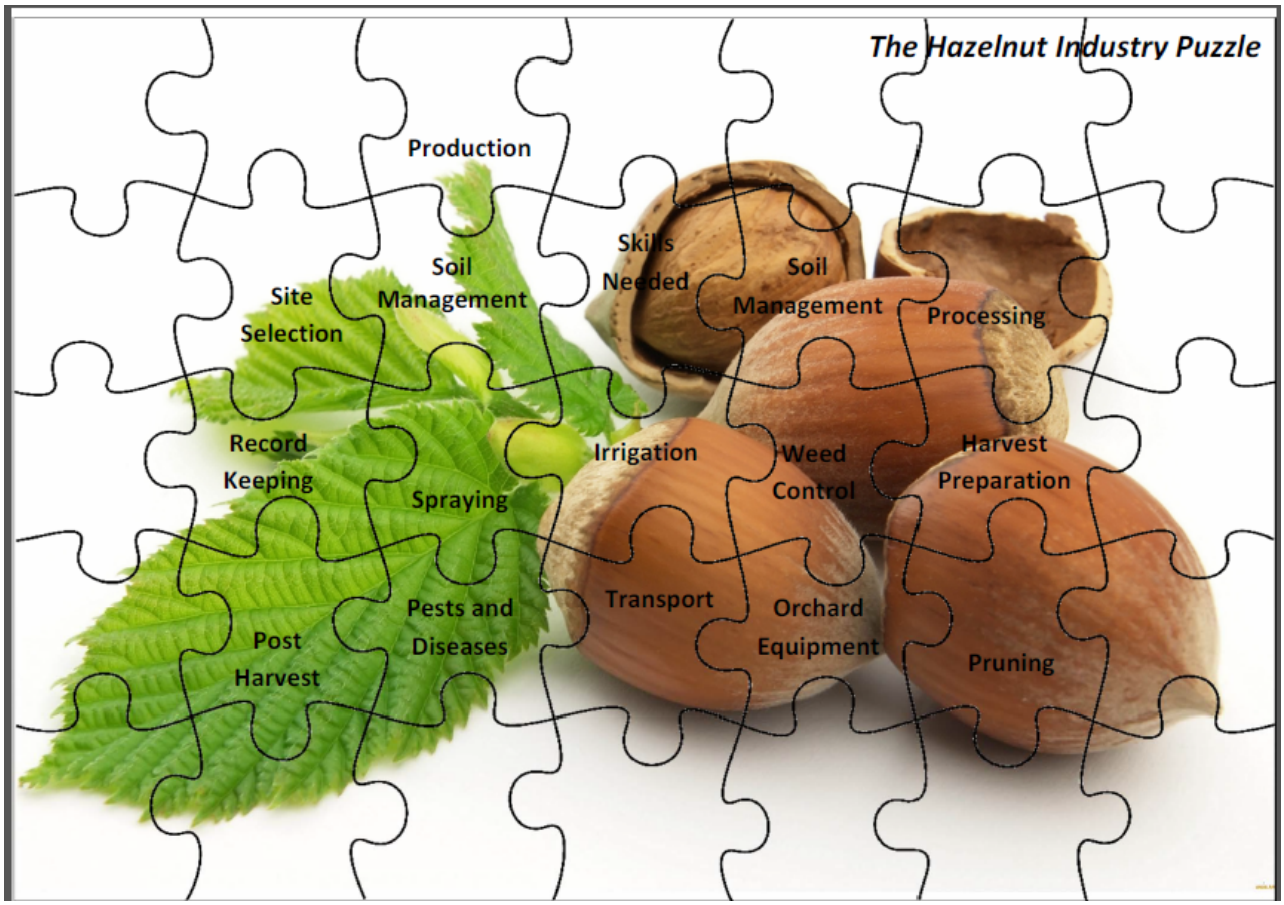
Monitoring and recording your performance is also important for your own benefit. Below are some examples of measurements you can make to track your environmental progress.

Property-Level Performance Measurements
◆ Level of soil compaction. ◆ Standard business practices include proactive discussions with neighbours regarding potential 'nuisance' activities. ◆ Number of complaints received (as an indicator of the offensiveness of any noise, odour and/or light impacting beyond property boundaries).

Further Information

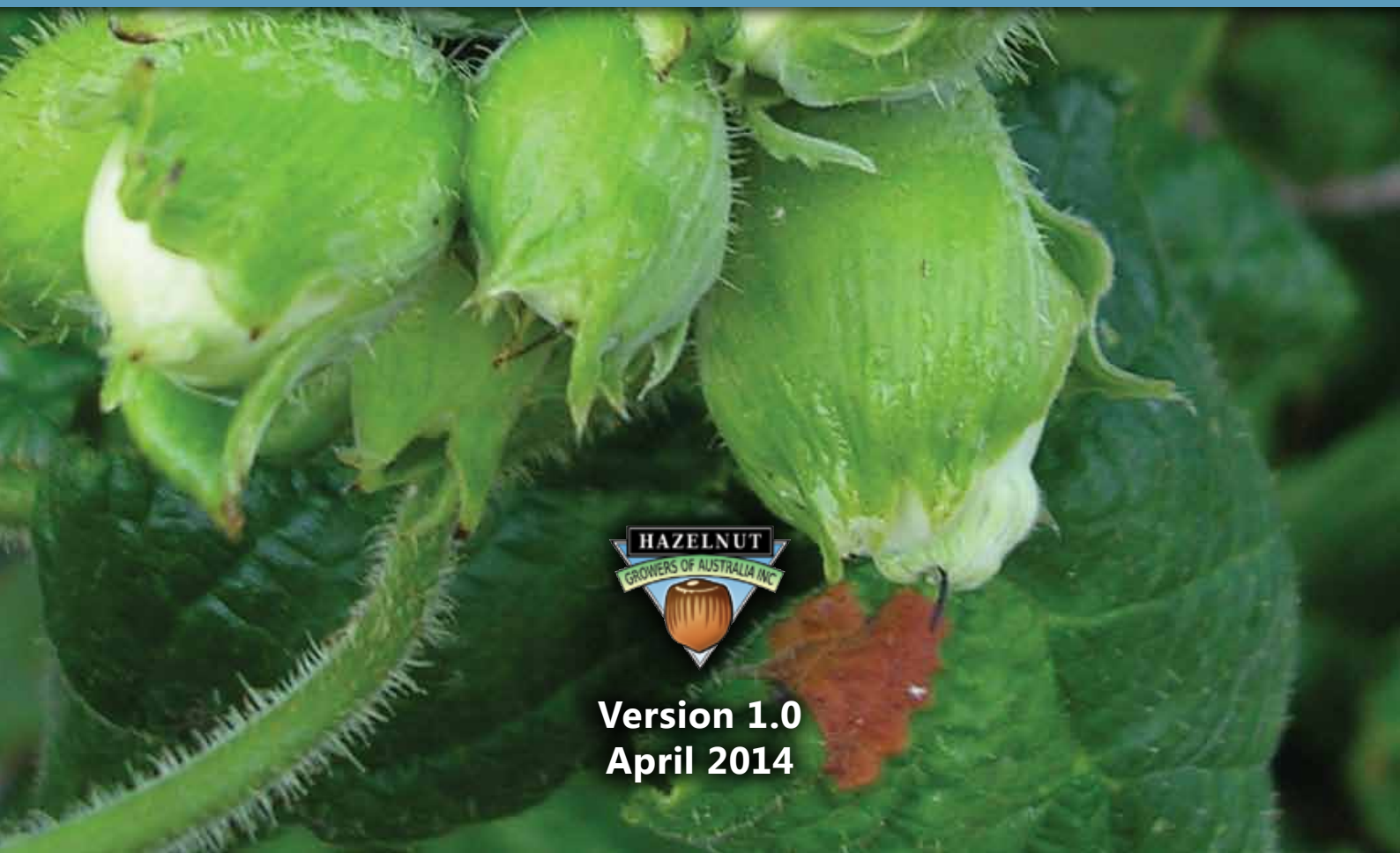
For further information on Harvest Management, refer to "*BMP/Environmental Guidelines for Perennial Horticulture*."

Appendix Q: DRAFT 'Hazelnut Orchard Puzzle'.



ORCHARD BIOSECURITY MANUAL FOR THE HAZELNUT INDUSTRY

A manual for hazelnut growers.
Reduce the risk of new pests entering and becoming established on your orchard.



HAZELNUT GROWERS OF AUSTRALIA INC

Version 1.0
April 2014

The Hazelnut Growers of Australia Inc (HGA) is the peak hazelnut industry body. The HGA represents and promotes the interests of Australian hazelnut growers, processors and marketers. Membership is voluntary and currently encompasses more than 95% of the Australian hazelnut production base. The HGA provides a channel for communication and dissemination of information between members of the Industry, governments and other sectors of horticulture; manages research and development and fosters industry growth, profitability and sustainability. The HGA is a member of PHA.

Contents

Six easy ways to protect your orchard

YOU HAVE AN IMPORTANT ROLE TO PLAY IN PROTECTING YOUR ORCHARD AND THE HAZELNUT INDUSTRY FROM BIOSECURITY THREATS

Here are six simple things you can do to reduce the threat of new pests entering and establishing in your orchard.

1. Be aware of biosecurity threats

Make sure you and your orchard workers are familiar with the most important exotic hazelnut pests.

2. Use high health status, pest-free propagation material from known sources

Ensure all propagation material and orchard inputs are fully tested and pest free. Keep records of your orchard inputs.

3. Keep it clean

Practicing good sanitation and hygiene will help prevent the entry and movement of pests onto your property. Workers, visitors, vehicles and equipment can spread pests so make sure they are decontaminated before they enter and leave your orchard.

4. Check your crop

Monitor your trees frequently. Knowing the usual appearance of your trees will help you recognise new or unusual events and pests. Keep records of all unusual observations.

5. Report anything unusual

If you suspect a new pest - report it immediately.

6. Abide by the law

Support and be aware of laws and regulations established to protect the hazelnut industry.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

EXOTIC PLANT PEST HOTLINE
1800 084 881

Biosecurity overview

WHAT IS BIOSECURITY?

Biosecurity is about the protection of livelihoods, lifestyles and the natural environment, which could be harmed by new pest incursions.

Biosecurity is a national priority, implemented at pre-border, border and post-border locations. It is essential for your business.

Australia's geographic isolation has meant that we have relatively few of the pests that affect plant industries overseas. Freedom from these exotic pests is a vital part of the future profitability and sustainability of Australia's plant industries. Biosecurity ensures that our plant health status is maintained. This allows us to preserve existing trade opportunities, and provide evidence to support new market negotiations.

In addition, 'area freedom' from a number of endemic pests, is vital to the prosperity of the hazelnut industry.

The definition of a pest used in this manual covers all insects, mites, snails, nematodes, pathogens (diseases) and weeds that are injurious to plants or plant products.

- Exotic pests are those not currently present in Australia
- Endemic pests are established within Australia

WHAT IS ORCHARD BIOSECURITY?

Orchard biosecurity is a set of measures designed to protect a property from the entry and spread of pests. Orchard biosecurity is your responsibility, and that of every person visiting or working on your property.

Through the implementation of orchard biosecurity measures, growers play a key role in protecting the Australian hazelnut industry from exotic pests. If a new pest becomes established in your orchard, it will affect your business through increased orchard costs (for monitoring, cultural practices, additional chemical use and labour to apply them), reduced productivity (yield and/or quality reductions) or loss of markets.

Early detection and immediate reporting increase the chance of effective and efficient eradication.

This manual is designed to assist you in protecting your hazelnut orchard and the hazelnut industry from new and invasive pests. By implementing the recommended measures in your day-to-day operations, you will enhance your biosecurity and that of your region, while minimising productivity losses and unnecessary costs.

More information on how to secure your orchard and secure your future can be found online at **www.farmbiosecurity.com.au**, a joint initiative of Plant Health Australia and Animal Health Australia.

REGIONAL BIOSECURITY

To strengthen the biosecurity measures implemented on your property, consider initiating biosecurity meetings and activities to promote biosecurity at the regional level. Through this collaborative approach, biosecurity threats to all properties in your region can be minimized.

Potential sources of biosecurity threats may be neighbouring orchards (operating or abandoned), nurseries, other commercial plantings, native vegetation and/or peri-urban residential or amenity plantings.

Implementation of orchard biosecurity underpins regional biosecurity, which in turn underpins national biosecurity. Promotion of biosecurity at the regional level is enhanced through broad engagement of the community, understanding the region's vulnerability, and the source and nature of threats, knowledge of the expertise base and resources available to the region, and a commitment from stakeholders to implement biosecurity measures, surveillance and reporting.

If orchard measures are supported by community based measures, a regional framework for biosecurity can be coordinated and is achievable.

Pest surveillance

Pest surveillance, or crop monitoring, involves looking for, recording and managing plant pests. Conducting regular surveys of your orchard gives you the best chance of spotting a new pest soon after its arrival. Surveillance can be incorporated into existing Integrated Pest Management (IPM) practices, quality assurance programmes, or as a component of best management practices. Active pest surveillance is necessary because:

- Early detection of exotic pests improves the chance of eradication or containment within a region. If eradication or containment is not feasible, early detection, in conjunction with contingency planning and preparedness by government and industry bodies (e.g. preparing emergency chemical registrations, permits for importation of biocontrol agents, awareness material and training in pest diagnostics) assists with a more rapid and effective response.
- Depending on the type of pest and seasonal conditions, many pests can quickly build up to high levels. General management of established pests requires regular inspections to determine presence and population levels. IPM should be a fundamental part of your orchard management practices.
- Export destinations for hazelnuts (and other nuts) require 'evidence of absence' data for exotic and some endemic pests that are of their concern. The Australian hazelnut industry, in collaboration with governments, must prove through surveillance that exotic pests have been looked for and found to be absent. This underpins claims of 'area freedom' in that a pest is 'known not to occur'.
- Surveillance at the orchard level contributes essential information to regional biosecurity efforts and ultimately to the national status (presence/absence) of a pest.

All pest (exotic and endemic) surveillance activities carried out on your property should be recorded. These records can be used in the response to a pest outbreak and provide support to industry surveillance activities. The addition of exotic pests to current datasheets used by consultants is an effective recording mechanism. An example pest surveillance datasheet is included in this manual.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

Report suspect pests

Report any unusual or suspect plant pest immediately via the Exotic Plant Pest Hotline on 1800 084 881.

Early detection and reporting may prevent or minimise long-term damage to, or quarantine period of, your orchard and the hazelnut industry.

Calls to the Exotic Plant Pest Hotline will be forwarded to an experienced person in the department of primary industries in your state or territory, who will ask some questions about what you have seen and may arrange to collect a sample.

Do not send samples without first speaking to someone from the state department, who can discuss the correct type of sample, its packaging, handling and transport to the laboratory assigned for diagnosis.

In some states, the Exotic Plant Pest Hotline operates only during business hours. Outside these hours, leave your full contact information and a brief description of the issue and your call will be followed up as soon as possible. Every report will be taken seriously, checked out and treated confidentially.

If you have found a suspected exotic plant pest, the following general precautions should be taken:

- Do not allow movement of people and equipment near the affected area.
- Wash hands, clothes and boots that have been in contact with affected plant material or soil.
- Do not touch, move or transport affected plant material. Incorrect handling could spread the pest further or render the samples unfit for diagnosis.

While waiting for the identification of the suspected exotic pest, the following measures should be put in place to contain the pest and protect other parts of your orchard:

- Mark the location of the pest detection.
- Limit access to the area.
- Restrict operations in the area.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

Biosecurity and quality assurance

If your orchard or the nursery providing your trees is accredited (i.e. maintains a quality assured scheme such as ISO 9000, SQF 2000, NIASA, Freshcare or Woolworths Quality Assurance Scheme), it is likely that some fundamental techniques of biosecurity best practice are already being applied.

Ensure that your scheme and your records allow full traceability. That is the ability to trace-back plant material on your orchard to its source (including the budwood sources, seed source, health testing specifics and authenticity records), to trace-forward plant material or produce that has left your property, and provision of records of surveillance and pest management practices undertaken on your property.

Auditable Quality Assurance schemes and achievement of membership to them, is beneficial in terms of biosecurity, market access, meeting specifications and customer expectations, and food safety.

Product management

PLANTING AND PROPAGATING MATERIAL

Use only high-health, 'clean' (i.e. tested with no pest detections) planting and propagation material. Obtain these only from nurseries that will provide you with reliable records of the material's source and testing history.

You cannot visually assess the health of your planting material. Viruses, viroids and phytoplasmas will not display symptoms on dormant wood, bare roots and in many other circumstances. Even many bacterial, nematode and fungal pathogens present no obvious symptoms on dormant trees.

To minimise the risk:

- Purchase plant material only from a nursery that takes biosecurity, hygiene, health testing and record keeping seriously. Those nurseries will have evidence to support answers to the nursery biosecurity checklist included in this manual.
- Check your nursery and planting material thoroughly.
- Maintain a register of your orchard's propagation material, including its source (with contact details), cultivar/rootstock combinations, specific planting locations, numbers of plants and date planted.

When purchasing planting material, seek as much information as possible from your nursery, complete the nursery biosecurity checklist included in this manual, and request and retain all documentation. Information that should be requested includes:

- The source of budwood (and seed for rootstocks).
- Mother tree health testing regime and timetable (get in writing what virus testing was completed, by whom and when).
- If the cultivar or rootstock is a recent import, ask for its accession number, import date and source.
- Location of foundation material of new imports (should be in screen house or isolated area away from commercial production trees).
- Quality Assurance scheme or certification status of the nursery itself and planting material provided.

HAZELNUT BY-PRODUCTS

Maintaining good orchard and nursery hygiene can minimise cross-contamination and breeding environments for pests. This should be achieved in combination with an effective monitoring/pest management program. A 'spray diary' record should accompany each consignment of hazelnuts.

Collect all plant waste and dispose of it away from nursery and orchard areas and water sources. Appropriate disposal mechanisms for plant waste include deep burial (away from production areas), burning or hot composting.

Ensure that no soil, plant material or insects are left adhering to vehicles, bins, and other equipment (including hand tools) used for harvesting the nuts.

People and biosecurity

BIOSECURITY SIGNS

Well designed signage informs visitors that biosecurity in your orchard is a focus and that they share responsibility for maintaining it. The signs serve to alert people to the potential impact of their visit.

Signs also demonstrate your commitment to orchard hygiene, safety and auditable systems. Biosecurity signage should be placed at the main gate, external entrances, visitor parking areas and wash-down facilities.

Biosecurity signs at entrances or near sheds should direct visitors to contact the owner/orchard manager or formally register their presence, before entering any production areas. The sign should include important contact details, such as the home telephone number, mobile number and/or two-way channel.

Contact Plant Health Australia for further information on obtaining biosecurity signs for your property.

MANAGING PEOPLE MOVEMENT

People moving between orchards, nurseries and other horticultural regions can spread pests on vehicles, equipment, boots and clothing. Even hair and watchbands can carry fungal spores or bacteria. The most obvious risks are pests carried in soil and plant material.

Implementing the following measures will reduce the threat of human activity introducing new pests into your orchard:

- Maintain a visitor register (example included in this manual).
- Inform all employees and visitors that their footwear and clothing must be free of soil and plant material before entering or leaving the orchard.
- Provide scrubbing brushes, footbaths, boot covers, rubber boots and protective clothing such as disposable overalls, for people entering or leaving your orchard, or moving from contaminated to clean areas of the property.
- Ensure budding crews are particularly diligent about cleaning their knives and footwear between cuts. At a minimum, knives should be cleaned between each bundle.
- Train and motivate staff to be aware of all threats and biosecurity measures. Test them occasionally. Reward biosecurity awareness and initiative.
- Brief all casual or itinerant workers, contractors and visitors on your orchard hygiene measures.
- Display biosecurity awareness material in staff rooms, trimming and packing sheds. Keep the messages simple and effective.

OVERSEAS TRAVELLERS

People returning from overseas are a threat to our biosecurity, especially if they have visited orchards, nurseries, or markets where plant material or produce was sold.

Several specimens carrying Prunus pests have been intercepted at the Australian border and overseas travellers have unknowingly brought in pests in the past. Air travel means exotic plant pests are only a few hours away.

To protect your orchard from overseas pests, ensure that all people who have recently returned from overseas have cleaned their boots and clothes before entering the orchard. Great care should be taken to prevent the introduction of plant pests into Australia.

CASUAL WORKERS AND TOURISTS

Itinerant workers (budding crews, contract harvest crews, backpackers, retirees) are often employed to assist with orchard budding, pruning, harvesting/picking and packing. While their contribution is highly valued, they are a particular biosecurity threat because they move orchard-to-orchard and region-to-region. They can potentially carry and spread pests from and to susceptible hosts on their clothing, footwear, gloves, and equipment (e.g. knives).

Before entering production areas or packing sheds, make sure itinerant workers are well briefed on biosecurity measures at your property, have changed or washed their clothes and boots, and all tools and equipment are cleaned and disinfected.

Equipment and vehicles

MOVEMENT OF VEHICLES AND MACHINERY

Vehicles and orchard equipment such as sprayers, tractors and hand tools can carry pests in adhering soil, sap and plant material. Pests can then be introduced to a previously clean property, or directly into previously pest-free plant material.

It is impractical to stop all vehicle and equipment movement on and off the property, but using dedicated orchard vehicles, washing down of machinery on concrete pads and denying access of dirty machinery can reduce the spread of pests.

A simple additional measure to reduce the risk of direct pest transfer is to park equipment not in use in full sun on hot days.

Contractors, re-sellers, service providers and drivers of delivery trucks (compost/mulch, fertiliser etc.) and earth moving equipment entering the property should be requested to clean their vehicles and equipment before entering your orchard. Orchards open to the public (e.g. U-Pick businesses) and those open to growers (e.g. for field days, equipment demonstrations) have a heightened risk and designated parking areas away from production sites are important.

Inspecting and cleaning machinery is more time and cost effective than managing a new pest introduced to your property.

Measures to reduce the risk of pest entry on equipment and vehicles include:

- Keep orchard vehicles clean by clearing the vehicle floor of soil, weed seeds and insects, especially after visiting other properties.
- Where possible, use your own vehicle to carry visitors around your orchard.
- In production areas, keep vehicle movement to a minimum, especially on wet soil. Stick to regular pathways through the orchard to minimise the threat of spreading pests.
- Hose off and disinfect machinery in a designated wash-down area before moving between properties.
- Ensure contract mechanical pruners are washed down thoroughly to remove any plant material or soil before entering your orchard.
- Use high pressure water or air to remove plant material and soil from larger equipment and machinery. Ensure that waste water and debris don't enter production or storage areas.
- Always make sure that borrowed and second-hand equipment and machinery is cleaned of all plant material and soil before moving them into your orchard.
- Regularly clean all tools and equipment, including pallets, palecons, cherry pickers, boxes, bags, trimmers and any other equipment used in the orchard, preferably with an antiseptic or bleach solution.

DESIGNATED PARKING AREAS

A well sign-posted designated parking area should be provided for all visitors to your property. Ideally, dedicated orchard vehicles should be used for transport around your property with other vehicle movement limited to direct entry to a designated visitor parking area.

Designated parking areas serve to contain the entry of new pests to an area away from production sites. It also allows for the inspection of tyres, equipment, floor mats and boots for soil and plant material which may carry new pests.

A biosecurity sign in the parking area will remind visitors of the threat of spreading pests between properties.

Do not allow the movement of orchard machinery through the parking area.

WASH-DOWN FACILITIES

A wash-down facility allows orchard employees, contractors and visitors to clean their vehicle and equipment in an easily managed area where wash water is contained.

Providing a high-pressure wash-down facility and cleaning equipment will assist you and your visitors to clean down vehicles and equipment.

For additional protection, an added detergent-based degreaser or disinfectant (for example, Septone Truckwash®, Castrol Farmcleanse® or Virkon®) may be appropriate. For best results, seek advice from re-sellers on the best product, and remove as much soil and plant material as possible from the equipment before using the disinfectant.

The wash-down area should have a sump or water collection area. The sump and area surrounding the wash-down facility should be treated or checked regularly for the presence of pests and weeds.

The wash-down area may be the same as that used for chemical wash-down of vehicles and equipment. If so, all occupational health and safety issues associated with chemical wash-down areas must be taken into account.

Wash-down areas should:

- Be readily accessible and located between the driveway and orchard roads.
- Be isolated from production areas.
- Have access to power and high-pressure water.
- Have a sealed (concrete or bitumen) or packed gravel surface.
- Not drain into a waterway or orchard.
- Have a sump or collection area for easy inspection.

FORM TEMPLATES

ORCHARD BIOSECURITY CHECKLIST:

Orchard/property name: _____

Date of biosecurity check: _____

Recommended practices	Yes	No	Comments
Pests			
Commercial trees and neighbouring vegetation regularly inspected for pests			
Orchard staff know how and where to report pests			
Orchard staff are familiar with the high priority pest threats for the hazelnut industry (see pages 6–8)			
Active pest surveillance is regularly conducted			
Survey activities and results are recorded, even when nothing is found			
Minimise numbers of mummies left after harvest and inspect those remaining			
Product management			
Propagation material is free from pests - visually and by documented testing			
Planting or propagation material is 'certified' or has defined health status			
Records of planting material and its source maintained			
Planting material without complete documentation not accepted on property			
Staff have specific knowledge of symptoms of hazelnut pests spread in propagation material			
Effective monitoring/pest management program maintained			
No soil, plant material or insects left on equipment or in bins			
Hazelnuts loaded and unloaded on paved or sealed pad away from production areas			
Fallen or waste hazelnuts and packing shed waste disposed of away from production areas and irrigation sources			
People movement			
Biosecurity signs are located at main entrances			
Visitors sign a Visitor Register on arrival			
Visitors, clothing, footwear and tools are free of loose soil or plant matter before entering or leaving the orchard			
All people recently returned from overseas have clean footwear and clothes before entering the orchard			

Recommended practices	Yes	No	Comments
Footbaths and scrubbing brushes provided for visitors and staff moving from contaminated to clean areas of the orchard			
Orchard vehicles used to transport visitors around the property			
Orchard staff aware of biosecurity procedures in place			
Equipment and vehicles			
Designated parking area for non-orchard vehicles			
Cleaning and wash-down facilities, preferably on a concrete pad, provided for people, machinery and equipment			
High pressure water or air available for use to remove plant material and soil from equipment and machinery			
Sump installed in wash-down facility to catch unwanted weeds and stop run-off			
Orchard vehicles kept clean by regularly clearing the vehicle floor of soil, weed seeds and insects			
Vehicle movement kept to a minimum in production areas			
Borrowed and second-hand machinery and equipment is cleaned of all plant material and soil before use			
Secateurs and grafting knives are disinfected using a bleach solution between trees			
Machinery cleaned before being moved off property			

NURSERY CHECKLIST:

To be completed through discussion with your nurseryman when purchasing propagation material from a nursery, to reduce the risk of introducing new pests to your orchard.

Nursery name:_____

Date of propagation material purchase:_____

Propagation material purchased:_____

Recommended practices	Yes	No	Comments
Pests			
Nursery staff familiar with general biosecurity practices			
Nursery staff familiar with exotic and endemic threats of almonds			
Specific testing periods for mother plants and seed are programmed			
Test results are recorded and auditable			
Pest threat posters displayed			
Staff know how and where to report pests			
No unlabelled or material of unknown source accepted as propagation material			
An effective monitoring/pest management program maintained and recorded in 'spray diary' or similar			
Active surveillance is formally conducted - inspections, sticky cards, etc.			
Survey activities are recorded, even when nothing is found			
Product management			
Propagation material is free from pests			
Certified plant material is physically separated from non-certified plant material			
Register of planting material and its specific source maintained			
Member on NGIA and using NIASA and Biosecure HACCP			
Register of plant material by accession number and date of importation maintained			
Staff are familiar with symptoms of hazelnut pests transmissible in propagation material			

Recommended practices	Yes	No	Comments
Pots and bins are regularly and thoroughly cleaned			
Plant debris and trimmings are disposed of appropriately			
Staff understand laws governing declaration and introduction of plant material			
People movement			
Biosecurity signs with contact details located at main entrance			
All visitors enter details into Visitor Register before moving about property			
All visitor and staff clothing, footwear and tools are free of loose soil or plant matter before entering and leaving the nursery			
All people recently returned from overseas are checked to ensure they have clean footwear and clothing before entering nursery			
Footbaths and scrubbing brushes are provided			
Staff trained in biosecurity measures and threats			
Staff understand neighbouring enterprises and their activities			
Equipment and vehicles			
Designated parking area provided for visiting vehicles and contractor equipment			
Paved, sealed or compacted walkways through the nursery propagation areas			
Suitable cleaning and wash-down facilities for in-field propagators			
Effective water treatment, recycling and run-off containment			
Livestock are isolated from irrigation water sources			
Vehicle and people movement minimised in production areas			
Borrowed and second-hand machinery and equipment is cleaned of all plant material and soil before entering production areas			
Root trimming secateurs, budding and grafting knives are disinfected (with bleach solution) between trees			

VISITOR REGISTER

Please enter your details to assist us with our orchard biosecurity records.

Date	Time on property		Name	Reason for visit	Vehicle registration and mobile phone	Blocks visited	Location/date of last contact with commercial hazelnuts or other associated species
	Arrival	Departure					

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

PEST SURVEILLANCE DATA SHEET

Orchard: _____

Scout: _____

Date: _____

Block	No. sites	Endemic pests				Exotic pests		Other pests found	Comments
		Pest 1	Pest 2	Pest 3	Pest 4	Pest 1	Pest 2		

* Estimated infestation level (e.g. zero/low/med/high or % trees affected) of endemic pests and presence/absence of exotic pests should be scored

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

PESTS OF CONCERN

Pests

The following are priority exotic pest threats for the Australian hazelnut industry and all would have serious consequences should they be introduced. These are not the only exotic pests of the Australian hazelnut industry. The severity of the impact may be dependent on rootstock-scion combinations and the presence/absence of pathogen vectors.

The climate of Australian hazelnut production regions would allow each of these pests to survive, spread and establish, should they be introduced. Additional information on each of these pest threats is included in fact sheets to be developed and in the final version of the manual.

HIGH PRIORITY EXOTIC PESTS OF THE HAZELNUT INDUSTRY

Eastern Filbert Blight

POTENTIAL ECONOMIC IMPACT - HIGH

- Bacterium - *Anisogramma anomalia*
- Found in North America

Hazelnut Weevil

POTENTIAL ECONOMIC IMPACT - HIGH

- Beetle - *Curcuilo nucum*
- Adults feed on flowers, buds and young nuts
- Larvae develop inside nuts

Gypsy Moth (Asian and European)

POTENTIAL ECONOMIC IMPACT - HIGH

- Moth (Lepidoptera) - *Lymantria dispar*
- Found in Asia and Europe
- Egg masses are a resilient, easily transported life stage. Often affixed to shipping containers, vehicles, ships, etc.
- It has a demonstrated ability for redistribution through human-assisted transport.
- Asian gypsy moth can disperse more than several kilomteres per year through its own movement or by abiotic factors. The European strain has wingless females so natural dispersal is only by wind-dispersal of ballooning first instar larvae
- High reproductive potential and a very broad host range.

Stigmatomycosis

POTENTIAL ECONOMIC IMPACT - MEDIUM

- Fungus - *Nematospora coryli*

Bacterial Canker

POTENTIAL ECONOMIC IMPACT - MEDIUM

- Fungus - *pseudomonas syringae pv. avellanae*

Almond Leaf Scorch

POTENTIAL ECONOMIC IMPACT - MEDIUM-HIGH

- Bacterium - *Xylella fastidiosa*
- Found in North and South America and the Mediterranean
- 'Burn' zones on leaves with golden margin; causing wilted 'scorched' canopy resembling salt damage; and stunted trees
- Spread by sap-feeding leafhoppers or by grafting of infected planting material

Obliquebanded Leafroller

ECONOMIC IMPACT - MEDIUM

- Lepidoptera (butterflies and moths) - *Choristoneura rosacearia*
- Feeding damage occurs directly on developing nut clusters and leaves
- Leaf infestations can result in defoliation prior to nut maturity and harvest
- Pheromone traps are available

Large Hazelnut Aphid

POTENTIAL ECONOMIC IMPACT - MEDIUM

- Aphid (Hemiptera) - *Corylobium avellanae*
- Found in Europe
- Found on new shoots and young twigs, especially fruit bearing twigs
- Difficult to detect since similar in colouration to plant petioles

European Shothole Borer

POTENTIAL ECONOMIC IMPACT - MEDIUM

- Beetle - *Xyleborus dispar*
- Widely distributed through Europe, Asia and North America
- Female beetles bore into stems and branches
- The symbiotic ambriosa fungus, *Ambrosiella hartigii* is established by the beetles in the galleries that they have constructed. After hatching the larvae feed exclusively on the ambriosa fungus.
- Adult females fly readily and flight is one of the main means of transport and dispersal.
- The favoured host range includes many important fruit and nut species
- Damage to trees can also lead to disease infection. It attacks healthy trees.

PRIORITY PESTS OF POLLINATION

Varroa Mite

POTENTIAL ECONOMIC IMPACT - HIGH

- Mite (Acarina) of bees - *Varroa destructor* and *V. jacobsoni*
- Widespread including recently arrived in New Zealand and Papua New Guinea
- Reddish, oval-shaped, pinhead-sized mites carried on European and Asian bees as external parasites
- Infest hives, introduce pathogens and damage developing bees
- Look for unusual bee behaviour

Remain observant for anything unusual in your orchard. If a pest is found that is not normally present in your orchard, it may be new not only to your orchard, but to the region, state or even Australia.

HIGH PRIORITY ENDEMIC PESTS OF THE HAZELNUT INDUSTRY

Bacterial Blight

POTENTIAL ECONOMIC IMPACT - HIGH

- Bacterium - *Xanthomonas arboricola* pv. *corylina*
- Key disease in Australia causing dieback of young twigs and branches
- Affects buds, leaves, branches and trunk
- Occasionally it attacks the nuts and spotting is observed on the husks
- Most injurious to trees up to 6 years old
- First infection on current-season stems consist of dark green water-soaked areas on the bark turning to reddish brown.

Fruit Tree Borers

POTENTIAL ECONOMIC IMPACT - HIGH

- Beetle - *Maroga melanostigma*
- Can cause severe damage by ringbarking the tree, weakening laterals and boring into the wood
- Infestation is usually in the fork of the tree
- Use of a parasitiod wasp as a biological control is under investigation.

Scale

POTENTIAL ECONOMIC IMPACT - HIGH

- Plum Scale - *Parthenolecanium corni*
- Closely related to aphids, mealy bugs and whiteflies
- Have piercing-sucking mouth parts
- Can kill twigs, retard growth and produce quantities of honeydew
- Overwintering occurs as immature scales
- Eggs hatch in early summer and crawlers migrate to the undersides of leaves to feed

Armillaria Root Rot

POTENTIAL ECONOMIC IMPACT - MEDIUM

- Fungus - *Armillaria mellea*
- Soil inhabiting fungus that causes root rots
- Most infection arise because orchard blocks are planted on recently cleared land that contains infected native trees
- Symptoms include poor shoot growth, defoliation, branch dieback, premature yellowing and stunted leaves

Hazel Aphid

POTENTIAL ECONOMIC IMPACT - MEDIUM

- Beetle - *Myzocallis coryli*
- Common pest in Australian hazelnut plantings
- Feed on leaves in spring and early summer
- Leaves become yellow and drop
- Heavy infestations may cause the production of honeydew

Big Bud Mite

POTENTIAL ECONOMIC IMPACT - HIGH

- Mite - *Phytoptus avellanae*
- Also known as filbert bud mite and hazelnut gall mite
- Known to be a problem in most of the major hazelnut production areas around the world
- Identified in samples from Tasmania
- Infested terminal buds become swollen and deformed
- Infestation becomes obvious during late summer and early autumn

HIGH PRIORITY ENDEMIC POST-HARVEST PESTS OF THE HAZELNUT INDUSTRY

Moulds

POTENTIAL ECONOMIC IMPACT - HIGH

- Mould - *Aspergillus flavus* and *Aspergillus parasiticus*
- Can produce the toxin aflatoxin.
- Postharvest handling has a major influence on hazelnut mycroflora
- Hot humid conditions can lead to mould growth on the nuts and to a high level of aflatoxin

PEST FACT SHEETS

DISEASE:

Hazelnut Bacterial Blight

IDENTITY:

Name: *Xanthomonas arboricola* pv. *corylina* (Miller *et al.*) Vauterin *et al.*

Synonyms: *Xanthomonas campestris* pv. *corylina* (Miller *et al.*) Dye
Xanthomonas corylina (Miller *et al.*) Starr & Burkholder

Taxonomic position: Bacteria: Gracilicutes

Common names: Bacterial Blight (English)

MORPHOLOGY:

X. arboricola pv. *corylina* is a Gram-negative rod with a single polar flagellum. It is strictly aerobic. Like other *Xanthomonas* bacteria, it produces a yellow carotenoid pigment in the culture medium. For more details on diagnostic characters, see Bradbury (1987).

HOSTS:

The main host of *X. arboricola* pv. *corylina* is the European Hazelnut (*Corylus avellana*), but *C. colurna*, *C. maxima* and *C. pontica* are also susceptible.

INTRODUCTION

Bacterial Blight is a widespread disease affecting many species of hazelnut around the world. The disease causes lesions, twig and branch dieback, reduction of leaf photosynthetic area and may mark the crop.

The disease seldom causes death of mature trees, but results in significant loss of fruiting wood, immature nut clusters and potential yield.

Mortality and/or major deformation of the bearing platform is common in trees aged under six years.

The economic impact of Bacterial Blight to the Australian hazelnut industry has not been quantified, but it is expected that losses are more significant than most growers realise.

It is likely that the incidence and economic significance of the disease is greatly under-rated by the young Australian hazelnut industry. The 2010 survey conducted by Hazelnut Growers of Australia showed only five percent of growers identified Bacterial Blight as a problem; 33% identified it as a problem in the 2012 survey.

This fact sheet provides technical information on the disease, descriptions of symptoms on plants at different ages, control, and management tips to assist control and improve operational hygiene both in orchards and in nursery beds.

OVERVIEW

The disease is caused by *Xanthomonas arboricola* pv. *corylina* or *Xanthomonas corylina*, a bacterium that affects the buds, leaves, branches and trunk. Occasionally it attacks the nuts and chartacteristic spotting is observed on the husks. Varieties that leaf out early - an event often associated with late frost and early spring rains - are often affected by early blight strikes.

Figure 1. Bacterial blight lesions on hazelnut leaf.
(Photo courtesy of Marco Scortichini, atlasplantpathogenicbacteria.it)

Hazelnut Bacterial Blight is most injurious to trees up to 6 years old as succulent tissue can be badly affected by lesions which girdle the shoot. Trees more than 6 years old rarely die following infection, but nut yields are reduced through the loss of immature nut clusters, small fruiting wood, and nut-bearing branches.

Losses due to this disease are higher in stressed trees, with environment and husbandry both playing a part. Poor environmental conditions such as poor soil drainage, high acidity, moisture stress, cold injury and orchards exposed to buffeting high winds increase risk, however, many of these factors can be ameliorated - for instance, liming, windbreaks. Poor husbandry including mechanical equipment damage, pruning cuts, clumps of suckers and weeds and general cultural neglect, can contribute to making trees susceptible to blight.

The first infection on current-season stems consists of dark green water-soaked areas on the bark, turning to reddish brown lesions. One- and two-year old twigs are attacked, girdled and killed. Infection enters through wounds (including abscision leaf scars), blighted buds and young shoots of the current season's growth. Dead leaves often cling to diseased stems for longer periods than in a normal leaf fall.

Protective copper-based sprays in late summer, autumn (three-quarter leaf fall), winter and early spring are the current means of control. Copper applications create a protective coating that destroys spores that come into contact with it. A number of copper products are registered for hazelnuts.

Effective containment of this disease revolves around securing disease-free planting material, using appropriate copper-based sprays and maintaining good sanitation in the orchard. Removal and destruction of infected plant material, including dead trees, will decrease the chances of inoculums spreading.

BIOLOGY AND INFECTION

- During the cold months of winter Bacterial Blight bacterium persists outside infected plants as dormant spores. These require a specific range and duration of temperature and moisture (Dr Pablo Grau, Chile) in order to become active and infective in spring.
- The bacterial pathogen enters through open stomata (on leaves) and wounds on the plant. It survives from one season to another in cankers and infected buds, surviving better in the large branch and trunk lesions than in the smaller twig lesions (less than 8 mm in diameter).

  Trunk lesions develop from pruning wounds or migration of the bacteria from adjacent infected buds or shoots.
- Bacterial Blight is 'vascular' but not systemic. Infection moves downward through the plant's vascular system, and infected shoots have a dark core. Infection appears to not move upward, new season shoots growing above an infection site/lesion have clean white cores and may grow vigorously until the blight lesion girdles the parent stem restricting sap/water exchange, yellowing of leaves and eventual death. This is particularly easy to spot during summer.
- Bacterial Blight has not been identified in the roots of hazelnut trees, possibly because of its aerobic need - but a plant barrier between stem and root tissue may exist. Suckers arising from the roots or below the crown are free of bacterial blight, but may be subsequently infected.
- Bacterial Blight is commonly introduced into an orchard or nursery on infected planting material, and spreads from plant to plant on pruning tools, equipment or by rain splash. Multiplication occurs on the leaf surface (epiphytic phase), 103-106 bacteria occurring per leaf throughout the growing season. The bacterium penetrates through stomata into buds, leaves and new shoots.
- Rainfall is considered one of the most influencing factors on Bacterial Blight disease occurrence. Since *Xanthomonas arboricola* pv. *corylina* has the epiphytic phase on hazelnut plants, probably, it becomes airborne in splash droplets during the rainfall, as other epiphytic bacteria.

  In addition, the importance of rainfall in triggering the multiplication of the epiphytes and the consequence for the epidemiology of bacterial diseases of plants has been demonstrated. Once bacteria multiply on the phylloplane high levels of bacterial populations can be reached. As a consequence, during the rainfall period the bacterial pathogen spreads at a rate that might cause severe infection, as bacteria within lesions are released very readily from wet leaves
- Hail storms can create wounds and often 'barking' of trees which may result in infection of the tree after such events.
- Within a research paper there was a suggestion that bacterial blight may be transmitted by pollen to female flowers, BUT further research is required to confirm if this is scientifically correct.
- Although *X. arboricola* pv. *corylina* can survive in cankers from one year to the next, this has little epidemiological importance. One grower has reported seeing 'ripe' cankers that swell and are full of inoculum that drips out, prior to the canker splitting and drying out (*Vanessa Cox, Pers Comm*)
- Infection of buds occurs during vegetative growth and they provide the main source of inoculum in the spring. The bacterium can survive over 4 months on fallen leaves but does not overwinter in the soil (Gardan, 1982; 1983).
- Researchers in Oregon, USA could not isolate the pathogen from soil under severely infected trees in trials. This suggests that the pathogen does not survive in soil.
- It does not appear that insects have an important role in disease spread.
- **Wet, warm weather (>20°C) favours infection.** Overhead spray irrigation, and conditions that delay tissue drying out e.g. clumps of weeds or suckers around the base of young trees are also known to favour infection. Temperatures over 20°C are more favourable to leaf infections and the incubation time is shorter than at lower temperatures. The disease may be more severe in years of heavy rainfall, followed by periods of high humidity, or late frosts where freezing injury has occurred.
- In culture, the optimum growth temperature is 28°C.

DETECTION AND IDENTIFICATION

Detection

Although Bacterial Blight is widespread in Australia, it can be managed.

Identification is the first step in controlling this disease. Sometimes Bacterial Blight can be confused with other diseases such as Sunscald and winter damage, but laboratory tests can confirm the presence of the bacterial pathogen. It is easiest to test for the bacterium during the spring.

Buds can be infected but not show symptoms for over 200 days. This means that healthy looking trees can be infected. All young trees (planting stock) should be handled as though they were infected.

Symptoms

Symptoms of Bacterial Blight appear different in orchards and in propagation nurseries due to differing age of plant material and cultural methods.

In orchards, hazel is grown like other fruit trees, and basal suckers are pruned away or 'burned off' using a dessicant or steam several times a year.

In nurseries, on the other hand suckering is encouraged on the mother plants, to produce shoots for layering. The mother plant bears densely crowded long young shoots, on which the disease can spread very readily.

The bacteria enter through natural openings or wounds on buds, leaves, branches or trunks, first infecting the outer bud scales, then moving into the inner bud and the plants vascular system. Buds may be completely killed (Figure 2) or partially damaged. Shoots that emerge from infected buds generally become infected from the bud scales as they grow past them.

Figure 2. Showing infected necrotic bud. If left, the dieback can spread down the stem. Also if not removed the disease over-winters within the dead bud and is a source of re-infection the following growing season.

In Nurseries

Shoots more than a year old show bud dieback, necrosis of the shoot tips and spots on leaves, in spring after bud-burst. Shoots may dry out entirely as the bacterium spreads downwards, either girdling the base and causing dieback of the distal portion, or causing cankers 10-25 cm long with longitudinal surface cracks. Brownish-black necrosis may appear on the convex side of the layered shoots. This necrosis can spread to the stump and girdle the shoot, resulting in its complete dieback.

The new growth shows oily lesions starting at the tip and spreading rapidly back: buds form limited necrotic cankers at which the shoots are liable to break. Buds below the necrotic zone then develop abnormally, giving a characteristic bushy appearance.

The underside of leaves show numerous oily polygonal lesions which may run together to cause a general chlorosis of the lamina and premature leaf fall.

International observations in nurseries indicate that hazelnut cultivars react differently to to *Xanthomonas arboricola* pv. *corylina* attacks:

- Fertile de Coutard (syn Barcelona) is highly susceptible (Luisetti et al., 1975; Prunier *et al.*, 1976),
- Ronde de Piemont shows an intermediate level of susceptibility,
- Imperatrice Eugenie is slightly susceptible, and
- Negret, Merveille de Bollwiller *syn Halls Giant) and Segorbe are almost resistant (Prunier *et al.*, 1976).

Of the cultivars mentioned only Barcelona and Halls Giant are commonly propagated in Australia.

Observations within Australia suggest that early leafing varieties may be more susceptible (that is more prone) to infection. The point for consideration is whether they are more susceptible or is it really the conditions at the time and their timing of leafout that plays the larger part.

In Orchards

While bud cankers, necrosis and dieback of new lateral shoots and cankers are seen, leaf symptoms are less obvious. Where infection is active, and particularly in humid weather, oily polygonal lesions which coalesce can be observed on the underside of infected leaves.

Figure 3. Swollen lesion on stem. Requires removal by pruning, then disposal of the prunings by burning. The wound left on the unaffected clean wood should be treated with a pruning paint or copper spray. The secauters must be sterilised before and after use.

Cankers on twigs, branches and trunks may girdle these organs, including trunks of young trees, thus killing the parts of the tree above the lesions.

The bacteria can overwinter in cankers on branches and buds, and the spores spreads to other parts of the tree in wet weather. Limited spread from tree to tree takes place by rain water splash - however overhead irrigators will excacerbate lateral infection.

Fruits show 'black heel' symptom with browning of the shell and corresponding part of the involucre, which are covered with bacterial slime (Figures 4a and 4b). Oily lesions 3-7 mm long are sometimes seen on the involucre and shell before lignification.

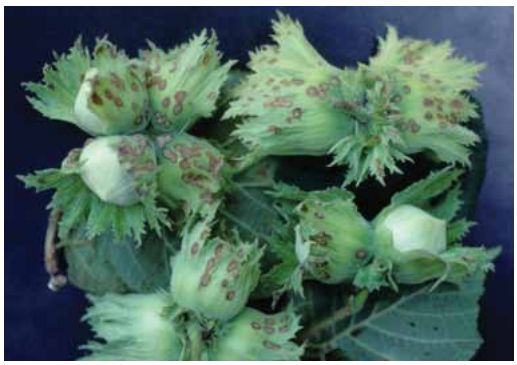


Figure 4a. **http://photos.eppo.org/albums/pests/Bacteria/Xanthomonas_corylina/XANTCY_03.jpg.** Typical spots induced by *Xanthomonas arboricola* pv. *corylina* on the husk of hazelnuts. *M. Scortichini, Istituto Sperimentale per la Frutticoltura, Ciampino Aeroporto, Roma (IT)*

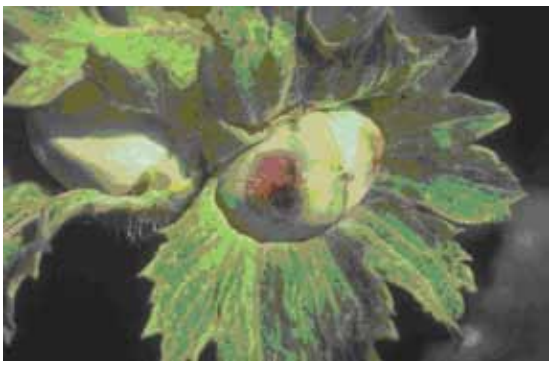


Figure 4b. Typical spots induced by *Xanthomonas arboricola* pv. *corylina* on the nut of hazelnuts.

In seasons of heavy winter rainfall, two or three applications may be required. Use of a suitable spreader/wetting agent will make these treatments last longer.

DISEASE SIGNIFICANCE

Economic Impact

Greatest losses are seen in orchards 1 - 6 years old, in which up to 10% mortality has been recorded (Figure 6). Older plants are rarely killed, but numerous buds and fruiting shoots are destroyed, losses in yield can vary from 1 to 10%.

Monitoring and Control

Inspect young orchards regularly. Symptoms are most evident in spring as small, angular, reddish-brown spots that are surrounded by a yellow-green circle (Figure 1). Leaf lesions eventually coalesce at the tip of the leaf. Infections on developing nut husks are less common but can appear as dark brown or black spots (Figure 4a & 4b). Water-soaked lesions may also appear on current-season stems followed by lateral shoot dieback and development of cankers as longitudinal bark cracks on twigs, branches, and main trunks.

In late spring and summer the contrast between healthy green leaves and yellowing leaves on infected branches is evident. Tracing down the stem will identify cankers on branches which can be more difficult to detect. Cankers are slightly sunken and reddish-purple with darkened underlying tissue and a sticky bacertia-rich liquid oozing from them when humidity is high. Leaves on dead twigs turn brown and cling to the branches (Figure 5).

Figure 5. Dieback of hazelnut leaf due to bacterial blight.
(Photo courtesy of L. Gardan, INRA, Angers, Bugwood.org)

Brown necrosis of the cambium can be observed when bark tissue is removed. By late summer, necrosis can extend down main branches to the trunk, causing complete girdling of branches (Figure 6).

Figure 6. In orchard, on a 3-year-old hazel tree, dieback of several 1- and 2-year-old shoots starting from localized necrosis on buds or new lateral shoots. *INRA, Angers (FR)*

Management

Management is an important agent of bacterial dissemination, especially by pruning young trees with contaminated cutting tools and is also responsible for the introduction of the disease into new areas with infected planting material (Bradbury, 1987; Anonymous, 1996). Bacterial Blight is now widely dispersed throughout Australian hazelnut regions. Experience from Bhutan (Dr Sean Watson, pers comm) suggests that even disease-free planting material propagated by tissue culture may eventually become infected.

Compact soil in the orchard due to the lack of soil breaking up practices may also be a factor in the disease development. The consequences of compact soils are that soil aeration, drainage and root elongation did not occur. Root asphyxia phenomenon is very frequent during the major raining seasons, causing general plant suffering. All these stress conditions predispose plants to bacterial attacks.

Magnesium is one of the essential elements for plant growth and production and its deficiency renders plants susceptible predisposing them to Bacterial Blight.

The role of soil aluminium content associated with lower pH values might play an important role in disease occurrence. Previous research studies showed the presence of acidic soil (pH,5) across some orchards which are much lower than the optimal pH values (5.5 – 7.8), for hazelnut crop.

Soils with lower pH values can increase the susceptibility of fruit tree species to bacterial diseases, especially to those caused by pseudomonads. In addition, lower pH values can have fatal results in association to higher aluminium in soil.

The negative effect of rainfall and temperature extremes is not easily manageable. The potential effects (direct and indirect) of climate change should not be overlooked. Increased atmospheric CO^2, heavy and unseasonal rains, increased humidity, drought, cyclones and hurricanes and warmer winter temperature are the major climate change factors influencing disease occurrence, severity and spread.

Changes to any one of these climatic factors can affect the distribution and biology of plant pathogens with very serious economic consequences.

Other strategies to manage this disease are to:

- Plant only nursery stock known to be free of the pathogen,
- Prune infected branches well below cankers (until the dark core is white) in the winter and/or summer to reduce sources of inoculum.
- Sanitize pruning tools in a dip of bactericide or diluted bleach ideally between working on infected branches and working on each tree.
- Remove infected material from the orchard or nursery.
- Burn or bury infected material, and
- After harvest and leaf-fall, mulch the orchard floor and apply urea to promote breakdown and decay of infected material and innoculum.

The spread of the disease can be controlled by:

- Removing and destroying affected shoots
- Avoiding mulching with infected foliage under trees (remove and burn)
- Avoid returning separated foliage and twigs to under the tree canopy, especially if the disease is prevalent. This may be difficult with current harvesting equipment but as part of orchard sanitation any potentially effected material should be collected and burnt.
- Avoiding harvesting equipment (e.g. vacuum harvesters) that blow infected leaves and husks up into the canopy, especially if the disease is prevalent.
- Disinfecting pruning tools,
- Spraying with copper-based products, and
- Use cultivars with some resistance when planting new orchards. Information on the level of resistance of Australian varieties appears to be lacking within the scientific papers and should be viewed as a research opportunity. Halls Giant (known as Merveille de Bollwiller) is one variety that can grow in Australia that has a level of resistance to Bacterial blight.
- Spraying after rain and hail events.

Production of healthy planting material is the major preventive measure. Young tender suckers are prone to infection, particularly where grown around the base of a mother tree in the orchard. Infection rates can be reduced by thinning suckers - removing short or spindly suckers. This not only results in better growth of the remaining suckers, but improves airflow and speeds drying after dew, rain or irrigation.

The most important factor for reducing mortality from Bacterial Blight in newly established hazelnut plantings is an adequate irrigation in the first 2-3 years after planting (Moore *et al.*, 1974).

Benefit of splitting nitrogen applications/dressings - reduced soft sappy growth prone to infection.

Maintain an open centre to tree - speeds drying out and avoids damp micro-climates that favour Blight activity and infection.

CHEMICAL TREATMENT

Some fungicides containing copper have bactericide action and are registered against bacterial blight in hazelnut.

Pest Name	Actives	Product	WHP	Chemical Group
Bacterial Blight	Copper Oxychloride	Copper Oxychloride	14	Group M1 Fungicide
Hazelnut Blight	Copper Hydroxide	PER13162 - Copper Hydroxide	1	Group M1 Fungicide

Cupric Hydroxide

Dupont Kocide Blue Xtra Fungicide plus other registered products containing 350g/kg **copper** present as **cupric hydroxide** as their only active constituent.

Restraints:

DO NOT apply when temperatures exceed 35°C, or when frost prone conditions prevail

DO NOT apply if rain is imminent

DO NOT apply when slow drying conditions prevail

DO NOT apply to wet crops

Rate:

150g product per 100L water

Critical Use:

- Read the product label carefully and adhere to all restraints and instructions on application
- Apply after harvest at 10, 30 and 75 - 100% leaf fall. Repeat application in mid-winter and again in spring before bud swell. Apply after pruning in winter to provide protection to new exposed cuts. If heavy rains occur soon after spraying, re-application will be required to maintain protective treatment.
- Apply a maximum of 6 spray treatments each year, with a minimum re-treatment interval of 7 days between consecutive applications
- Apply to the point of run-off, ensuring thorough coverage of all foliage
- Use a recommended spray volume of between 1,500 - 1,800L per hectare for mature plantations. Select suitable spray volume to match tree maturity and expansiveness of canopy.

Withholding Period:

DO NOT harvest for **1 DAY** after final application.

Avoid Host Damage:

The sensitivity of foliage of all hazelnut cultivars to be treated under this permit has not been fully evaluated. It is advisable, therefore to only treat a small number of hazelnut trees to ascertain their reaction before treating part or the whole of a plantation. It is important to adhere to the restraints and conditions of use listed on the permit and on the product label to minimise any potential risk of host damage

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TIPS TO HELP MANAGE BACTERIAL BLIGHT IN TREES UNDER STRESSFUL ENVIRONMENTAL PRESSURE

Prepared by Dr. Pablo Grau, Chile - 2013

This information on Bacterial Blight has been reprinted with the permission of Dr Pablo Grau. Some of the information relates to the production of nursery trees and Hazelnuts as they are grown in Chile and may not reflect how nursery trees and Hazelnuts are grown in Australia.

The information in this document is a guide and growers need to consider their own circumstances and growing situation at all times and implement those practices which suit their conditions.

- Choose wind protected plots for orchard establishment and wind breaks must be established before the orchard.
- When looking for land to establish a hazelnut orchard, be careful not to choose locations are too cold and/or where freezing conditions are frequent, by leaf fall or leaf out.

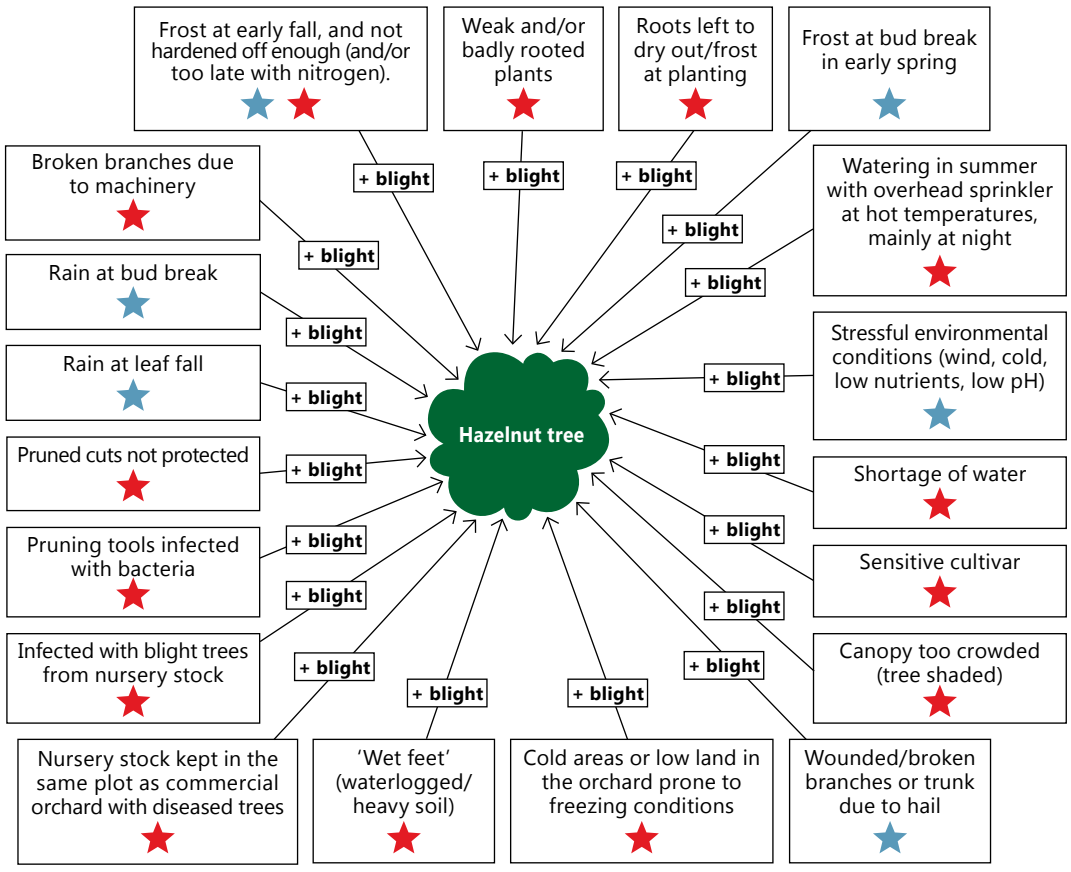
  Under those conditions the new limbs and twigs, in the very young orchard, will get more wounds and have a greater chance for bacteria to enter the plant. Also be careful with low spots in the orchard, where the cold temperatures accumulate and there is more opportunity for freezing conditions. In such places the spray applications should be at different times and frequency compared with the higher orchard positions.
- Look at the temperature records and check the November - December maximum. Average temperature should not be less than 22ºC.
- Do a soil analysis before planting the orchard and add the nutrients that are lacking in the soil. Add lime or dolomite if the pH is below 6.2.
- Avoid planting in heavy soils or if using such soils mound the soil to at least 50 cm in height. (Be careful to install drip irrigation over the mound in order to water the tree adequately from the beginning).
- Hazelnut trees **MUST** come from a nursery that produces just hazelnut nursery trees in the nursery, and **NEVER** together with a commercial orchard. This increases the likelihood that the older hazelnut trees have Blight, and the disease is spread by tools, wind, etc. to the nursery stock. (This is the most common situation all over the world!)

  The analogy is that very young plants are exactly the same as in the human cycle - a new plant is like a baby - which needs all care to be healthy from the beginning (Blight is worst in the very first years). So, would you believe a hospital where babies are born and kept in the same room that very old people are being treated for disease? Do you think the nurses would take care of cleaning (disinfecting) every tool they utilize when doing any work on one or other person (tree)? Of course never. The farmer can understand this situation quite well.
- Buy only **HEALTHY** two-year-old hazelnut trees and with the best root system.
- At planting avoid the roots drying out from the sun, dry winds or due to delays in planting.
- At the nursery, two-year-old plants have to be sprayed with copper sulphate at leaf fall (three times) and budbreak (two times), and also when pruned back at spring at the beginning of the second year for protection.
- If two-year-old trees (or older) were not pruned back when whips and need to be trained for the first time do it by **SUMMER TIME** (or when rain is minimum) and **PROTECT** the cuts by painting with a bactericide and/or fungicide. Also apply copper sulphate.
- The best time for orchard planting is at the end of autumn or early winter. Early spring or later does not allow the roots to develop and establish and further growing of the aerial part is at the expense of root development.
- Increase the density in new orchards according to vigour of the cultivar established and environmental conditions in each location. **DO NOT OVER CROWD**.
- Avoid applying any nitrogen source after December (southern hemisphere) because it delays hardening of new growth.
- Protect any cuts with paint with a bactericide and/or fungicide.
- Any branches broken or damaged by equipment, hail or snow must be cut back with pruning tools and protected by painting with a bactericide and/or fungicide.
- When cutting suckers, disinfect pruning tools regularly with chlorine to avoid the spread of Blight from the affected plants to healthy ones.
- Thin over crowded trees to let in the sun. The cheapest and most efficient bactericide or fungicide is the sun and dry air that passes through the canopy to help it dry out.
- Discard branches and twigs with Blight and burn them.
- Disinfect pruning tools with chlorine solution after each use.
- Do leaf analysis regularly and apply nutrients accordingly. **BE CAREFUL WITH ANY NUTRITIONAL DISORDER** (the incorrect ratio between some nutrients is a nutritional disorder). If a nutritional disorder is present the hazelnut tree is more prone to get Blight.
- **REGULARLY** apply copper sulphate at 10-15% leaf fall, then at 50% and 100% leaf fall. At 10-15% bud break apply the same product again and repeat 15 days later. Then apply copper oxide after rain events.

- Using hazelnut cultivars tolerant or highly resistant to Blight is a **MUST** in any breeding program for the hazelnut industry.
- Water the trees as needed and avoid any water stress in the trees.
- Keep the rows free of weeds within the hazelnut orchards as they take away water and nutrients. Keep weeds away from the collar of the tree to minimize a wet environment.
- **AVOID ANY STRESS IN NOVEMBER - DECEMBER**
- Try other cultivars which appear less sensitive to Blight than TBC cultivar but always follow the suggestions above.

PREDISPOSING FACTORS FOR BACTERIAL ATTACK IN HAZELNUT TREES

The 21 we do have to care about... just for now



Prepared by Dr. Pablo Grau, Chile - 2013

COPPER SPRAY PROGRAM

First spray by 30% of leaf fall
Second spray at 50 to 60% leaf fall
Third spray at 100% leaf fall

Copper oxychloride applied at 350 grams of commercial product in 100 litres of water and utilizing 1000 litres of water per 1 hectare of hazelnut orchard.

Some farmers apply one or two times during the winter in order to protect against any new bacteria getting into new wounds in the tree.

Another very crucial time for the bacteria attack is at bud burst (leaf out) in spring, with one application at 10 - 15% bud break and the repeat 15 days later.

Apply copper after rain events.

Program utilised by Dr Pablo Grau, Instituto de Investigaciones Agropecuarias, Centro Regional de Investigacion, Quilamapu, Chile

Filbertworm

What is it?

Filbertworm (*Cydia latiferreana*) is an insect pest of hazelnut, chestnut, walnut and almond that is not present in Australia. It is the larvae of the moth that causes damage to nut crops by feeding on kernels, causing premature nut drop and reducing yield. This pest is also a problem in storage as it is able to survive and continue to cause damage after harvest. The difficulty and cost involved in separating out infested nuts is a problem in the United States where this pest occurs.

What to look for

The moths lay eggs on or very close to nut clusters and once hatched the larvae feed on the kernel, replacing it with frass and webbing. At maturity the larvae chew out of the nut, drop to the ground and pupate in the soil.

If you see adult moths like these or notice nuts damaged in this way report it immediately to increase the chances of a successful eradication program.

Where is it found?

Filbertworm is widespread across the United States and also occurs in Canada, Mexico and Turkey.

Louis Tedders, USDA Agricultural Research Service

Larvae in pecan shuck

Larry R. Barber, USDA Forest Service

Adult moth

How can I protect my orchard from Filbertworm?

Check your orchard frequently for the presence of new pests and unusual symptoms. Make sure you are familiar with common nut pests so you can tell if you see something different.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

EXOTIC PLANT PEST HOTLINE
1800 084 881

Lerry A. Payne, USDA Agricultural Service

Adult moth on pecan shuck

Eastern filbert blight

What is it?

Eastern filbert or hazelnut blight (caused by *Anisogramma anomala*) is a fungal disease that causes potentially fatal cankers on the truck and branches of hazelnut trees. It is not present in Australia and is restricted to the United States where entire orchards have been lost to this disease.

What to look for

Once cankers form, they can expand at a rate of 30cm/year. This causes canopy and yield loss and can cause death of mature trees in 5-15 years with younger trees being killed within 4-7 years. As the canopy dies back, new shoots and suckers may emerge from the tree base and these inturn become infected and die.

Infected trees may not show symptoms for up to two years. New infections are usually as a result of infected nursery stock.

The fungus cannot spread over large distances as cool wet weather and rain splash is needed for dispersal.

Where is it found?

This disease is found in the United States on native filberts as well as cultivated hazelnuts.

Dr Jay W. Pscheidt (Pscheidt, 2006) Oregon State University

Infected twig showing white fungal spores

Dr Jay W. Pscheidt (Pscheidt, 2006) Oregon State University

Fungal fruit bodies under bark – early symptoms

How can I protect my orchard from Eastern filbert blight?

Check your orchard frequently for the presence of new pests and unusual symptoms. Make sure you are familiar with common nut pests so you can tell if you see something different.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881

EXOTIC PLANT PEST HOTLINE
1800 084 881

Dr Jay W. Pscheidt (Pscheidt, 2006) Oregon State University

Dieback of hazelnut tree branches infected with Hazelnut blight

HAZELNUT INDUSTRY BIOSECURITY PROGRAM

Hazelnut industry biosecurity statement

Hazelnut Growers of Australia Inc is strongly committed to ensuring the Hazelnut Industry effectively reduces the impact of incursions of emergency plant pests and diseases that could adversely impact on the viability of the industry domestically and internationally. The Hazelnut Industry has worked hard over the last decade to develop a strong industry based on improved varieties and through development of new technologies. The Hazelnut Industry is also strongly committed to ensuring responses to any pest incursions that may occur are undertaken as effectively as possible to minimise costs to growers, the industry, other plant industries, government parties and the wider community.

In 2012 the industry produced approximately 110 tonnes of fresh nuts with a farm gate value of around $440,000. During the decade ending 2010 the rate of planting new orchards increased by an average of 30% per year. It is estimated that two thirds of trees planted have yet to come into crop, and one third of those planted have yet to reach mature cropping levels. Hazelnuts are located in regions with adequate hours of chill in all States of Australia. The industry is considered an emerging regional and rural employer.

Hazelnut Growers of Australia Inc. is aware that hazelnut trees are a commonly used host by the Australian truffle industry.

INDUSTRY BIOSECURITY PLAN - HAZELNUT INDUSTRY

The hazelnut industry through Hazelnut Growers of Australia Inc. is working with Plant Health Australia, and the Australian and state and territory Government agencies to develop a comprehensive national approach to managing biosecurity risks in the hazelnut industry.

The hazelnut industry has negotiated with Plant Health Australia to develop an industry biosecurity plan (IBP) for the hazelnut industry and a farm biosecurity manual for the hazelnut industry. The industry has also committed research and development funds through HAL to assist PHA develop the IBP. Work on the plan recommenced in January 2013 and is expected to be completed by June 2013.

HAZELNUT IBP will comprise an introduction and three other key sections:

Threat identification

Includes development of a priority pest list, developed through the identification, analysis and prioritisation of exotic pests.

Risk mitigation

Outlines a range of pre-emptive strategies at the national, state, regional and property levels to ensure the exclusion/management of serious plant pests.

Response management procedures

Details key industry contacts and communication procedures, relevant counselling and financial counselling providers.

The Hazelnut IBP will contain fact sheets and links to PLANTPLAN and some contingency plans. Contingency plans will be used in conjunction with the general management structures of PLANTPLAN. Each contingency plan includes pest or industry specific details relating to the management/control/eradication of individual pest threats.

The hazelnut IBP will also include details of other relevant information that may increase preparedness - e.g. quarantine maps, legislative analysis, details of plantings, databases etc.

Hazelnut Growers of Australia Inc. will work with Plant Health Australia and provide appropriate assistance for future reviews of the plan.

PEST CATEGORISATION

Hazelnut Growers of Australia Inc. commits to ensuring appropriate industry technical experts will be available to participate in future meetings of the Categorisation Group to consider either pest categorisation or funding weight calculations for Emergency Plant Pests with multi-industry impacts.

NATIONAL DECISION MAKING PROCESSES/PLANTPLAN

Hazelnut Growers of Australia Inc. has endorsed PLANTPLAN (Australian Emergency Plant Pest Response Plan) and will use this document to work effectively with government parties to manage any agreed responses to an EPP.

Hazelnut Growers of Australia Inc. will ensure senior and qualified industry delegates are available to participate in meetings of the Consultative Committee on Emergency Plant Pests (CCEPP) or the National Management Group (NMG) and to take up roles in Local Pest Control Centres or the State Pest Control Headquarters. Hazelnut Growers of Australia Inc. will also ensure all delegates participate in relevant competency and non-competency based training to be delivered through Plant Health Australia's Emergency Plant Pest Preparedness Training Program.

BIOSECURITY AWARENESS

Hazelnut Growers of Australia Inc. has been involved in promoting biosecurity within the hazelnut industry via participation in Plant Health Australia's National Plant Health Awareness Campaign. Regular sessions are held at industry conferences to inform growers and to improve communication. The industry technical magazine will continue to contain relevant in depth information regarding plant health matters. The industry newsletter is also used to promote awareness of plant health issues.

OTHER ACTIVITIES

Hazelnut Growers of Australia Inc. funds, through the voluntary levy, projects aimed at improving the industry's ability to deal with plant heath issues such as pest and disease technical bulletins, integrated pest management and grower events.

Hazelnut Growers of Australia Inc. has commenced liaison with the truffle industry in an effort to mitigate threat from hazelnut truffle trees with the aim of developing common biosecurity protocols.

Vanessa Cox,
President
Hazelnut Growers of Australia Inc

April 2013

Farm Biosecurity Action Planner

The essentials

farmbiosecurity

secure your farm: secure your future

ISBN 978-0-9872309-5-9

Plant Health AUSTRALIA

AnimalHealth AUSTRALIA

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Contents

"Take biosecurity seriously. Pathogens have no respect for spin."

Peter and Frances Bender
Salmon and trout farmers, Dover, Tasmania

Farm biosecurity

Simple everyday practices can help protect your property from biosecurity risks. The Farm Biosecurity website has resources for all Australian producers, including:

- crop and livestock specific information
- templates for records and signs
- biosecurity manuals
- checklists
- personal biosecurity toolkits
- information on exotic plant pests
- videos
- links to useful sites
- biosecurity action planner.

Find out more at:
farmbiosecurity.com.au

Secure your farm

...against diseases, pests and weeds

Preparing an on-farm biosecurity plan

The best defence against pests and diseases is to implement sound biosecurity practices on your farm. Quick and simple measures built into everyday practice will help protect your farm and your future.

This farm biosecurity planner will help assess the biosecurity risks on your farm and illustrate steps to address them. Refer to the planner periodically to check on progress and prioritise actions.

A biosecurity action plan will help you identify and prioritise the implementation of biosecurity practices relevant to your property. When devising a plan for your farm, the biosecurity essentials are a good place to start. The essentials are:

- Farm inputs
- Farm outputs
- People, vehicles and equipment
- Production practices
- Ferals, pests & weeds
- Train, plan & record

Completing a self-assessment checklist will also help you to identify biosecurity strengths and weaknesses on your property. It might be helpful to have a map of your property to consider the best places to locate biosecurity zones or 'check points'. This could include signs at entrances to the property, parking areas near the house or site office, where deliveries are picked-up or dropped-off in relation to storage facilities, vehicle wash down areas, existing roads or tracks for movement within the property.

Think about what you can do to minimise the risk of introducing diseases, pest and weed seeds at each of the checkpoints. If you build your plan around daily, monthly or yearly farm routines, then biosecurity should become a habit.

The actual management practices you choose to use will vary from site to site, depending on the size of your property(s), the physical facilities available and the day-to-day management of operations.

If you are already following an accreditation scheme or industry best management practice guidelines they often include a biosecurity component. For example the cotton industry's myBMP.

With each action, set-out the steps needed to achieve the task – this is especially helpful if a group is working on the plan. A responsible person will need to be appointed to oversee the implementation of the actions.

Good practices need not be expensive, but they do need to be easy to follow. They may also take a little of your time, but they are beneficial in the long run.

After you have ranked your priorities, think about which ones you can achieve in the short and long term. Go back to the plan periodically and check progress towards your goals.

As a guide, short-term activities can:

- be planned and implemented within 12 months
- help your business comply with regulatory requirements
- be financially feasible in the short-term
- fit in with the time commitments of your enterprise.

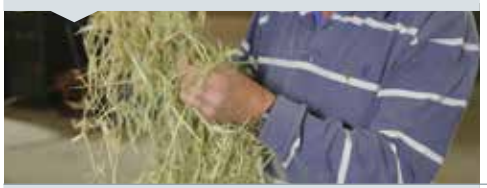
Long-term activities:

- are planned and implemented over more than one year
- need additional financial or personnel resources that are not currently available
- enhance the overall quality of service, aesthetics or administrative procedures.

FARM INPUTS

Almost anything moved onto your property can be a potential source of pests and diseases for livestock and plants. Monitor animals or plant materials that enter the property, as well as sources of water, feed, bedding and fertiliser.

FARM INPUTS	Potential risk	Actions to reduce the risk	Action(s) to take	✓/×
New plants or animals 	Introducing new plants and animals on to your property can allow unwanted diseases, pests and weeds to enter. Isolating new plants or animals for a quarantine period limits the risk of exposing your entire stock to new pests and diseases and spreading weeds into production areas.	When possible, isolate new plants or animals away from production areas for 21 days before mixing them with your existing stock. This provides: **a)** animals a chance to shed weed seeds they may have ingested with feed **b)** plants and animals to show signs of disease that were not obvious when purchased. Regularly check newly planted areas and stock holding areas for the presence of pests and weeds, and treat before they become established.		☐ ☐
Animal feed 	Animal feed can harbour diseases, pests and weed seeds.	Always request a commodity vendor declaration and ensure any feed you purchase is fit for purpose.		☐
Banned animal feed 	Feeding **restricted animal materials** (RAM) to ruminants is illegal in Australia as it is linked to the spread of mad cow disease. It is **illegal to feed swill to pigs** in Australia. It is a dangerous practice which has led to the spread of diseases such as foot and mouth disease in many countries.	Always read the label of any stock feed you purchase and store feed containing RAM separate from feed for ruminants. Pigs should never be fed any kind of swill, including leftover food from the kitchen table. Always read the label of any purchased stock feed to ensure compliance with these laws.		☐ ☐ ☐

FARM INPUTS	Potential risk	Actions to reduce the risk	Action(s) to take	✓/×
Water sources 	Many pest and disease-causing organisms can survive for a long time in water sources until they find a suitable host.	Ensure water sources are secure from contamination by wild animals and pests. Prevent algal blooms by aerating or treating water that is stored in dams and is high in nutrients.		
Animal bedding material 	Animal bedding material can harbour diseases, pests and weed seeds.	Ensure bedding material is fit for purpose, refreshed regularly and is stored in a clean, dry and vermin free environment.		
Hives 	Bees from wild and managed hives pollinate many fruit and vegetable crops. Bees can act as vectors for the spread of pests and diseases.	Make sure you know where any bee hives have been prior to your property. Check the health of the bees regularly, and advise your hive provider of any intended use of any potentially harmful chemicals.		
Fertiliser 	Organic fertilisers such as manure and compost can be a source of weeds if not composted thoroughly.	Ensure that animal manure and green waste is aged and thoroughly composted to destroy weed seeds and disease causing organisms present in the material. Maintain a record of the source of organic fertilisers, the application dates and where applied. Check that the supplier is following the industry Purchasing Code of Practice or equivalent quality controls.		

FARM OUTPUTS

Responsibility for biosecurity doesn't end when plant products or animals leave the farm gate. The measures in place on your property support biosecurity in your region.

FARM OUTPUTS	Potential risk	Actions to reduce the risk	Action(s) to take	✓/×
Moving plants and animals off the property 	Crops and livestock can spread diseases, pests and weeds from your property and put the status or productivity of the entire region or industry at risk.	Ensure plant products and animals are fit to travel, your records are up to date and that the transport vehicle is clean. Provide copies of supporting paperwork such as National Vendor Declarations, Animal Health Statements or Interstate Certification Assurances. Update the National Livestock Identification System database if moving cattle, sheep, goats or pigs.		
Shows and sales 	Events where animals are brought together are an opportunity for disease to spread: **a)** directly from animal to animal **b)** via contact with contaminated soil, food and water. Stock can be exposed to disease by mixing with other plants or animals or coming into contact with contaminated pens, vehicles, people or equipment.	Only take healthy plants, produce or livestock to shows, sales and markets. Do not share equipment with others and have a separate supply of feed and water for livestock. When possible, isolate returning stock as you would for any new stock entering the property.		
Product transport 	Dirty bins used for harvesting can transfer insect pests and diseases to subsequently harvested crops. Soil and plant material adhering to harvested crops can carry insect pests and disease organisms.	Ensure no soil, waste plant material or pests are left on or in bins or transport containers by removing organic matter and disinfecting the bins.		

FARM OUTPUTS	Potential risk	Actions to reduce the risk	Action(s) to take	✓/×
Product packing 	Soil and plant material adhering to harvested crops can carry insect pests and disease organisms.	Remove loose soil and plant material from harvested crops. Minimise post-harvest contamination. Only potable water should be used for washing fruit and vegetable produce as part of packaging operations. A 'spray diary' record should accompany each consignment of vegetables, fruits and nuts.		

Biosecurity toolkit

The Farm Biosecurity website has a range of material to help you to implement biosecurity on-farm, including animal health declarations and statements, crop and livestock specific biosecurity manuals, and templates for records.

Go to **farmbiosecurity.com.au/toolkit**

"Biosecurity has always been at the forefront of the production processes in the nursery."

Peter Young
Production nursery owner, Woombye, Queensland

PEOPLE

If it can move, it can carry diseases, pests and weeds. For this reason, people, vehicles and equipment pose a high biosecurity risk and should be managed accordingly.

PEOPLE	Potential risk	Actions to reduce the risk	Action(s) to take	✓/×
Property access 	Multiple, unsecured entry points to your property make it difficult to control visitor access and manage high risk visitors such as those who visit multiple properties each day.	Limit the number of access points to your property (lock unused gates). Use signs to direct visitors to designated parking or reception areas. Access to production areas (fields, paddocks or sheds) should be limited to a restricted range of personnel only.		
Signage 	Never assume that people know what to do when they arrive at your property. Without signage, visitors and staff may be unaware of the biosecurity procedures enforced on your property.	Erect signs to instruct visitors. Use clear instructions and provide relevant contact details.		
Visitor risk assessment 	Visitors can unknowingly carry diseases, pests and weeds on their clothes and personal items. The risk is greater if they've been in contact with other livestock or crops, or have recently been interstate or overseas.	Conduct a risk assessment before you allow a visitor onto your property. If required, provide cleaning equipment or a change of clothing or footwear to reduce the risk. If you cannot reduce the risk, refuse entry to high risk visitors.		

PEOPLE	Potential risk	Actions to reduce the risk	Action(s) to take	✓/×
Visitors to the property 	If you don't know where visitors have come from or what they have been doing, it will be difficult to trace back or trace forward in the event of an incursion or disease outbreak.	Direct all visitors to a designated parking area away from livestock or crops and ask them to report to management and sign a visitor register.		
Visitor contact with plants and animals 	Visitors can unknowingly carry diseases, pests and weeds on their clothes and personal items.	Limit access to and contact with crops and livestock, and eliminate any unnecessary contact altogether.		
General hygiene 	Pests, disease causing organisms and weed seeds can be present on hands, clothing, footwear and personal items of people.	Provide hand washing facilities, foot baths or alternative clothing and footwear for visitors to use while on-farm.		

"The management of people and product onto the property have high priority."

Ron Creagh
Grain and sheep producer, Nungarin, Western Australia

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VEHICLES & EQUIPMENT

Diseases, pests and weeds can enter a farm and be spread by equipment and vehicles, either directly or in plant material, soil or manure. It is important to maintain equipment hygiene and ensure all vehicles that visit your property are clean and well maintained.

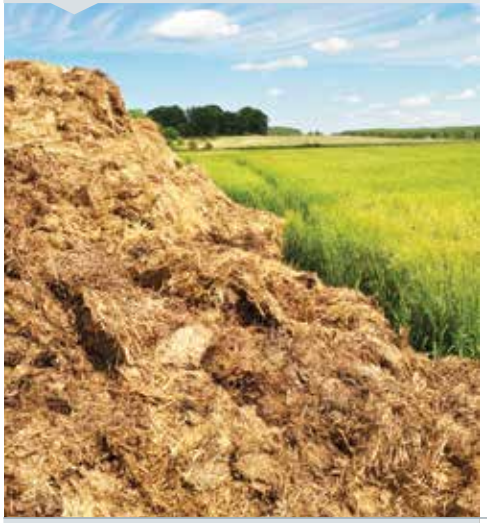
VEHICLES & EQUIPMENT	Explanation of risk	Actions to reduce the risk	Action(s) to take	✓/×
Equipment hygiene 	Tools and equipment can carry diseases, pests and weeds seeds. The risk for disease spread is higher when equipment is borrowed, lent or bought second-hand from other properties.	Clean and disinfect tools and equipment before and after use on crops or livestock. Clean and disinfect equipment between rows of plants (eg secateurs) or between different batches, mobs or herds of animals. Clean and disinfect second-hand, borrowed or lent equipment before and after use.		
Dedicated equipment 	Practically, it may be best to have dedicated tools, clothing and footwear for use on crops or livestock affected by pests or diseases. This equipment should never be used in clean areas of your property.	Have dedicated tools, clothing and footwear available for use in production areas or on animals and plants affected by pests or disease. Always work with sick plants or animals last (work from clean to dirty).		
Storage areas 	Some pests and diseases can live in the natural environment for months or years.	Clean and disinfect equipment storage areas regularly.		
Vehicle entry points 	Multiple, unsecured entry points to your property make it difficult to control access and manage high risk visitors such as utility providers who visit multiple properties every day.	Encourage visitors to enter the property via one or two routes only. Use signs to inform visitors about property access points.		

VEHICLES & EQUIPMENT	Explanation of risk	Actions to reduce the risk	Action(s) to take	✓/×
Vehicle movement and parking 	All parts of a vehicle can carry disease causing organisms, pests and weeds seeds. Without restricting parking and vehicle movements within the property, it is difficult to control and monitor the spread of diseases, pests and weeds.	Minimise the number of vehicles you allow onto the property and restrict them to designated visitor parking areas. Monitor areas next to parking facilities for signs of diseases, pests and weeds. Not all vehicles need to access production areas. It may be easier to have vehicles that are for use only on-farm. If possible, use your own farm vehicles to transport visitors around the property.		
Vehicle hygiene and washes 	All parts of a vehicle can carry disease causing organisms, pests and weeds seeds.	Provide a wash area for vehicles that need to enter production areas, or before moving crops or livestock. If possible, use a high pressure wash down (or blow down) facility located well away from crops or livestock for cleaning vehicles and equipment. For maximum protection, it is recommended that you also disinfect after washing.		
Run-off from wash areas 	Run-off from vehicle washing can contain diseases, pests and weed seeds.	Collect run-off from vehicle wash areas in a sump, or direct it away from production areas. Monitor areas next to cleaning facilities for signs of pests and diseases, and treat weeds before setting seed or becoming established.		
Roads and tracks  Image: DAFWA	There is an increased risk of introducing diseases, pests and weeds when vehicles travel off or divert from established roads and tracks.	Ask visitors to stay on established roads or tracks. Check areas next to roads and tracks for signs of diseases, pests and weeds, and treat before becoming established.		

PRODUCTION PRACTICES

Good on-farm hygiene reduces the risk of spreading pests and diseases. Implement simple hygiene practices for feed and water, product packaging, storage facilities, livestock husbandry, waste materials and plant propagation activities.

PRODUCTION PRACTICES	Explanation of risk	Action(s) to reduce the risk	Action(s) to take	✓/×
Water management 	The management of water supplies is important for the maintenance of healthy plants and animals. If water sources become contaminated they can spread pests throughout production areas.	Prevent algal blooms by aerating or treating water that is high in nutrients and is stored in dams. Where possible, use drip irrigation for recycled water to avoid aerosol formation. Make sure livestock cannot drink from waste water storage dams. Prevent young and vulnerable livestock from grazing pastures irrigated with recycled effluent during the 'withholding period' after each irrigation.		
Plant waste 	Leaf material or fallen fruit, abandoned orchards or vineyards can attract or harbour pests and diseases. It is important to break the life cycle of insect pests.	Collect all plant waste that shows signs of pests or disease and dispose of it by deep burial or burning, well away from water sources, nursery and production areas. For cuttings or healthy waste plant material, use a dedicated waste management facility or compost it thoroughly.		

PRODUCTION PRACTICES	Explanation of risk	Action(s) to reduce the risk	Action(s) to take	✓/×
Animal manure and waste 	Effluent, waste and dead animals can harbour disease causing organisms. Disease agents in effluent can contaminate pastures, stockfeed and water sources.	Dispose of animal carcasses and waste as soon as practical in a segregated area that cannot be accessed by livestock, or wild and feral animals. Select disposal areas to avoid the potential spread of contaminants by water, wind or animals. Manage effluent dispersal to minimise disease spread through the contamination of pastures, stockfeed and water. Maintain grazing intervals (21 days) between applications of these materials to paddocks and grazing of livestock. Always ensure you are adhering to government and industry requirements for carcase, effluent and waste management.		
Feed storage 	Poor feed storage encourages pests and diseases which may contaminate feed or reduce its usefulness. Old feed can harbour disease organisms and pests that may be harmful to your livestock. Wet and mouldy feed is a potential source of disease or poisoning.	Keep feed in a clean, dry storage area. Regularly inspect feed supplies for insects, pests, mould and damage and ensure they remain secured and fit for purpose.		
Feed and water troughs 	Contaminants can accumulate in animal feed and water troughs if they are not cleaned regularly. Old feed or water left in the trough can contaminate new feed or water.	Clean feed and water troughs regularly to prevent the build-up of contaminants. Implement a cleaning roster to ensure they are always clean. Provide cover for animal feed and water where possible, and keep the troughs high enough so they cannot be contaminated by animal faeces.		

PRODUCTION PRACTICES	Explanation of risk	Action(s) to reduce the risk	Action(s) to take	✓/×
Monitoring and surveillance 	Early detection of pests and diseases gives you the best chance of preventing pests or diseases from establishing on your property and ongoing additional expenses for their control. Early detection also increases the chances of eradicating a new pest or disease. Recording the absence of pests or diseases is just as important as recording what you do see.	Regularly monitor your crops and livestock. Become familiar with pests and diseases commonly found in your region so you will know if you see something different. Sentinel plants or livestock can provide early warning of emerging pest problems. Display posters showing common pests and diseases to help staff with identification.		
Monitoring frequency 	The optimum frequency of monitoring depends on the type of crop or livestock being managed, and the production intensity. Additional monitoring may be required during disease outbreaks, seasonal presence of insects, or growing periods. This can minimise the chance of diseases, pests and weeds entering and spreading on your property.	Increase the frequency of inspections of crops and livestock during periods of higher risk, such as known disease outbreaks, increased insect and wildlife activity or growing periods for weeds.		
Silo storage of grain  Image: DAFWA	Spilled grain around grain storage areas can attract insect pests and vermin. Silos need to be gas tight to ensure fumigation treatments are effective and to prevent insects becoming resistant to treatments such as phosphine. There is a high risk that the first grain to pass through harvesters at the start of the season contains storage pests.	Maintain good hygiene around your storage areas. Clean and pressure test sealable silos and repair any faulty rubber seals before filling with grain. Separate the first grain to pass through harvesters at the start of each season.		
Fencing 	Damaged fences can allow livestock to stray. It could also allow your neighbour's livestock to mix with your stock.	Ensure fences prevent livestock from straying onto/off your property. Use double fencing if possible to prevent livestock from making direct contact with neighbours' animals. Fenced-off vegetation planted as wind breaks or corridors can also act as a buffer zone between properties.		

PRODUCTION PRACTICES	Explanation of risk	Action(s) to reduce the risk	Action(s) to take	✓/×
Feed spills & disposal 	Spilt feed can be spread around the property by wind or other means (eg birds).	Dispose of spilt, old or contaminated feed safely and promptly, keeping it away from livestock and pests.		
Product storage 	Stored products, feed and equipment can attract or harbour pests and diseases. Soil and plant material adhering to harvested crops can carry insect pests and disease organisms.	Clean equipment before storage. Remove loose soil and plant material from harvested crops before storage. Products, feed and equipment should be stored securely to avoid attracting pests. Minimise post-harvest contamination.		
Agvet chemicals 	Chemical residues on plants and animal products can result in rejection from international and domestic markets, and can pose a risk to human health. The misuse of chemicals can also lead to the development of resistance by pests, potentially creating new biosecurity risks and management challenges.	Be sure to follow the instructions on the label and observe withholding periods after treatments. Where necessary, seek training in appropriate use of agvet chemicals.		
Insect resistance to chemicals  Image: GRDC	Inappropriate use of chemicals can cause insects to become resistant, making control difficult. This can cause more widespread and ongoing biosecurity problems.	If you suspect insects in your stored grain are resistant to chemicals, contact your nearest Department of Primary Industries or agronomist to have the insects tested.		
Vaccination 	Some organisms that cause disease in animals can infect humans.	Ensure all personnel working on-farm are vaccinated for identified risk diseases (eg Q Fever and tetanus). Where necessary, vaccinate livestock against zoonotic (animal to human) diseases (eg Hendra and leptospirosis).		

FERALS & WEEDS

Feral animals, plant pests and weeds are a widespread nuisance but can also cause harm to your business, so they need to be actively controlled.

FERALS & WEEDS	Explanation of risk	Action(s) to reduce the risk	Action(s) to take	✓/×
Wild and feral animals 	Wild or feral animals and vermin may carry disease causing organisms.	Develop a wild and feral animal control program to protect livestock and cropping land. Ensure farm buildings are in good repair and that feed and water sources are free from contamination. Work with neighbours and other producers in your local area to implement a coordinated approach to feral animal control.		
Boundary fences 	Wild or feral animals may carry disease causing organisms.	Ensure boundary fences are secure.		
Property cleanliness 	Spilled food, rubbish dumps and carcases can attract pests or wild animals that carry diseases onto the property.	Remove or contain anything that is likely to attract vermin, insect pests or wild animals.		

FERALS & WEEDS	Explanation of risk	Action(s) to reduce the risk	Action(s) to take	✓/×
Weeds 	Weed species are significant biosecurity problems in their own right, as well as being alternative hosts of some agricultural and horticultural pests. Some weeds can also make livestock sick. Grain export markets have zero tolerance for weed seeds, and may cause shipments to be rejected.	Establish a weed management plan for your property, including plans for eradicating, containing or managing current weeds on your property, and preventing the introduction of new species. Control weeds along dirt tracks and roads, in areas used to isolate new stock, and next to vehicle parking or cleaning areas. Look for outbreaks of weeds, especially after drought, fire and flood.		
Volunteer plants  Image: Cotton Australia	Volunteer plants that have escaped from production areas and created a 'green bridge' can harbour pests or diseases between growing seasons.	Control volunteers or green bridges including, where necessary, plants external to the paddock (eg roadways, and head ditches).		
Property and land destruction  Image: DEPI	Property and land destruction through excavation activities, fire, flood or storms provide an opportunity for pests and weeds to become established, and for feral animals to enter your property.	Control weeds in fields and paddocks after flooding, drought or fire. Inspect any areas that have been recently landscaped (eg new roads or dams) or affected by land destruction (eg fences) and treat weeds before they have a chance to set seed and become established.		

"Biosecurity measures start at the farm gate with washing vehicles, footwear and anything else that has come into contact with soil."

Shannon Paton
Banana grower, Nerada, Queensland

TRAIN, PLAN & RECORD

Ensure that staff are well trained and that you have the ability to trace where animals or plants have come from and where they went. Keep accurate records of purchases, sales and movement of all products entering or leaving the property.

TRAIN, PLAN & RECORD	Explanation	Action(s) to reduce the risk	Action(s) to take	✓/×
Biosecurity planning 	An on-farm biosecurity plan will help you prioritise the implementation of biosecurity practices relevant to your property.	Devise a plan for your property, prioritise actions, and update the implementation table as you achieve goals.		
Record keeping 	A property owner or manager should to be able to 'trace back' and 'trace forward' if there is a disease, pest or weed incursion on their property.	Keep records of purchases and sales, health certificates and declarations, and pest and disease monitoring activities.		
Vendor declarations and statements 	Animals and plants entering your property can carry pests, disease causing organisms or weed seeds. Simple visual inspection of plants or animals may not be enough to know they are healthy.	Always request history and supporting paperwork, such as National Vendor Declaration, commodity vendor declaration, Animal Health Statement, seed or nursery stock certification.		

TRAIN, PLAN & RECORD	Explanation	Action(s) to reduce the risk	Action(s) to take	✓/×
Staff training 	Anyone working on the property (including friends and family) may not know how easily diseases, pests and weeds can spread and how to prevent this from happening.	Inform staff of the biosecurity standards required on site. Provide biosecurity training or information sessions for staff. Have posters to remind staff of the importance of farm biosecurity		
Monitoring and surveillance 	Active monitoring and surveillance can provide early warning of potential or emerging problems with pests and diseases. Monitoring data can be used to support continued access to domestic and international markets. Recording the absence of pests or diseases is just as important as recording what you do see.	Keep a record of all crop or livestock monitoring, even if you don't see anything.		
Suspect diseases, pests and weeds 	You have a responsibility to report unusual diseases, pests or weeds to an agronomist, vet, state DPI, the Emergency Animal Disease Watch Hotline or the Exotic Plant Pest Hotline.	Know who to call if your suspect you have an emergency animal disease or plant pest. Keep details of state DPIs, vets, agronomists, **Emergency Animal Disease Watch Hotline** or **Exotic Plant Pest Hotline** at hand. Develop an Emergency Animal Disease Action Plan. (go to **farmbiosecurity.com.au/about/emergency-animal-diseases/**)		

"Everyone should take responsibility for their own properties to guard themselves against diseases."

Richard Halliday
Sheep producer, Bordertown, South Australia

Need help?

If you need help with your plan or have any questions about on-farm biosecurity, you can contact the Grains Biosecurity Officers or the Livestock Biosecurity Network.

Livestock Biosecurity Network

lbn.org.au

Northern Australia	Sarah-Jane Wilson	0437 725 877	sjwilson@lbn.org.au
Victoria	Patrick Kluver	0499 077 213	pkluver@lbn.org.au
Tasmania	Jess Coad	0488 400 209	jcoad@lbn.org.au
Western Australia	Megan Harrod	0488 100 426	mharrod@lbn.org.au
New South Wales	Louise Pearce	0488 400 207	lpearce@lbn.org.au
Queensland	Corrie Grimmett	0403 863 413	cgrimmett@lbn.org.au

Grains Farm Biosecurity Program

phau.com.au/gfbp

New South Wales	Rachel Taylor	0409 945 069	rachel.taylor@dpi.nsw.gov.au
Queensland	Kym McIntyre	0429 727 690	kym.mcintyre@daff.qld.gov.au
South Australia	Judy Bellati	0412 218 228	judy.bellati@sa.gov.au
Victoria	Jim Moran	0418 377 930	jim.moran@dpi.vic.gov.au
Western Australia	Jeff Russell	0447 851 801	jeff.russell@agric.wa.gov.au

Other industries have also appointed biosecurity specialists to help producers to implement biosecurity measures on-farm. Contact your peak industry body for details.

Plant Health AUSTRALIA

AnimalHealth AUSTRALIA