Horticulture Innovation Australia

Final Report

Facilitating Development of the Australian Chestnut Industry – Industry Development Officer

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Chestnuts Australia Inc

Project Number: CH13003

CH13003

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Contents

Summary

The aim of this project was to support development of the Australian chestnut industry through the services of a part-time Industry Development Officer (IDO).

This project was developed to support the implementation of the Australian Chestnut Industry Five Year Strategic Investment Plan 2011-2016 (CH10001), with a focus on achieving a consistent, sustainable and profitable supply of quality Australian chestnuts to meet consumer demand and maintain or improve grower returns by increasing demand for Australian chestnuts in line with increasing supply.

The project was designed to support the Australian Chestnut industry by providing a mechanism to transfer information and technology to all stakeholders, including growers, other industry partners and consumers, the Chestnut IAC, Chestnuts Australia Inc. (CAI), and both the R&D and Marketing Committees.

Activities in support of the chestnut industry development within this project included:-

a) Organising and facilitating of field days;

b) Regional grower visits, meetings and workshops;

c) Facilitation of technology exchange between growers and industry stakeholders;

d) Updating and disseminating, with the Communications Officer, the national planting and production statistics;

e) Prioritising and developing R&D ideas into briefs for the R&D Sub-Committee;
(This included assisting in identifying appropriate service providers to deliver the projects and alternative funding sources to the limited Chestnut Industry R&D Levy.)

f) Collaborating with and utilising the relevant outputs generated by the Minor Use Coordinator (MT10029) on the strategic agrochemical review process (SARP) and other minor use / chemical issues;

g) Collaborating with and utilising relevant outputs generated by the ANIC Coordinator (NT12001) on biosecurity and other ANIC related issues;

The following is an overview of the outputs through the life of the project from 1st August 2013 to 27th June 2016:-

INDUSTRY DEVELOPMENT

- Maintained the chestnut industry biosecurity, research and development and chemical portfolios through collection of data, preparation of reports and distribution of information to the growers.
- Undertook visits to the Adelaide, Sydney and Melbourne Markets, in 2015 and 2016, to discuss and distribute more Quality Assurance information to the wholesalers and retailers as well as collecting information to feedback to chestnut growers.
- Managed compliance with Plant Health Australia (PHA) through attendance at meetings in March/May 2014, November 2014, December 2014, March and May 2015, November 2015 and March and May 2016.
- Finalised the review of the chestnut components of the Nut Industry Biosecurity Plan.
- Prepared and finalised the review of the industry components of the On-farm Biosecurity Manual and the DRAFT format requires further discussions with Plant Health Australia so that it can be formatted for distribution to ALL chestnut growers. This will be finalized as on output of the ongoing industry program through project CH16000.
- Attended the meetings of the National Management Group (NMG) in relation to Chestnut Blight and acted as the spokesperson for the Chestnut Industry.
- Assisted Chestnuts Australia Inc in preparing a grower's brief in relation to Chestnut Blight and the proposed changes to the Emergency Plant Pest Response (EPPR) Levy.
- Collection of information on Gall Wasp that has been placed into a DRAFT technical bulletin that once reviewed by the CAI R&D Committee will be finalized and distributed to ALL chestnut growers. This will be finalized as on output of the ongoing industry program through project CH16000.
- Collection of information on Nut rot that has been placed into a DRAFT technical bulletin that once reviewed by the CAI R&D Committee will be finalized and distributed to ALL chestnut growers. This will be finalized as on output of the ongoing industry program through project CH16000.

- Varietal Evaluation activities – development of poster/define cooking processes (taste tests)/Quality Assurance
- Managed Chemical issues including:-
    - Liaison with APVMA:
    - Chemical Registration:
    - Permits – maintenance - Glyphosate/Phosphoric Acid/Chlorine:
    - Permits – new – Rovral:
    - SARP Report:
    - General Permit management:
    - Attended the AgVet Chemical Collaborative Forum
- Reviewed appropriate MRL's - Shell versus Nut to ensure that there are no breaches in the domestic and export markets.
- Finalised the development of a Chestnut Quality Parameters manual TEMPLATE that has been placed into a DRAFT format that once reviewed by the CAI R&D Committee will be used to input specific parameters and measures. This will be further developed as on output of the ongoing industry program through project CH16000.

TECHNICAL FACILITATION

- Over the life of the project distributed, under the IDO signature, forty (40) publications, articles and relevant newsletters that had information of interest to chestnut growers.
- Prepared and distributed Technical Bulletins
    - Tech note on Copper Sulphate – degradation' for distribution to chestnut growers.
    - Cool chain requirements on farm
    - Cool chain requirements through the supply chain
    - Cool chain requirements in the retail sector.
    - Biology and Management of Nut Rot of Chestnuts
    - Chestnut Quality Assurance
    - Chestnut Nut Rot matters
    - Chestnut Gall Wasp
    - Current Chemical Options for Australian Chestnut Growers
    - Chestnut Bubbly Bark Technical Bulletin
- Prepared six (6) technical reports for the industry Nuts & Burrs newsletters in 2014, 2015 and 2016.
- Attended, presented a technical report and facilitated at the one day industry symposium and a one day farm walk in February and September 2014, 2015 and 2016.

INDUSTRY COMMUNICATIONS (utilizing 'tools' including the Newsletters and CAI website)

- Worked collaboratively with the Communications Officer through weekly communications.
- Participated and had Chestnut input into the AgVet Chemical Collaborative Forum.
- Liaised with ANIC regarding Chestnut industry presentation at the Nut Conference.
- Participated in the Victorian Horticulture Industry Network and liaison with researchers.
- Prepared and submitted bi-monthly reports to the Project team.
- Undertook an end of season production survey to gauge the 2015 production and projected planting to establish new base line data and process post 2015. The lack of response made any data collected of no real value but a new survey is to be undertaken at the end of 2016 and the results will part of the outputs of the ongoing industry program through project CH16000. Some figures collected throughout 2015 are detailed in the outputs below.
- Across the life of the project undertook four (4) grower visits in regional Victoria and New South Wales to discuss production issues and develop ongoing research, development and extension programs. In addition attended a further five (5) grower Farm Walks/Symposium.

COMMITTEE WORK

- Project and general industry communications with the Project Team, Chestnuts Australia Executive Committee and R&D and Marketing sub-committees through written reports, participation at face-to-face meetings, participation in teleconferences and facilitation of industry strategic planning events.
- Attended and gave presentations at the CAI Annual General Meeting in 2014 and 2015.
- Continued to assist Chestnuts Australia Inc with the 2013/14 HAL Review process leading to the structural changes in November 2014 and the formation of Horticulture Innovation.
- Technical input into the CAI paper to the Agriculture Competitiveness Green Paper.
- Assisted CAI with Strategic Development.

Keywords

Chestnut, Industry development, communications, chemicals, biosecurity, research and development, facilitation, technology.

Introduction

The Australian chestnut industry is a small national industry. There are approximately 300 chestnut growers in Australia: 70-80 % of these are in NE Victoria, with other growers in NSW, Tasmania, SA and WA. Prior to 2006 the industry lacked a formal plan for communicating issues and technical information. Effective communication and technical support is necessary for the transfer of technical understanding and up-skilling of the industry, key elements to the growth and development of the chestnut industry.

This project was designed to support the Australian Chestnut industry by providing a mechanism to transfer technology to all stakeholders, including growers, other industry partners and consumers, the Chestnut IAC, Chestnuts Australia Inc. (CAI), and both the R&D and Marketing Committees.

Since 2006, the industry has undertaken a communications projects (HAL Projects: CH06004, CH09003 and CH12000) to provide a formal mechanism within the industry for dissemination of information. Results, reported in milestone and final reports, together with the findings from the Industry Development Needs Assessment (CH08002) indicate that these projects were extremely effective. Industry members now have an up-to-date website with links to other sites of interest, a comprehensive newsletter and a focal contact point for all industry enquiries. The Chestnut IAC also benefitted due to operational support for consultation meetings with HAL.

This project supported the implementation of the Australian Chestnut Industry Five Year Strategic Investment Plan 2011-2016 (CH10001). Developed in June 2011, this plan focused on the Chestnut Industry's position within three key priority areas:

1. Supply – production and productivity

2. Demand – Product marketing and market focus

3. Industry – industry organisation, resourcing and management

Following finalisation of the strategic investment plan, a scoping study was undertaken to assess the potential for engaging a chestnut Industry Development Officer. A position description for this position was developed, with a high level of correlation between the proposed IDO role and plan implementation. Research and development activities conducted through this project were closely aligned to the Chestnut R&D program.

The industry has had a simple communication plan in place that has been directed toward growers and broader industry stakeholders. Through the IDO position CAI has been able to implement this plan through the distribution of information describing best practice post-harvest handling, tree management and production inputs and supported this information with field days and workshops. At least two field days have been held each year, and regional workshops where practical have become a mechanism for technology transfer. Other information concerning biosecurity, chemical usage and regulatory requirements have also been distributed using this project.

CAI has over a long period worked hard to access the best people to do certain roles knowing that it has limited resources to achieve the best possible results demanded by the growers.

The linkage between this project CH13003 and the Communications Officer Project CH12000 has been an important and integral part of the development of the Australian Chestnut Industry.

Since January 2014 the collaboration between the Communications Officer, Tanya Edwards and the Industry Development Officer, Trevor Ranford has given CAI an extremely important resource to ensure maximum results from limited financial resources and made CAI a stronger and more effective organisation in communicating and delivering technical outcomes for the Australia Chestnut Industry. They have collaborated across all areas including Field days, Conferences, Newsletter content, technology transfer and the dissemination of information to growers on a wide range of topics. The two roles compliment and support each other and Trevor and Tanya have communicated regularly regarding venues, locations, speakers, presenters for upcoming Field days, Workshops and Conferences. In this way by pooling resources the Industry has been able to host many successful Industry events, presenting a diverse range of topics that have been useful to the entry level grower, up to the established large chestnut grower.

The appointment of an Industry Development Officer has enabled enhanced technical support for growers and facilitated the collection of industry information.

Methodology

A Steering Committee was established to oversee project activities undertaken by the Industry Development Officer (IDO). The Steering Committee met at least six-monthly to approve Annual Operating Plans and six-monthly KPI's specific to the role. Membership of the Steering Committee from the commencement of the project comprised:-

- CAI President (Adam Gatford)
- R&D Chair (Chris Dikkenberg) and
- IAC Chair (Brian Casey)
- HAL Representatives (David Low/Brad Wells/Alison Anderson)

Over the life of the project the steering committee membership was consistent even though the roles of the people changed.

An Industry Development Officer (IDO) was to be engaged for up to 50 hour per month, with a view to extending the role as funding may have permitted.

Trevor Ranford commenced as the part-time IDO on the 1st January 2014 and held the position until the completion of the project on the 27th June 2016. His role was to support development of the Australian chestnut industry and implementation of the Australian Chestnut Industry Five Year Strategic Investment Plan 2011-2016 (CH10001).

The IDO has been responsible for undertaking the following key functions:

Industry Development

Promotion of the adoption of best practice production and handling guidelines to assist:

- Growers in improving farm productivity, quality, sustainability and adoption of market preferred varieties
- Supply chain partners in optimising product quality and presentation
- Assist industry in addressing on-farm production pest (including disease) issues
- Assist industry to identify R&D priorities
- Assist industry by identifying potential, qualified and appropriate service providers to deliver projects
- Assess future industry chemical requirements and provide support for chemical registration and permitting processes
- Support Chestnut industry biosecurity processes, including addressing grower education and awareness, reinforcing the messages from the biosecurity project on chestnut blight (CH11000)
- Investigate and proactively seek additional income / funding streams to support implementation of the Australian Chestnut Industry Strategic Investment Plan 2011 – 2016.

Technical Facilitation

Ensuring that important results and outputs from R&D projects were communicated and made available to the Chestnut industry in a complete and timely manner by:

- Facilitating the development and delivery of technical transfer activities for growers such as field days, open days and workshops
- Prepare technical articles for inclusion in Chestnut newsletters, Australian Nutgrower and Nuts and Burrs Newsletter.

Industry Communications utilizing 'tools' including the Newsletters and CAI website

- Provide briefing material, industry development updates, fact sheets and articles.
- Communication & Liaison with growers, industry organisations, government agencies, researchers and scientists.
- Work collaboratively with the Chestnuts Communications Officer.
- Manage the collection, analysis and dissemination of industry statistics.
- Proactively build relationships with key stakeholders, research organisations and agencies, other service providers, and international networks to foster cooperation and partnerships which provide opportunities for the Australian chestnut industry.
- Provide support to CAI Executive Committee members to liaise with industry stakeholders on key

industry development issues.
- Liaise with Minor Use Coordinator (MT10029) on SARP and other minor use / chemical issues and ANIC Coordinator (NT12001) and utilize the relevant outputs.
- Identify topics and guest speakers for industry workshops.

Committee Work

Support the Chestnut Industry Advisory Committee/Chestnut R&D Committee by attending meetings as required, providing technical information and implementing agreed actions

Outputs

INDUSTRY DEVELOPMENT

The broad output was to promote the adoption of best practice production and handling guidelines to assist:

a) Growers in improving farm productivity, quality, sustainability and adoption of market preferred varieties

(1) VARIETAL EVALUATION:

Technical data has been and continues to be collected from within Australia and overseas. Past information on nut quality has been collected and adapted into an A3 Nut Quality Standards poster.

Copies of the poster are attached as Appendices 1 and 2 to this report.

(2) DEVELOPMENT OF A CHESTNUT QUALITY PARAMETERS DOCUMENT:

As part of the process of developing a Chestnut Quality Parameters manual the IDO has undertaken the following:-

(a) Held ongoing discussions with the Chair of the CAI R&D committee in relation to the concept and material for a Chestnut Quality Parameters manual and it is proposed that a small group of grower's workshop this topic in September 2016.

(b) Obtained the reports from projects CH13005 – "Assess post harvest handling and cooling" and CH14005 – 'Chestnut Supply Chain' and extracted relevant material for use in industry technical bulletins and ultimately drawn into a quality parameters manual.

(c) Continued to source information from the Michigan State University and the University of California to gather relevant technical information around quality parameters used overseas.

(d) Held meetings with retailers – Coles on the 21st August 2015 and IGA on the 24th August 2015 - to discuss quality issues and their particular quality parameters and food safety requirements. Information continues to be supplied to the retailers to keep them abreast of the cool chain R&D being undertaken.

(e) Visited the Wholesale markets and met with Agents to discuss and review quality issues as per the following itinerary:-

- Sydney Market – Wednesday 13th April 2016 and met with representatives of Fresh Produce group and visited other agents selling chestnuts
- Melbourne Market – Friday 15th April 2016 and met with representatives of Premium Fruit and visited other agents selling chestnuts.

(f) Visited growers during June 2016 to discuss specific quality issues as they relate to Nut Rot.

Utilising the relevant information a Chestnut Quality Parameters template document has been prepared and made available to the CAI Executive Committee and the CAI R&D Committee for further development and distribution to the industry.

A copy of the Chestnut Quality Parameters Manual template is attached as Appendix 3 to this report.

3) CHESTNUT GROWERS HANDBOOK

The IDO obtained a copy of the new Chestnut Growers Handbook that was released at the Chestnuts Australia Inc Field Day in February 2014.

A number of pages from the Growers Handbook have been extracted out by the IDO and used as quality assurance material to distribute to the market agents and growers.

A copy of the Quality Standards poster is attached as Appendix 1 to this report.

b) Supply chain partners in optimising product quality and presentation

The IDO attended the following markets as part of a coordinated Chestnuts Industry development visit:-

- Sydney Market – 9th April 2014
- Melbourne Market – 5th May 2014
- Adelaide Market – 7th May 2014

One of the major issues reviewed was the variance in packaging and the information on the packaging.

As part of the visits we prepared and distributed an A3 quality poster utilizing two pages from the Chestnut Grower Booklet. This was printed, laminated and was supplied to agents in each of the markets.

A copy of the Quality Standards poster is attached to this report as Appendix 2.

The IDO visited the following markets in 2016 as a coordinated Chestnut quality assessment visit:-

- Adelaide Market – Tuesday 5th April 2016
- Sydney Market – Wednesday 13th April and Tuesday 3rd May 2016
- Melbourne Market – Friday 15th April 2016

As part of improving chestnut quality, within the supply chain, the IDO:-

(a) Collected and collated information on nut storage throughout the supply chain.
(b) Using that information prepared and printed an A3 laminated poster titled "The Chestnut Cool Chain" which detailed the cool storage requirements throughout the supply chain. A copy of the poster is attached as Appendix 4 to this report.
(c) Prepared and distributed a media release on the importance of maintaining the cool chain to ensure high quality nuts are available to the consumer. A copy of the poster is attached as Appendix 23 to this report.
(d) Distributed this poster and other information to growers, processors, wholesalers and retailers.
(e) Presented the poster and media release to CAI for inclusion on the website.
(f) Accessed market reports and has commenced the compilation of the data to assist with developing an understanding of what nuts go to the wholesale markets and a good set of chestnut statistics for 2015 and beyond.

In addition contacts were made with the relevant chestnut managers within Coles, Woolworths and the IGA to discuss issues relating to the storage and displaying of chestnuts to ensure good shelf life. Relevant information including 'The Chestnut Cool Chain' poster was sent to the relevant representatives. Follow-up meetings were held in August 2015.

c) Assist industry in addressing on-farm production pest (including disease) issues

(a) Phytophthora

The IDO worked with the HAL ISM Anna-Louise Cross and the Chestnut R&D Committee to prepare a brief for a literature search on Phytophthora.

A copy of the Project Brief is attached as Appendix 4 to this report.

The brief was put out to tender and three tenders received.

The IDO was part of a project team to review the tenders and select the provider for approval by the Chestnut IAC. A teleconference of the project team was held on Monday 21st July 2014.

(b) Xylella fastidiosa - a biosecurity threat to Australia

The IDO attended and participated in the Xylella fastidiosa Workshop held on Wednesday 1st June 2016 to learn more about this high priority disease and to ensure the Chestnut Industry has an awareness of the disease and the need for good national, state and property biosecurity.

(c) Gall Wasp:

Technical data has been and continues to be collected from overseas and a technical bulletin was presented at the CAI Chestnut Conference on the 12th September 2015.

A copy of the technical material is attached as Appendix 5 to this report.

d) Assist industry to identify R&D priorities

1) R&D Committee

(a) The IDO serviced the CAI R&D sub-committee by assisting with the

- organising of the sub-committee teleconference meetings,
- reporting on the relevant chestnut R&D Projects,
- acting as the secretary and preparing agendas, minutes and relevant discussion papers, and
- development of R&D priority rankings.

Copy of the R&D priority rankings are detailed in Appendix 6 to this report.

(b) The IDO assisted in developing the R&D components of the DRAFT Chestnut Strategic Plan and also assisted in developing proposed investment strategies for 2016 onwards.

(c) The IDO assisted with the review of project CH13003 and the preparation of a variation application to HIAL for the extension of the project until May 2016.

The Chestnuts Australia Inc R&D Committee

(1) Met face-to-face on Saturday 8th February 2014 at Beechworth.
(2) Conducted a teleconference on Wednesday 23rd July 2014.
(3) Conducted a teleconference on Monday 4th August 2014.
(4) Met face-to-face on Saturday 15th November 2014 at Wangaratta.
(5) Conducted a teleconference meeting on the 16th February 2015.
(6) Conducted a teleconference on the 14th July 2015.
(7) Conducted a teleconference on the 5th January 2016

2) R, D & E topics being managed by the IDO

The IDO has collected, collated and distributed, through articles, fact sheets and face-to-face meetings, relevant information where appropriate on the following topics

- Pests and Diseases
- Rootstock trial
- Post harvest handling
- Nursery sanitation
- Orchard sanitation
- Retailer handling
- Retailer liaison
- Weather analysis
- Packaging
- Storage and handling
- Quality Parameters

e) Assist industry by identifying potential, qualified and appropriate service providers to deliver projects

The IDO worked with the HAL ISM Anna-Louise Cross and the Chestnut R&D Committee to prepare a brief for a literature search on Phytophthora.

f) Assess future industry chemical requirements and provide support for chemical registration and permitting processes.

The IDO undertook a range of activities including:-

1) Liaise with APVMA:
Regular e-mails and phone conversations have been held with representatives of APVMA. Letters have been sent to APVMA indicating issues with the current permit for Scholar and liaison with APVMA continues to ensure the maintenance of the permit.

2) Chemical Registration:
Ongoing review of current chemicals and consideration of what new chemicals might be required by industry.

3) Permits – maintenance - Glyphosate/Phosphoric Acid/Chlorine:
Action is being undertaken to ensure the renewal of current permits are achieved at the appropriate time.

4) Permits – new – Rovral:
Collation of appropriate information is being undertaken and is ongoing.

5) SARP Report:
The SARP report has been prepared and was reviewed by Chestnuts Australia Inc and the Chestnut IAC and continues to be utilized by the industry.

6) Permit management:
Liaison with HIAL is maintained to ensure that the permit information is current and being regularly reviewed.

g) At the request of CAI the industry has relinquished the permit PER11731 – Spray seed / chestnuts & pistachio / weeds.

h) Collected and collated industry information on chemical requirements and presented them to both HIAL and the AgVet Chemical Collaborative Forum for inclusion in the 2015 chemical priority list.

i) Attended the AgVet Chemical Collaborative Forum in Canberra on the 9th and 10th of June 2015 on behalf of Chestnuts and assisted in the inclusion and finalization of the relevant chestnut chemical requirements for 2015.

j) Prepared and submitted to HIAL a permit application for Rovral. Subsequently HIAL has submitted the application to the APVMA.

k) Prepared and submitted to HIAL the following information to assist in the preparation of a project tender for residue and efficacy work on Rovral and Scholar:

"In relation to treatments the trial should look at a number of treatments. The two major techniques are dipping and flood-spray over the conveyor.
Industry would suggest:-

- *IN/OUT*
- *30 seconds*
- *60 seconds*
- *2 minutes*
- *5 minutes*
- *Flood-spray over conveyor"*

l) Continued to collect relevant data and information from appropriate sources to ensure there are no MRL breaches.
Chestnut samples were tested for chemicals and the relevant information supplied to the APVMA, in relation to industry concerns with the use of Scholar, in June 2014.

g) Support Chestnut industry biosecurity processes, including addressing grower education and awareness, reinforcing the messages from the biosecurity project on chestnut blight (CH11000)

Across the life of the project the IDO has:-

1) Presented technical information on Chestnut Blight and other biosecurity issues to the Biosecurity Roundtable held on the 5th March 2015 in Canberra.

2) Presented technical input into the review of the National Biosecurity R, D & E program at a meeting in Melbourne on the 20th May 2015.
Specific areas of concerns tabled where:-
   - Chestnut Blight eradication
   - Chestnut Gal Wasp (as an exotic pest)
   - National listing of ALL Australian Chestnut growers
   - National surveillance program including inputs from growers assessing their orchards directly or through consultants
   - Lack of chemicals available to small/emerging industries
   - Lack of control of external contractors entering and working of grower properties,
   - Vertebrates – damage to trees and nuts as well as moving of other pests around the orchard.

3) Gained access to the Plant Health Australia/Animal Health Australia Farm Biosecurity videos. Links to the videos have been placed on the CAI website.

4) Participated in national biosecurity programs including:
   - Attended a Department of Agriculture Biosecurity roundtable meeting on Thursday 3rd April 2014 in Melbourne.
   - Meeting with the Department of Agriculture on the 24th November 2015 to discuss a range of issues including those relevant to the chestnut industry
   - Attendance at the PHA/AHA joint industry forum held in Canberra on the 24th November 2015.
   - Attendance and acted as the CAI proxy to the range of PHA meetings held in Canberra on the 25th November 2015.

   At appropriate times in these meetings relevant issues were raised relating to the industry's dealings with the eradication of Chestnut Blight including:-
   - Informing them of the Minister's decision to approve the request to implement the EPPR Deed Levy for Chestnuts,
   - Making PHA Management aware of some of the technical issues relating to the eradication of Chestnut Blight.

   A number of times PHA Management highlighted the positive approach CAI had taken in dealing with and managing the Chestnut Blight outbreak.

5) Participated in a teleconference, organised by the Victorian Department of Agriculture, in relation to pest and disease surveillance programs and industry requirements that need to be implement by the Victorian Department. This teleconference was held on 29th October 2015.

6) Responded to the national NMG and CCEPP on specific pests and disease matters on behalf of CAI.

7) Assisted with technical responses to the Chestnut Blight CCEPP.

8) Assisted the Victorian DEPI with technical information in relation to information for inclusion in the Chestnut Blight eradication program material to growers. The IDO also participated in a Blight teleconference on the 11th December 2015.

9) Obtained copies of the PHA 'Farm Biosecurity Planner' and posted a copy to each member of CAI.

10) Assisted CAI with technical information for the application to the Victorian Department in relation to growers applying for involvement with the Victorian Property Identification Code (PIC) legislation.

11) Gathered technical information for inclusion in the review of the Nut Industry Biosecurity Plan to be undertaken on the 25th August 2015.

12) Assisted the Victorian DEPI with technical information in relation to nurseries for inclusion in the Chestnut Blight eradication program.

13) Managed compliance with Plant Health Australia (PHA) through attendance at meetings in March/May 2014, November 2014, December 2014, March and May 2015, November 2015 and March and May 2016. The IDO has represented the Chestnut Industry at a number of PHA Forums and meetings throughout the period including.
    - Member Engagement Forums and Regional Meetings,
    - Meeting with Minister Joyce to discuss broad plant industry matters,
    - Joint meeting of Plant Health Australia Industry members and Animal Health Australia Industry members,
    - PHA Member Industry Forum,
    - EPPRD meeting,
    - PHA General and Annual General Meetings,
    - Torres Island Fruit Fly Meeting,
    - Meeting with Greg Fraser to discuss aspects of the EPPR Levy and how it might be better implemented to undertake biosecurity work,
    - Meeting with Rod Turner and Michael Milne to discuss the On-farm biosecurity Manual costs and production, and
    - Joint meetings of Plant Health Australia Industry members and Animal Health Australia Industry members.

14) At appropriate times in these meetings relevant issues were raised relating to the industry's dealings with the eradication of Chestnut Blight including:-
    - Informing them of the Minister's decision to approve the request to implement the EPPR Deed Levy for Chestnuts,
    - Making PHA Management aware of some of the technical issues relating to the eradication of Chestnut Blight.

    A number of times PHA Management highlighted the positive approach CAI had taken in dealing with and managing the Chestnut Blight outbreak.

In Addition the IDO has been undertaking work in the following areas:-

- Owner Reimbursement Costs (ORC)
    - Data has been collected and the template for ORC is being prepared for consideration by PHA.

- Nut Industry Biosecurity Plan and Pest and Disease List - refinement and update
    - The list of Chestnut Pests and Diseases within the Nut Industry Biosecurity Plan has been reviewed and was refined as a part of the full review of the Nut Industry Biosecurity Plan.
    - Gathered technical information on relevant pests and diseases for inclusion in the review of the Nut Industry Biosecurity Plan.
    - Sourced input from members of the CAI Executive Committee and the Chestnut R&D Committee on the major exotic pests and diseases.
    - Attended the PHA/ANIC planning session that was undertaken on the 25th August 2015 in Sydney and represented the Chestnut industry during the session.
    - Through the IDO, Chestnuts Australia Inc gave final sign-off to the revised Nut Industry Biosecurity Plan on 9th November 2015.
    - The Nut Industry Biosecurity Plan was launched by Plant Health Australia in May 2016.

- Grower Training
    - A biosecurity session was held as part of the November 2014 Chestnut Field Day.

- On-Farm Biosecurity Manual
  - A draft Chestnut On-farm Biosecurity Manual has been prepared and will be released to the industry once agreement is reached with Plant Health Australia.

A copy of the DRAFT Chestnut On-farm Biosecurity Manual is attached as Appendix 7 to this report.

- Emergency Plan Pest Response Deed (EPPRD) Committee
  The IDO has represented Chestnuts Australia Inc on the Chestnut Blight Consultative Committee on Emergency Plant Pests (CCEPP) and the National Management Group (NMG) and has participated in a number of CCEPP teleconferences.

- Finalisation of proposed changes to the EPPR LEVY.
  The IDO assisted in preparing an industry technical brief for Chestnuts Australia Inc, who subsequently submitted it to the Minister of Agriculture, Barnaby Joyce on the 8th April 2015 seeking the activation of the EPPR Levy to assist in the eradication of Chestnut Blight. Additional technical information on the value of the chestnut crop, chestnut prices and chestnut sizes was supplied to representatives of the Department of Agriculture to assist in the finalisation of the review of the documentation by the Department and the Minister. The EPPR Levy was enacted by the Federal Government in 2015 for commencement on the 1st January 2016. This Levy will assist in the finalization of the eradication program due to be completed by July 2016.

h) Investigate and proactively seek additional income / funding streams to support implementation of the Australian Chestnut Industry Strategic Investment Plan 2011 – 2016.

The IDO

1) Assisted the CAI in the development of a DRAFT Strategic Position Paper that was further discussed at the 2015 CAI Conference in February 2015 with the aim of finalising the development of the Chestnut Industry Strategic Plan.

2) Assisted with the 2016 Annual Investment Planning Workshop held on Saturday 6th February, 2016 at the Uniting Church Hall, Ireland Street, BRIGHT, VICTORIA

3) Prepared and submitted an application to the Australia China Agricultural Cooperative Agreement (ACACA) for a visit to China to assist in the development of export market opportunities.
   (The application was unsuccessful).

TECHNICAL FACILITATION

Ensuring that important results and outputs from R&D projects were communicated and made available to the Chestnut industry in a complete and timely manner by:

a) Facilitating the development and delivery of technical transfer activities for growers such as field days, open days and workshops

The IDO has participated in the following field days, open days and workshops throughout the period including.

1) FEBRUARY 2014
The IDO attended the Chestnuts Australia Inc Field Day on Saturday 8th February 2014 at Beechworth, Victoria.

A short presentation on the IDO and aim of the project was presented to the attendees.

A copy of the presentation is attached as Appendix 8 to this report.

In addition the IDO worked with Dale Griffin from Crop Protection Research to facilitate a session on the review of the Chestnut Industry SARP.

2) NOVEMBER 2014

The IDO attended the 2014 Annual General Meeting/ Special General Meeting of Levy Payers/ Conference & Field Day titled *"Biosecurity - Protecting Our Future"* held on Saturday & Sunday 15th/16th November 2014 at Wangaratta/Stanley NE Victoria
The IDO attended and participated in the following activities:-

(a) Annual General Meeting,
(b) Industry Forum,
(c) Special Levy Meeting
(d) Farm Walk

As part of the activities
(a) Presented a session on On-Farm Biosecurity and Orchard Sanitation,

A copy of the presentation is attached as Appendix 9 to this report.

(b) Facilitated a strategic planning session,
(c) Facilitated the master class on grafting and the other aspects of the Farm Walk

In addition support was given to the Communications Officer in setting up and dismantling of both the forum and the farm walk.

3) FEBRUARY 2015

The IDO assisted with the technical components of the CAI Conference held on Saturday 21st February 2015 at Beechworth, Victoria.
As part of the program the IDO:-

- Attended as a delegate
- Facilitated the Strategic planning session
- Presented a paper on the results of the Review of Phytophthora Root Rot of Chestnuts Project.

A copy of the presentation is attached as Appendix 10 to this report.

4) SEPTEMBER 2015

The IDO attendance the one day industry symposium and the one day farm walk in September 2015.

In conjunction with the Communications Officer, the IDO undertook the following:-

a) assisted with the sourcing of technical topics and presenters for the symposium and farm walk,
b) assisted with the planning of both the symposium and the farm walk,
c) assisted with the set-up and dismantling of both the symposium and farm walk,
d) attended both the symposium and farm walk,
e) facilitated components of both the symposium and farm walk with particular emphasis on the Panel session covering nut rot, quality assurance and the 2015 harvest and associated problems,
f) presented a technical paper for and on behalf of Peats Soil and Garden Supplies titled 'Bring your soil to Life'.
g) maintained and manned a display of technical reports/documents for the delegates to collect and/or read at the symposium,
h) met with individual growers to discuss technical topics of concern,
i) input into relevant discussions, including asking specific questions to generate grower participation in topics of interest at both the symposium and the farm walk.

5) FEBRUARY 2016

The IDO attended the 2016 Pre Field Day Dinner & Season Launch Field Day held on Saturday & Sunday 6th & 7th February, 2016 held at Bright/Porepunkah/ Wandiligong, Victoria.

In conjunction with the Communications Officer, the IDO undertook the following:-

a) Assisted with the sourcing of appropriate venues,
b) Attended as a delegate
c) Facilitated the Field Day activities and introduced the speakers and special guests, generated discussion and directed questions.

b) Prepare technical articles for inclusion in Chestnut newsletters, Australian Nutgrower and Nuts and Burrs Newsletter or as e-mail blasts.

The IDO has prepared and distributed the following technical articles throughout the period including.

1) Obtained access to a 'Tech note on Copper Sulphate – degradation' for distribution to chestnut growers.

A copy of the Tech note on Copper Sulphate is attached as Appendix 11 to this report.

2) Technical bulletins have been developed and have been finalized and distributed to the industry and/or ready for review by the R&D Committee and then designed and distributed to the growers.
The technical bulletins include:-
(a) Cool chain requirements on farm

A copy of the DRAFT bulletin is attached as Appendix 12 to this report.

(b) Cool chain requirements through the supply chain

A copy of the DRAFT bulletin is attached as Appendix 13 to this report.

(c) Cool chain requirements in the retail sector

A copy of the DRAFT bulletin is attached as Appendix 14 to this report.

(d) Biology and Management of Nut Rot of Chestnuts

A copy of the presentation is attached as Appendix 15 to this report.

(e) Chestnut Quality Assurance

A copy of the presentation is attached as Appendix 16 to this report.

(f) Chestnut Nut Rot matters

A copy of the presentation is attached as Appendix 17 to this report.

(g) Chestnut Gall Wasp (as detailed above)

(h) Current Chemical Options for Australian Chestnut Growers

A copy of the presentation is attached as Appendix 18 to this report.

(i) Chestnut Bubbly Bark Technical Bulletin

A copy of the presentation is attached as Appendix 19 to this report.

INDUSTRY COMMUNICATIONS: (utilizing 'tools' including the Newsletters and CAI website)

a) Provide briefing material, industry development updates, fact sheets and articles.

1) Fact sheets and articles:

The IDO has prepared and distributed the following technical fact sheets and articles throughout the period including as per the details above.

In addition the IDO prepared a range of other reports including:-

(a) Due to the September Newsletter being constructed around the Conference and Farm Walk no specific IDO report was included. Instead the IDO offered technical assistance with the articles included in Issue No 3/2015, 'Special Post Conference Edition – Nuts & Burrs'.

(b) IDO reports were prepared for the December 2015, February 2016 and the June/July 2016 editions of Nuts & Burrs.

Copies of the reports for the June/July 2016 Nuts and Burrs are attached as Appendices 20 and 21

In addition a technical paper on "Progress made in addressing chestnut Gall Wasp" was utilised in the February 2016 edition.

(c) In an endeavour to spread the message about the technical issues on the cool chain of chestnuts a media release was prepared and distributed broadly.

A copy of the media release is attached as Appendix 22 to this report

(d) An article was prepared for and distributed by Fresh Plaza news in relation to the upcoming season.

A copy of the article is attached as Appendix 23 to this report.

2) General briefing and industry development

The following are the general briefing and industry development undertaken through the life of the project:-

- Assisted the Communications Officer on technical issues/items.
- Reported on the project to the CAI Executive Committee during their teleconference meetings on the 13th October and 8th December 2014.
- Attended the CAI R&D sub-committee meeting on 25th November 2014 and reported on the relevant chestnut R&D Projects. In addition acted as the secretary to this sub-committee.
- Supplied relevant technical articles to the Communications Officer for inclusion in 'Nuts and Burrs'
- Assisted the Communications Officer by supplying a number of specific items including a report from the Bureau of Meteorology on Climate and Water Outlook for placement on the website.
- Assisted the CAI Marketing Committee with technical input into storage material important and relevant to the Chestnut supply chain as part of a teleconference on the 14th January 2015 resulting in the preparation of the Chestnut Cool Chain poster.

A copy of the Chestnut Cool Chain poster is attached as Appendix 24 to this report.

- Reported to the project steering committee on a number of occasions during other Chestnut industry events on the 20th February, 23rd May and during a teleconference on the 27th July 2015.
- Reported on the project to the CAI Executive Committee during their teleconference meeting on the 10th March, 15th June and 27th July 2015.

- Supplied relevant technical articles to the Communications Officer for inclusion in the 'Preseason' and 'Winter' editions of 'Nuts and Burrs' including:-
    - Chemical Permit
    - Quality from Orchard to Consumer
    - Report from the IDO (both editions)
    - Australian Chestnut Industry Strategic Review
    - Microwaves control brown rot in chestnuts?
- Maintained a linkage with the Michigan State University Extension service and sourced relevant technical information on chestnut gall, chemicals and orchard management for distribution to the industry.
- Assisted in the planning of the technical components of the September 2015 Conference and Field Day including sourcing speakers on bird management and compost. In addition planning is being undertaken for a session on R&D and Nut rot.
- Distributed technical bulletins and scientific papers to the chestnut growers including:-
    - Soil Microorganism paper
    - Chemical technical bulletin
    - AgChem update (as received from a HIAL across industry project).
- Distributed technical e-mail information to the CAI Executive and sub-committee members including:-
    - Tendrils (PHA Newsletter)
    - National Working Party on Pesticide Application (NWPPA) update newsletter
    - Plant Biosecurity Cooperative Research Centre news

- Through requests from growers for information on potential export information a linkage to MICoR - Manual of Importing Country Requirements - was established and distributed.

b) Communication & Liaison with growers, industry organisations, government agencies, researchers and scientists.

Throughout the life of the project the IDO has maintained strong communications with a wide range of industry representatives, researchers and technical people and organisations. Some of the specific communications are detailed:

1) Communications with Jenny Ekman.

The IDO has maintained communications with Jenny Ekman in relation to project CH13005 to consider the expansion of the project to cover topics relating to quality assurance in the wholesale supply chain and the retail network.

2) Communications with Researchers.

As part of maintaining linkages with relevant researchers and technical personnel the IDO participated in the Victorian Horticulture Industry Network on the

(a) 2nd and 3rd December 2014 at the DPEI Centre at Attwood on behalf of the chestnut Industry and reported on the recent activities of CAI.

(b) 2nd July 2015 at the DPEI Centre at Attwood on behalf of the Chestnut Industry. The IDO participated in a Biosecurity Industry Liaison Officer course facilitated by Department of Economic Development, Jobs, Transport and Resources. The aim of course was to have personnel prepared to represent industry in an Emergency Plant Pest response.

(c) Wednesday 20th January 2016 held at the University of Melbourne. This offered the opportunity to liaise with researchers at the University undertaking work relevant to the chestnut industry including land use mapping for both biosecurity purposes and determining the location of orchards.

3) Liaise with Levies Revenue Service.

The IDO has maintained regular communications with Levy Revenue Services in relation to the Chestnut levy collection to obtain statistical data to build a new production database for the Australian Chestnut Industry.

4) ANIC.

The IDO

(a) Participated on a working committee helping to plan the 2015 Nut Conference and ensured that CAI is in a position to give a presentation to up-date delegates on the Australian Chestnut Industry.

(b) Attended the 2015 ANIC Nut Conference as a Chestnut Industry representative,

(c) Assisted with representing the Chestnut industry at and on the CAI trade display booth, and

(d) Prepared and presented the season report on the Australian Chestnut industry for and on behalf of Chestnuts Australia Inc. The presentation has been up loaded onto the CAI website.

Detailed as Appendix 25 and a copy of the Chestnut Industry Presentation has been supplied to Horticulture Innovation.

Over the life of the project the IDO has continued to liaise with the ANIC Executive Officer, Chaseley Ross and has assisted with a range of information in areas including industry statistics, biosecurity and chemicals.

c) Work collaboratively with the Chestnuts Communications Officer.

The IDO maintained weekly communications with the Communications Officer via phone and/or e-mail resulting in the supply of a range of information/newsletters/reports being supplied and distributed to either the CAI Executive and/or the chestnut growers.

The material distributed included:-

- Monthly Plant Health Australia newsletters (Executive)
- Monthly CRC for Plant Biosecurity newsletters (Executive)
- Agriculture, Horticulture and Conservation Training package material (Executive)
- Emergency Plant Pest Response Levy notification (Growers)
- CAI DRAFT Strategic Plan (Growers)
- Climate reports from the Victorian Department (Growers)
- National Working Party on Pesticide Application quarterly report (Growers)
- ChemClear Newsletter (Growers)
- AgChem reports prepared and distributed by Kevin Bodnaruk (Growers)
- Horticulture Industry Network Newsletters (Growers)
- NRM on Farms Newsletters (Growers)
- Hort Innovation Newsletters (Executive)
- Biosecurity Matters Newsletter (Growers)
- Drought and About Newsletter (Growers)
- INC Newsletter (Growers)
- Biosecurity Legislation e-blasts (Growers)

In addition the IDO prepared articles titled "Report from the IDO – Trevor Ranford" for each of the editions of Articles for 'Nuts & Burrs' supplied to the Communications Officer for inclusion in Nuts and Burrs and/or on the CAI website.

d) Manage the collection, analysis and dissemination of industry statistics.

1) The IDO has undertaken the following:-

(a) Designing a production survey for the Chestnut Industry.

(b) Circulated the DRAFT Survey to the CAI Executive Committee and the Chestnut R&D Committee for input and final sign-off.

(c) Redrafted the Survey.

Copy of the survey is attached as Appendix 26 to this report.

2) The survey was distributed to Chestnut growers via e-mail after the Christmas/New Year break with a closing date of the 29th January 2016.
The survey responses were very poor making the data collected of limited value.
A new survey is planned at the completion of the 2016 season with the aim of gathering much more information.

3) Data has been collected from AusMarket and this material is made available to growers through the CAI website. Below are the details of chestnuts transported to the major markets during 2015

		TRANSORTATION OF CHESTNUTS BY STATE		**HARVEST 2015**			
WEEK ENDING	**SYDNEY**	**MELBOURNE**	**BRISBANE**	**ADELAIDE**	**PERTH**		
06/03/15	0.783	0	0	0	0		
13/03/15	7.434	3.88	0	0	0		
20/03/15	27.604	6.311	0	0	2		
27/03/15	30.688	14.385	3.875	4.9	3		
02/04/15	45.104	4.97	2.5	8.54	0		
10/04/15	32.577	18.74	3.47	3.54	1		
17/04/15	38.91	18.13	3.74	1.975	1		
24/04/15	31.368	8.735	1.49	2.205	0		
01/05/15	27.467	10.645	1.45	1.99	1		
08/05/15	22.081	9.28	1	0.815	0		
15/05/15	32.235	10.77	0	2.7	0		
22/05/15	11.025	7.92	2.22	2.86	0		
29/05/15	16.856	13.675	3.42	1.97	0		
05/06/15	16.06	10.39	3.36	0	0		
12/06/15	16.08	4	0.81	0	0		
19/06/15	16.67	2.33	1.04	1	0		
26/06/15	9.02	2.19	1.32	1.76	0		
03/07/15	12.03	1.425	1.79	0	0		
10/07/15	9.04	0	2.17	0	0		
17/07/15	9.73	1	0.9	0	0		
24/07/15	6.5	0	0.94	0	0		
	419.262	**148.776**	**35.495**	**34.255**	**8**		**645.788**

4) 2015 gross value of production, farm investment and export figures for the total industry were collected. Projections for 2020 and 2025 were also made. The information has been supplied to the Australian Nut Industry Council for inclusion in an all inclusive nut report/overview.

Estimated Australian Production of Chestnuts							
						% growth over period	
Area Planted, ha	**2011**	**2016**	**2021**	**2025**		**2016**	**2025**
Chestnuts	1,240	1,440	1,640	1,800		2.5%	2.4%
Production, tonnes	**2011**	**2016**	**2021**	**2025**		**2016**	**2025**
Chestnuts, inshell	2,000	2,500	3,000	3,200		1.6%	1.5%
Farm Gate Value $m	**2011**	**2016**	**2021**	**2025**			
Chestnuts	$ 10.00	$ 12.50	$ 15.00	$ 16.00			
Domestic Consumption, tonnes	**2011**	**2016**	**2021**	**2025**			
Chestnuts, inshell	1,329	1,617	1,967	2,301			
(domestic consumption taken as average 2002/03 to 2004/05)							
Exports, tonnes	**2011**	**2016**	**2021**	**2025**			
Chestnuts, inshell	671	18	1,033	899			
Exports, value $m	**2011**	**2016**	**2021**	**2025**			
Chestnuts	$ 3.36	$ 0.50	$ 5.16	$ 4.49			

e) Proactively build relationships with key stakeholders, research organisations and agencies, other service providers, and international networks to foster cooperation and partnerships which provide opportunities for the Australian chestnut industry.

1) Agriculture Competitiveness White Paper:

The IDO participated on behalf of Chestnuts (and other nut industries) in a Horticulture session held in Melbourne on Thursday 27th November 2014 to gather information relating to the Ag Competitiveness Green Paper

The IDO assisted with technical information to be included in the response to the Green Paper by CAI.

2) Manage compliance with HAL

(a) The IDO has represented the Chestnut Industry at a number of HAL Forums and meetings throughout the period including:-

- HAL Review Meeting – 21st February 2014
- ACIL Allen Meeting (Independent Consultants) – 4th March 2014
- HAL Members Forum – 28th May 2014.
- Members Meeting in relation to HAL Review – 16th May 2014.
- HAL Review Meeting – 23rd July 2014.

(b) The IDO assisted the Communications Project Officer and the Chestnuts Australia Inc Executive Committee in preparing a Chestnut Industry submission to the Independent Consultant as part of the HAL Review.

f) Provide support to CAI Executive Committee members to liaise with industry stakeholders on key industry development issues.

1) Seasonal visits to growing regions:

(a) MAY 2014

The IDO visited the Myrtleford region of Victoria during the period 22nd to 25th May 2014 and

(1) Visited a number of growers within the region to discuss the following issues of concern to the growers and the industry
- Blight eradication
- Dipping of nuts to control mould
- Pests and Diseases, and

(2) Attended the Chestnut Dinner at Gapsted Winery on Friday 23rd May 2014, and

(3) Met growers at the Chestnut Display at the La Fiera Food and Wine Festival held in Myrtleford on Saturday 24th May 2014 and discussed a range of issues, including Chestnut Blight and chemicals, and

(4) Met with members of the Project Team to discuss relevant issues.

(b) MAY 2015

During a visit to the Beechworth/Myrtleford region during the period – 22nd and 23rd May 2015 the IDO:-

(1) visited a number of grower properties and discussed industry issues, and

(2) held a meeting with the Chair of the CAI R&D Committee, and

(3) discussed project matters with the project steering committee, and

(4) discussed technical matters with a range of growers who visited the Chestnut Industry Display at La Fiera Food & Wine Festival, Myrtleford – Saturday 23rd May, 2015, and

(5) Assist the Communications Officer with relevant chestnut events held during that period.

(c) MAY 2016

During a visit to the Beechworth/Myrtleford region during the period – 19th to 22nd May 2016 the IDO:-

(1) visited a number of grower properties in Stanley and discussed industry issues, and

(2) held a meeting with the Chair of the Project Team – Brian Casey, and

(3) discussed project matters with the project steering committee, and

(4) discussed technical matters with a range of growers who visited the Chestnut Industry Display at La Fiera Food & Wine Festival, Myrtleford – Saturday 21st May, 2016, and

(5) Assist the Communications Officer with relevant chestnut events held during that period.

(d) JUNE 2016

During the period 21st to 23rd June 2016 the IDO visited the three major growing regions – Yarra Valley, Beechworth, Tumbarumba and held one-on-one meetings with growers and/or a joint face-to-face meeting:-

(1) 21st June – Yarra Valley
Met with Chris Dikkenberg and had a two hour discussion on a range of R&D issues and topics.

(2) 22nd June - Stanley
Grower meeting at Stanley, hosted by Richard Guthrie at Nightingales Orchard.
- 12 growers in attendance
- The CO Tanya Edwards also in attendance.
- Collected bur samples for testing

(3) 23rd June – Tumbarumba
- Met with Bill and Jan Connoley
- Met with Malcolm Marshall
- Collected bur and nut samples for testing

2) General liaison with growers on industry issues:

Throughout the life of the project the IDO has communicated with many growers about issues of concern and/or requests for information including:-

(a) Input into the Chestnut R&D strategies within the Chestnut Strategic Plan review.
(b) Communicated with in relation to export opportunities.
(c) Pests and disease matters
(d) Chemicals.

3) Technical input into industry issues:

Assisted in the preparation of the following broad horticulture and specific technical chestnut submissions including:-

- APVMA review of full cost recovery.
- Review of amendments to the APVMA legislation to reduce red tape.
- Senate Rural and Regional Committee Inquiry on the APVMA legislation to reduce red tape.
- Agriculture Competitiveness White Paper.

The submissions presented technical industry information with the aim of having any new processes and/or regulations being technically practical for growers to implement.

g) Liaise with Minor Use Coordinator (MT10029) on SARP and other minor use / chemical issues and ANIC Coordinator (NT12001) and utilize the relevant outputs.

The IDO

1) Participated in an AgVet Chemical Forum in Canberra on Friday 5th December 2014 on behalf of Chestnuts (and the other three nut industries) and have technical input into the chemical requirements for Australian Chestnut Growers.
The AgVet Chemical Forum is part of a project funded by RIDIC and it is looking at establishing a Forum to direct/manage minor use permits from mid 2015 onwards.
Relevant papers from both the first and second forums were distributed to the CAI Executive Committee.
CAI believes that this was important that the Chestnut industry be involved particularly given the importance of minor use chemicals to the smaller/emerging industries.

2) Participated in the AgVet Chemical Collaborative Forum in Canberra on the 9th and 10th of June 2015 on behalf of Chestnuts and assisted in the inclusion and finalization of the relevant chestnut chemical requirements for 2015.

h) Identify topics and guest speakers for industry workshops.

The IDO assisted with organising the following topics/speakers for the industry workshops:-

- Strategic Planning – Varietal assessment parameters/Levies/5 year growth estimates/Chemicals/Biosecurity/Marketing/HIA
- Labour Hiring and employment requirements - Labour Solutions Australia
- Irrigation - Netafim Agronomist
- On-Farm Biosecurity Training – Trevor Ranford and Plant Health Australia
- Composting - Peats Soil & Garden Products
- Bird Control - Dr Ashley Tews, CSIRO

COMMITTEE WORK:

a) Support the Chestnut Industry Advisory Committee/Chestnut R&D Committee by attending meetings as required, providing technical information and implementing agreed actions

1) Initial Project Planning Meeting

A planning meeting was held on 17th December 2013 in Albury, NSW to discuss the project and commence the development of the Work Plan.
In attendance at the planning meeting were:-

Brian Casey, Chair Chestnut IAC
Adam Gatford, President, CAI
Tanya Edwards, Communications Officer, CAI
Trevor Ranford, Trevor Ranford Pty Ltd.

The following were agreed upon:-

Purpose of the position:

Research, develop and disseminate technical data/guidelines for the chestnut industry and promote awareness and uptake by the industry including:-

- Working closely with growers in improving farm productivity, quality, sustainability and adoption of market preferred varieties
- Assist industry to identify R&D priorities and identifying potential, qualified and appropriate service providers to deliver projects
- Assess future industry chemical requirements and provide support for chemical registration and permitting processes
- Support Chestnut industry biosecurity processes, including addressing grower education and awareness, reinforcing the messages from the biosecurity project on chestnut blight (CH11000)
- R&D projects – including the effective extension of results to growers and other stakeholders
- Collection and management of industry data
- Supporting the communications program
- Liaison with associated government departments, industry associations and groups.

Work Plan

An initial work plan was prepared in early January 2014 and agreed to by the Project Team.

2) PROJECT TEAM MEETINGS:

A Project Team teleconference was held on Wednesday 23rd July 2014 to review the project and assess the project against the original Work Plan.
In attendance at the planning meeting were:-

Brian Casey, Chair Chestnut IAC
Adam Gatford, President, CAI
Chris Dikkenberg, Chair, CAI R&D Committee
Tanya Edwards, Communications Officer, CAI
Trevor Ranford, Trevor Ranford Pty Ltd.

During the life of the project the IDO has:-

(a) Reported to the Project Team through a face-to-face planning session held on the 14th November 2015 at Beechworth, Victoria.

(b) Reported to the Project Team and to the CAI Executive Committee on the 7th September and 2nd November 2015. Both written and verbal reports were given on the project activities and other broad industry events attended by the IDO on behalf of the chestnut industry.

(c) Reported to the Project Team and to the CAI Executive Committee on the 19th January and the 16th May 2016. Both written and verbal reports were given on the project activities and other broad industry events attended by the IDO on behalf of the chestnut industry.

Outcomes

This project was developed to support implementation of the Australian Chestnut Industry Five Year Strategic Investment Plan 2011-2016 (CH10001), with a focus on achieving the following objectives:

- Ensure a consistent, sustainable and profitable supply of quality Australian chestnuts to meet consumer demand
- To maintain or improve grower returns by increasing demand for Australian chestnuts in line with increasing supply.

The appropriate objectives within the Australian Chestnut Industry Five Year Strategic Plan 2011-2016 that have been covered by this Project are as follows:-

- Update and promote the adoption of best practice production, harvest and postharvest handling guidelines to assist growers in improving farm productivity, quality and sustainability.

  This has been achieved through the discussions with growers on their practices and then accessing the relevant information and turning them into articles, technical bulletins and manuals for use by growers.

- Update and promote the adoption of best practice guidelines to assist supply chain partners in optimising product quality and presentation.

  This has been achieved through the development of links with the chestnut supply chain – transporters, market agents and retailers – and the presentation of research results to assist in the understanding of supply chain issues that affect nut quality. In addition the development and supply of posters and technical bulletins on supply chain requirements to the industry and supply chain stakeholders.

- Access and adopt new research and technology, systems and / or practices that reduce the incidence of nut rot.

  This has been achieved through a range of research projects, nut quality assessments at grower, market and retail level and information presentations at conferences and field days. The IDO has allocated a reasonable time to this problem and the industry has generated a substantial library of technical information and scientific papers that will be used as part of an ongoing nut rot program.

- Collate relevant industry data in a timely manner to inform business (and industry) decision making in relation to supply (and demand) issues.

  While the collection of production data has been less than desired the processes are in place to gather more accurate information going forward.
  A wide range of industry data has been collected allowing the industry to give a strong overview of the value of the Australian Chestnut Industry.

- In conjunction with government agencies and PHA ensure that the chestnut industry has appropriate biosecurity arrangements and resources in place to meet the expectations of levy payers and government.

  This has been achieved through the establishment and expansion of the working relationship between Plant Health Australia, the government and industry members of PHA and the Australian Chestnut Industry. The results have been the finalisation of the Nut Industry Biosecurity Plan and the increased involvement of growers in on-farm bisosecurity.

- Proactively build relationships with key stakeholders, including government, research organisations, other service providers, and international networks to foster cooperation and partnerships which provide opportunities for the Australian chestnut industry.

  The Australian Chestnut Industry continues to be well respected within the Australian Horticultural Industry and has wide local, national and international networks that have assisted in the industry being able to deal with a wide variety of topics including pest and disease management, export, marketing and capacity building.

- Utilising a range of media and forums, ensure the effective communication of relevant industry information/ messages to a range of industry stakeholders including levy payers; service providers; supply chain businesses; government and the community.

  This has been achieved through the preparation of a wide variety of communication 'tools' and distributing them through a range of communication methods including technical bulletins, e-mail blast, articles in industry newsletters and magazines and the media.

- A more coordinated approach to R&D for the Australian Chestnut Industry.

  This has been achieved through the review of the Chestnut Industry Strategic plan and the R&D priorities that now can be used to develop annual investment strategies.

Project evaluation was undertaken by Horticulture Innovation Australia Limited via a survey of industry stakeholders undertaken prior to project completion to evaluate stakeholder satisfaction with the services delivered.

Evaluation and Discussion

The "Facilitating Development of the Australian Chestnut Industry – Industry Development Officer" project was a very important one for the Australian Chestnut Industry because it brought some focus into the past, current and future needs and activities of the Australian Chestnut Industry.

The aim of the project was to continue the development of the Australian Chestnut Industry to achieve increased profitability through a multi-faceted approach to industry capacity building. The strategy was to undertake the employment of a part-time Industry Development Officer to extend technical information to industry to assist growers in increasing yields and improving nut quality.

The first five months of this project (1/8/2013 to end of 2013) was involved in setting up the parameters for the project and employing an Industry Development Officer.

During that period the Project Team determined that the broad objectives of the project were to undertake research, develop and disseminate technical data/guidelines and promote awareness and uptake by the chestnut industry by:-

- Working closely with growers in improving farm productivity, quality, sustainability and adoption of market preferred varieties
- Assisting industry to identify R&D priorities and identifying potential, qualified and appropriate service providers to deliver projects
- Assessing future industry chemical requirements and provide support for chemical registration and permitting processes
- Supporting Chestnut industry biosecurity processes, including addressing grower education and awareness, reinforcing the messages from the biosecurity project on chestnut blight (CH11000)
- Developing and promoting R&D projects – including the effective extension of results to growers and other stakeholders
- Collecting and managing industry data
- Supporting the communications program
- Liaising with associated government departments, industry associations and groups.

CAI worked with HAL to appoint an Industry Development Officer – Trevor Ranford.
One of the advantages of contracting Trevor Ranford as the Industry Development Officer has been that he has also undertaken similar roles for the Pistachio, Walnut and Hazelnut industries. This has resulted in the Chestnut 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 chestnut industry.

While no specific evaluation was undertaken by the project team of the overall project the following forms of evaluation/input were undertaken:-

a) Grower input into issues of importance to their business and/or the broader industry.

This resulted in following list of broad topics that have been used by CAI to develop strategic actions and specific R&D programs.

- RESEARCH
- MARKETING
- TECHNOLOGY TRANSFER/EXTENSION
- STATISTICS
- STRUCTURE/FUNDING
- VARIETIES/ROOTSTOCKS

b) Grower involvement in the Strategic Planning process.

This resulted in the following list of issues that were subsequently built into the CAI Chestnut Industry Strategic Plan.

- Varieties
- Cool Chain
- Grading/Standards
- Tree Health
- Chemicals

- Biosecurity issues
- Harvesting
- Management of Nut Rot
- Surface rot
- Supply Chain
- Retail Handling
- Consumer handling

c) Grower evaluation surveys at the conclusion on the symposiums/farm walks.

Through the evaluation of the field days/conferences/farm walks CAI has both an assessment of each activity and a list of issues/topics of further interest to the growers.
The collated responses for each of the activities were undertaken by the CAI Communications Officer as part of project CH12000. An example of the results obtained from such surveys is detailed below:-

Participant Feedback Sheet – CAI Field Day 7th February, 2016
Please rate the following out of 10 by circling your choice - 1 represents very poor and 10 represents excellent.

1) How useful was the day for you? 1 2 3 4 5 6 7 8 9 10
   - **11 responses rated 10**
   - **6 responses rated 9**
   - **5 responses rated 8**

   Why
   Learnt where the industry is heading and some operational concerns
   Meeting growers and learning about chestnut issues
   Introduction to industry
   As a new person to the industry found it very useful listening to people
   Education and management of nuts and postharvest
   Good information on irrigation, disease, growth
   Great to catch up with other growers
   Never too old to learn
   Good diversity of people
   Brilliant to be able to walk through the orchard and packing shed, and get hands on advice
   Seeing different orchards and processes
   Tree management options
   Processing research information
   Networking
   We are new to chestnuts; everything today was new knowledge for us, thanks!
   Presentations
   Great experience, love visiting new orchards and see other growers' management systems
   Ian Brain's orchard – model application
   Varied, interesting, informative, congenial

2) How would you rate the quality of the day? 1 2 3 4 5 6 7 8 9 10
   - **10 responses rated 10**
   - **6 responses rated 9**
   - **6 responses rated 8**

   Why
   Very well organised, good food at lunch
   Comprehensive – covered postharvest and value adding
   Well organised and informative
   Meet other growers
   Good speakers and food
   Thoughtful – different to other days
   Inclusive
   Ran on time and all information useful
   Well organised, great locations
   Seeing how waste and orchard planning affects production
   Networking
   Relevant

In analysing the results there is a strong indication that overall CAI has good acceptance from the participants on the conferences/field days/farm walk including the right content, interesting and informative and meeting grower's needs.

Getting the balance right in preparing and presenting conferences/field days/farm walks is always a challenge given the varying needs of a large group of growers but AWIA appears to have achieved a good balance and base to build from.

d) Data collection.

All endeavours have been undertaken to gather relevant industry data from a range of sources including:-

1) levy collection,
2) industry database of growers,
3) wholesale market reports, and
4) a specific grower survey.

From that the industry has been able to offer some broad information to the industry and to the relevant organizations and agencies seeking data.

CAI had previously struggled with collecting grower data on production, tree numbers and other specific information. The collection of the data from the 2015 Grower Production Survey was extremely disappointing based on the number of responses received.
The overall process has started to work well for other industries but it has been based on both persistence and building grower trust. CAI will continue the survey collection in 2016 and beyond to assist the industry in achieving a sound base to work from.

The willingness of growers to present their information through a confidential survey needs to be a goal to achieve a new maturity within the industry.

e) Grower survey of the project.

No specific grower survey of the IDO project was undertaken during the life of the project although the surveys conducted by the Communication Officer after each field day/conference/farm walk have given useful input into the needs of the growers.

Project evaluation was undertaken by Horticulture Innovation Australia Limited via a survey of industry stakeholders undertaken prior to project completion to evaluate stakeholder satisfaction with the services delivered.

f) Project evaluation by the Project Team and CAI Executive.

The Industry Development Officer has communicated regularly with the Chair and members of the project team, as well as other members of CAI Executive Committee and Sub-Committee leaders and the individual grower members of Chestnuts Australia Inc.
Also as necessary the Industry Development Officer has communicated with experts external to CAI Executive and membership.

As part of the process the Industry Development Officer has reported on the project at each of the CAI Executive Committee meetings and/or teleconferences and prepared reports for each of the meetings.

This has ensured that both the project team and the CAI Executive were well informed of the activities and outcomes and were able to make regular evaluations of the project and then make adjustments and/or take appropriate actions throughout the life of the project.

Since January 2014 the collaboration between the Communications Officer, Tanya Edwards and the Industry Development Officer, Trevor Ranford has given CAI an extremely important resource to ensure maximum results from limited financial resources and made CAI a stronger and more effective organisation in communicating and delivering technical outcomes for the Australia Chestnut Industry. They have collaborated across all areas including Field days, Conferences, Newsletter content, technology transfer and

the dissemination of information to growers on a wide range of topics. The two roles compliment and support each other and Trevor and Tanya have communicated regularly regarding venues, locations, speakers, presenters for upcoming Field days, Workshops and Conferences. In this way by pooling resources the Industry has been able to host many successful Industry events, presenting a diverse range of topics that have been useful to the entry level grower, up to the established large chestnut grower.

Chestnuts Australia Inc (CAI) as the peak body representing the interests of chestnut growers in Australia is overseeing an ever changing industry. 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 Industry Development Officer and the "Facilitating Development of the Australian Chestnut Industry – Industry Development Officer" project.
The linkage between this project CH13003 and the Communications Officer Project CH12000 has been an important and integral part of the development of the Australian Chestnut Industry.

Recommendations

"Chestnuts Australia Inc recommends that

a) the position of Industry Development Officer be continued and utilise the resources to building on past programs/projects to continue to grow the Australian Chestnut Industry;

b) a 2016 grower survey be implemented and all endeavours are made to achieve at least a 75% grower response;

c) additional resources be accessed to finalise the completion of the components of the Chestnut Quality Parameters Manual;

d) all endeavours are made to maintain the chestnut industry biosecurity, research and development and chemical portfolios and continue the collection of data, preparation of reports and distribution of information to the growers.

Scientific Refereed Publications

None to report

Intellectual Property/Commercialisation

No commercial IP generated.

References

No specific references to record.

Acknowledgements

Thanks to Chestnuts Australia Inc for having the initiative to prepare, submit and administer the past 30 months Industry Development Officer 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 Brian Casey, Adam Gatford and Chris Dikkenberg for their organization and support during the life of the project.

Thanks also to the members of the CAI Executive Committee, past and current, for their input and guidance on the project and its outcomes.
Thanks to Tanya Edward for her assistance in undertaking the communications activities relating to the IDO project including the maintenance of the CAI website.

Thanks also to the Australian Government, through Horticulture Australia Limited, in making available the matching funds for this project to compliment the Chestnut Industry R&D Levy.

Appendices

Appendix 1: Chestnut Quality Standards Poster

Appendix 2: Chestnut Quality Standards Guide Poster

Appendix 3: Chestnut Quality Parameters Manual template

Appendix 4: Phytophthora Project Brief

Appendix 5: Technical Bulletin – Gall wasp

Appendix 6: Chestnut R&D priorities

Appendix 7: DRAFT On-Farm Biosecurity Manual

Appendix 8: 2014 February Field Day IDO Presentation

Appendix 9: Chestnut Biosecurity and Orchard Sanitation Presentation at the November 2014 Conference

Appendix 10: Presentation at the February 2015 Conference titled 'Review of Phytophthora Root Rot of Chestnuts'.

Appendix 11: Tech Note on Copper Sulphate

Appendix 12: DRAFT Cool Chain requirements on farm bulletin

Appendix 13: DRAFT Cool Chain requirements through the Supply Chain

Appendix 14: DRAFT Cool Chain requirements in the Retail Sector

Appendix 15: Technical Bulletin – 'Biology and Management of Nut Rot of Chestnuts'

Appendix 16: Bulletin – 'Chestnut Quality Assurance Requirements'

Appendix 17: Chestnut Nut Rot update

Appendix 18: Technical Bulletin – 'Current Chemical options for Australian Chestnut Growers'

Appendix 19: Technical Bulletin – 'Chestnut Bubbly Bark'

Appendix 20: IDO Report – June/July 2016 'Nuts & Burrs' Newsletter

Appendix 21: Technical Report – Nut Rot update. June/July 2016 'Nuts & Burrs' Newsletter

Appendix 22: MEDIA RELEASE- *"COOL YOUR (CHEST) NUTS"*

Appendix 23: Article for Fresh Plaza news

Appendix 24: Chestnut Cool Chain Poster

Appendix 25: Chestnut Presentation at the 2015 Australian Nut Industry Conference

Appendix 26: 2015 Production survey

Appendix 1: Chestnut Quality Standards Poster

Australian Chestnuts - Quality Standards

Chestnuts sent to market should be mature, sound, clean, well formed and free of physical damage or rots and moulds. Chestnuts that have bird pecks or splits or are poorly formed, dried out or immature should be discarded.

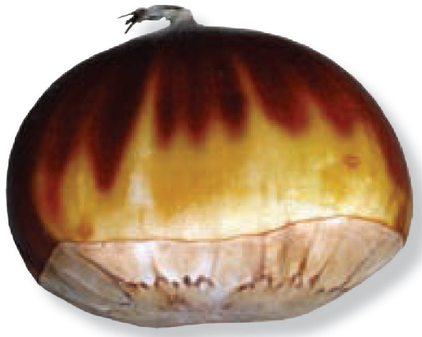
High quality chestnuts are free of blemishes and well formed.

Growers who send defective fruit to market will not only have their own fruit rejected but may also damage the reputation of the industry as a whole. Particular care needs to be taken in years when rain has occurred during blossoming, potentially resulting in high levels of internal rot. In years when chestnut rot is prevalent, give strong consideration to not harvesting rot-prone varieties.

Preferably do not store chestnuts past August, as demand declines then. It is also not recommended to store fruit over summer for sale the following autumn; although these fruit may appear sound on removal from storage, quality will decline rapidly during transport and retail. Moreover, selling old fruit to inevitably disappointed customers reduces demand for new season product.

Below: (Left) Accurate grading into seven sizes. (Right) Reject poorly formed fruits such as these.

Australian Chestnuts - Quality Standards



Unmarketable fruits. (Far left): Immature fruits; (Left): Split shells.

Unmarketable fruits. (Far left): Bird pecks; (Left): Leaf, grass or other foreign material.

Unmarketable fruits. (Far left): Mixed sizes or varieties; (Left): Rot.

Unmarketable fruits. (Far left): Mould; (Left): Dried fruits.

Appendix 2: Chestnut Quality Standards Guide Poster

QUALITY STANDARDS

Pictorial Reference Guide

Accurate grading (the five industry grade sizes) *Photo: A. Gibb*

Accurate labelling
Photo: A. Gibb

High quality presentation
Photo: D. Ridley

Wafers, flats or pennies
Photo: A. Gibb

Bird Pecks
Photo: A. Gibb

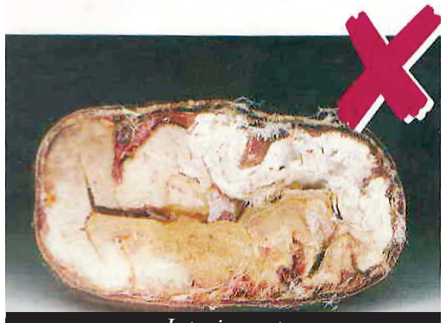
Splits
Photo: A. Gibb

External mould
Photo: D. Ridley

External mould
Photo: A. Gibb

External mould
Photo: A. Gibb

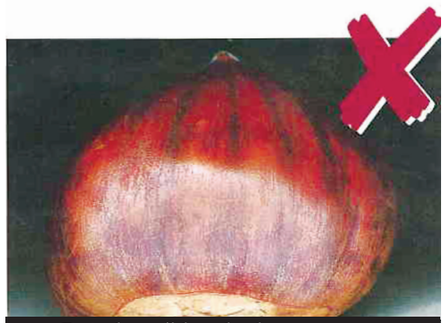
Scratching
Photo: D. Ridley



Interior rot
Photo: A. Gibb

Interior rot
Photo: A. Gibb

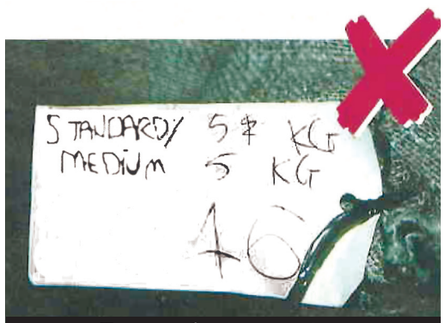
Immature
Photo: A. Gibb



Dried out/bleached appearance
Photo: A. Gibb

Two varieties in container
Photo: D. Ridley

Leaf material in container
Photo: D. Ridley



Two grades in container
Photo: D. Ridley

Inadequate labelling
Photo: D. Ridley

Appendix 3: Chestnut Quality Parameters Manual template

QUALITY PARAMETERS

FOR

AUSTRALIAN CHESTNUTS

Developed by the

CHESTNUTS AUSTRALIA INC

MAY 2016

QUALITY PARAMETERS

Contact:
Trevor Ranford
Industry Development Officer
Chestnuts Australia Inc
Phone: 0417 809 172
Email: sahort@bigpond.com

INTRODUCTION:

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

Locally produced Chestnuts 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 Chestnut 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 Chestnuts Manual is to ***'maintain and improve the quality of Australian chestnuts 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 Chestnut Industry

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

CONTENTS:

Quality Parameters for Australian Chestnuts.

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

Measures for assessing chestnut 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 chestnut '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 chestnuts)	
Cultivar	
Rootstock	
Age of trees	
Distance between rows	
Distance between trees within rows	
Area of block contributing to the bin of chestnuts 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 4: Phytophthora Project Brief

CHESTNUTS AUSTRALIA INC

PROJECT BRIEF

TOPIC: ***Phytophthora root disease and its management – Literature review***

CHESTNUTS AUSTRALIA:
Chestnuts Australia Inc (CAI) represents growers, producers and processors across the chestnut industry. The Association with the membership has implemented the Chestnut Industry Strategic Plan with emphasis on the management of industry pests and diseases.

BACKGROUND:
Phytophthora is considered to be one of the three major diseases of chestnut in Australia; it has the potential to limit production and productivity.

During 2012, it was estimated that 6700 trees died or were severely affected by Phytophthora sp (Borschmann 2012). This represents a loss of 1675 tonnes of chestnuts (valued at $8 million) over the 10 years required to replace these trees and does not even include losses from sub-clinical infection.

OBJECTIVE:
The objective of this project is to produce a report outlining the current state of research on Phytophthora in Australia and worldwide, identify knowledge gaps in Phytophthora R, D & E and recommend further project direction with respect to the chestnut industry.

METHODOLOGY:
1) Research Phytophthora in Australia, including current management practices. (Phosphoric acid, rootstocks, etc)

2) Research Phytophthora in other Australian tree nut crops (eg Macadamias and Avocado), detailing epidemiology, impact and current management practices.

3) Research Phytophthora overseas (esp. France and Italy), paying particular attention to work on clonal rootstocks, identifying material that could be imported for Australian trials.

PROPOSAL COMPONENTS:
To enhance the chestnut knowledge about *Phytophthora* in Australia and overseas the following components will be part of the project:

a) Literature search.
Undertake the appropriate literature search.

b) Chemical controls
Prepare a list with supporting documentation on current and potential chemical controls

c) Biological Controls
Prepare a list with supporting documentation on current and potential biological control

d) Rootstocks
Prepare a list with supporting documentation on current and potential resistant rootstocks

e) Gaps
Report on any knowledge gaps as identified.

f) Report
Prepare a comprehensive report to Chestnuts Australia

PROJECT MANAGEMENT:
The overall project management will be by the CAI R&D Committee but day to day management and reporting will be through the CAI Industry Development Officer.

The Project Service Provider is requested to prepare a project submission detailing the implementation of each phase of the project listed above and the costs associated with each phase.

Costing should be inclusive of GST.

The project submission should be forwarded to:

Trevor Ranford
Industry Development Officer
Chestnuts Australia Inc
27 Ludgate Hill Road,
ALDGATE SA 5154

Mobile: 0417 809 172

E-mail: sahort@bigpond.com

Closing date of submissions:

Commencement date:

For more information contact: Chris Dikkenberg, Chair, CAI R&D Committee
Mobile 0458 220 122
E-mail: fuminafarms@bigpond.com

Trevor Ranford, Industry Development Officer, CAI
Mobile: 0417 809 172
E-mail: sahort@bigpond.com

Appendix 5: Technical Bulletin – Gall wasp

Chestnut gall wasp (Oriental or Asian)

Scientific Name: *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera Cynipidae)

Images for gall wasp chestnuts

Adult Asian chestnut gall wasp.

Photo: Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org

The chestnut gall wasp *Dryocosmus kuriphilus* is a global pest of chestnut (*Castanea*). The Chestnut gall wasp is native to Asia and established as a pest in the mid 20th century in Japan, Korea, USA (1974) and Europe.

Chestnut gall wasps are a potentially devastating invasive pest that can infest all species in the genus *Castanea*, including ornamental species and those planted for nut production.

Dryocosmus kuriphilus is considered to be one of the greatest causes of damage to the species of the genus *Castanea* at a worldwide level and is classified by the European and Mediterranean Plant Protection Organization (EPPO, 2005) as a quarantine organism. It is a pest of Chinese origin which attacks exclusively chestnut trees inducing the formation of galls on new spring shoots, thus disrupting twig growth and resulting in severe plant decline and drastic yield reductions (Kato and Hijii, 1997). The larvae feed within the galls in spring, the adults emerge in summer and lay their eggs inside the buds, in which the first instar larvae overwinter until the following season (EPPO, 2005), making detection difficult by simple external plant inspection. In Japan, Korea and the United States, countries where the gall wasp was introduced accidentally and has been widespread for sometime (Rieske, 2007), it has caused vast damage to chestnut - growing. More recently *D. kuriphilus* has been detected in Nepal (Abe *et al.*, 2007) and also in Europe: first in Italy in 2002 (Brussino *et al.*, 2002) and three years later in Slovenia (Seljak, 2006) and France (EPPO, 2007).

The distribution of this pest is primarily due to the transport of infested seedlings to new areas and the exchange of infested scion wood used to graft new trees.

Biology and Life cycle.

- Female adult wasps, one-eighth-inch long, lay three to five eggs in a cluster inside chestnut buds.
- Multiple adults may oviposit in a bud, with as many as 25 eggs per bud.

- Eggs hatch in 40 days and the larvae remain dormant until bud break the following spring when they induce the formation of galls on developing plant tissues.
- Larvae feed on the inner gall tissue for 20 to 30 days before pupating.
- Adult wasps emerge from the galls and the dispersal by wasp flight has been at a rate of 23 km per year, however, dispersal of adult insects has been augmented by prevailing winds.
- The emerging adults locate new chestnut shoots, laying eggs for the next generation.
- After the wasps emerge, galls become woody and dry out, potentially persisting on the tree for several years.
- The gall wasp produces one generation per year via asexual reproduction.
- Galls can form on the stem, petiole or leaf and provide the larvae and pupae protection.
- As you cannot detect the buds where eggs have been laid, the movement of all chestnut materials – except seed – between orchards, including scion wood and seedling rootstocks, should immediately cease.
- It is known that the cultivar 'Bouche de Betizac' is the only chestnut cultivar completely immune to Asian chestnut gall wasps.

Tree damage

Chestnut gall wasps cause globular twig, shoot and leaf galls on actively growing shoots, leaves or petioles of all Castanea species.These are usually green in early spring, turning red or rose-coloured in late spring and early summer, then drying out and becoming woody and brown from late summer.
This insect pest lays eggs in the buds of chestnut shoots, and galls develop on the shoot tips, leaves and catkins. Galling reduces fruiting and nut yield, suppresses shoot elongation, reduces tree vigour and wood production and can kill trees. Galling also prevents infested shoots from producing new shoot growth and flowers, thereby reducing or eliminating future production.
After adult insects emerge, the dried, blackened galls become woody and can persist on older limbs for several years. In cases of severe infestations, interior portions of the tree canopy die and trees are killed.

Previous seasons' woody brown galls can be found at any time of year, especially if they formed on the petioles. Galls can grow to 4cm (1.75 inches) in diameter, although most are been between 1 and 2cm.

Treatment
Control options include insecticide treatment. However, insecticide treatment of widespread outbreaks in the wider environment is unlikely to be effective because the galls encase the larvae, protecting them from chemical treatments.

An option in localised outbreaks is to conventionally harvest affected trees by felling or coppicing them and burning, deeply burying, or mulching (branch and tree-top material).

In the long term there could be the possibility of using a parasitoid organism to achieve a measure of 'biological control', but this would need careful research beforehand to ensure that the control organism itself would not cause environmental damage

Appendix 6: Chestnut R&D priorities

R&D PRIORITIES - SUMMARY

1. **Communications:**

   - Scope the work required

2. **Industry Development**:

   - Scope the work required

3. **Chemicals:**

   - Agree to fund efficacy/residue work on Rovral (subject to quotes)
   - Consider during work on Scholar at the same time (subject to costs/available funds).

4. **Bird/Vertebrate Management/control**

   - Promote as a multi-industry project with co-investment from agencies like CSIRO.
   - Seek support to push the multi-industry project from ANIC. **DONE**

5. **Cool Chain**

   - Technology transfer of results. **Commenced by IDO**
   - Undertake supply chain presentations in Sydney and Melbourne markets. **To be organised by IDO as part of current project.**
   - Review recommendations from Final report and scope potential new projects.

6. **Phytophthora**

   - Scope a project to undertake the phenology work to establish the correct application timing.
   - Investigate the use of composts, organic matter, symbiotic fungi and beneficial organisms as a potential method of control/management.
   - Survey growers in relation to their observations and treatments in the control/management of the disease.
   - Finalise and distribute a Tech sheet utilising the R&D project report – **IDO to undertake this work ASAP.**
   - Scope a project to establish a chestnut nursery program to obtain and supply resistant rootstocks. To be a multi-year and multi-staged project with some cost/benefit analysis.
   - Utilising the R&D work summarise what other industry groups are doing to control/manage the disease.

7. **Nut Rot**

   SHORT TERM PROGRAMS

   - Data Collection of growers practices including level of nut rot and environmental conditions.
   - Orchard Floor trial
   - Tree trial

- Orchard sanitation – **IDO to prepare a Tech sheet and distribute to growers**

MEDIUM TERM PROGRAMS

- Establish correct timings of sprays based on the disease and the tree physiology/phenology.
- Undertake in vitro efficacy trials on a range of chemicals and bio-controls including those used on pistachio fungi.
- Establish the critical levels of spores that cause an infection and what the environmental triggers are for temperature, rainfall and relative humidity at blossom.

LONG TERM PROGRAMS

- Investigate the use of weather stations and prediction models.
- Scope a multi-year project that includes integrated replicated trials and random block controls.

NOTES FROM R&D SESSION

PHYTOPHTHORA

PRIORITY AREAS:-

1. Scope a project to undertake the phenology work to establish the correct application timing.
2. Investigate the use of composts, organic matter, symbiotic fungi and beneficial organisms as a potential method of control/management.
3. Survey growers in relation to their observations and treatments in the control/management of the disease.
4. Finalise and distribute a Tech sheet utilising the R&D project report – IDO to undertake this work ASAP.
5. Scope a project to establish a chestnut nursery program to obtain and supply resistant rootstocks. To be a multi-year and multi-staged project with some cost/benefit analysis.
6. Utilising the R&D work summarise what other industry groups are doing to control/manage the disease.

MATERIAL FROM WHITE BOARD

- Review – self explanatory
- Phytophthora isolated from the roots
- Phytophthora in healthy trees – expresses itself with the right conditions
- Look at all past projects
- Nursery accreditation – accredited stock
- Link with the nursery industry accreditation scheme
- Phos Acid – when to apply and how much.
- Need to understand the chestnut physiology – phenology
- Need to understand what growers are doing to control the disease and what results they are achieving. This should not be expensive or difficult.
- Once we understand what growers are doing then maybe we can establish some replicated trials.
- Survey of growers observations – investigate further.
- Benchmark against other past research/trees.
- Best practice tool – what/when
- Treating effected trees versus treating across the whole block
- Develop nursery program.
- Resistant rootstock imports and then propagation
- Undertake cost/benefit review.
- Consider a three year project/program
- We have a small genetic base with limited rootstocks
- Dwarfing rootstocks?
- Identification of early stages of Phytophthora in the tree – extension project
- Value of compost/organics/symbiotic fungi/beneficial organisms

- Scope out project(s) through the R&D Committee. Develop project brief
- Scope what other groups are doing.

NUT ROT

PRIORITY AREAS:-

SHORT TERM PROGRAMS

1. Data Collection of growers practices including level of nut rot and environmental conditions.
2. Orchard Floor trial
3. Tree trial
4. Orchard sanitation – IDO to prepare a Tech sheet and distribute to growers

MEDIUM TERM PROGRAMS

5. Establish correct timings of sprays based on the disease and the tree physiology/phenology.
6. Undertake in vitro efficacy trials on a range of chemicals and bio-controls including those used on pistachio fungi.
7. Establish the critical levels of spores to cause an infection and what the environmental triggers are for temperature, rainfall and relative humidity at blossom.

LONG TERM PROGRAMS

8. Investigate the use of weather stations and prediction models.
9. Scope a multi-year project that includes integrated replicated trials and random block controls.

MATERIAL FROM WHITE BOARD

- Disease always there in one form or another
- Main source of infection from the orchard floor – ORCHARD FLOOR TRIAL
- Tree trial
- Chemical – no single chemical that is the best one to use
- Biological control on orchard floor – 'Biocontrols', Mulching, Urea. Is there something new?
- Trunk injection
- Symptomless until nut falls.
- Data collection of grower practices – nut rot level, environmental conditions
- Test other chemicals eg. Pistachio group of chemicals
- Effect at flowering – we know some triggers.
- Embryo testing – over the growth period of the nut
- Orchard sanitation – Tech Sheet. Promote practices to growers.
- Phenology for Phytophthora – can we do it for nut rot
- Timing of any sprays is important.
- Integrated approach – test options. Replicated trials and random block trials.
- Cultivar selection
- Regional situation
- 2nd Flowering
- Irrigation systems/amount
- Microclimatic conditions
- Warning systems? Weather stations.
- Litter removal
- Ground covers
- In vitro efficacy trials of fungicides and biocontrols
- What is the critical level of spores for infection
- Temperature/rainfall/relative humidity at blossom
- What part of the life cycle of the disease do we try to control?
- Understanding of the disease is essential
- Multi-year data collection project.

Orchard Biosecurity Manual for the Chestnut Industry

Version 1.0

October 2015

A manual for chestnuts growers

Reducing the risk of new pests entering and becoming established on your orchard

TABLE OF CONTENTS:

Six easy ways to protect your orchard

You have an important role to play in protecting your orchard and the chestnut 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 chestnut 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 chestnut 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 chestnut 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 chestnut 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 chestnut orchard and the chestnut 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.

farmbiosecurity

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 programs, 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 chestnuts (and other nuts) require 'evidence of absence' data for exotic and some endemic pests that are of their concern. The Australian chestnut 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 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 chestnut 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 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.

Chestnut 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 chestnuts.

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.

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 chestnut 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 chestnut pests spread in propagation material			
Effective monitoring/pest management program maintained			
No soil, plant material or insects left on equipment or in bins			
Chestnuts loaded and unloaded on paved or sealed pad away from production areas			
Fallen or waste chestnuts 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			
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			

Recommended practices	Yes	No	Comments
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 chestnuts			
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 chestnut pests transmissible in propagation material			
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 chestnuts 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:

		Endemic pests				Exotic pests			
Block	No. sites	Pest 1	Pest 2	Pest 3	Pest 4	Pest 1	Pest 2	Other pests found	Comments

If you see anything unusual, call the Exotic Plant pest Hotline on 1800 084 881

* Estimated infestation level (e.g. zero/low/med/high or % trees affected) of endemic pests and presence/absence of exotic pests should be scored

PESTS OF CONCERN

Pests:

The following are priority exotic pest threats for the Australian chestnut industry and all would have serious consequences should they be introduced. These are not the only exotic pests of the Australian chestnut industry. The severity of the impact may be dependent on rootstock-scion combinations and the presence/absence of pathogen vectors.

The climate of Australian chestnut 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 chestnut industry

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CHESTNUT BLIGHT

POTENTIAL ECONOMIC IMPACT – EXTREME

- Fungus – *Cryphonectria parasitica*
- Primary Host: *Castanea* spp
- Affects whole plant, leaves and stems.
- Environmental impacts due to host range including *Eucalyptus* spp.
- Continues to spread as a result of human activities.

CHESTNUT WEEVILS

POTENTIAL ECONOMIC IMPACT – HIGH

- Beetle – *Curculio elephas, Curculio auriger, Curculio rectus, Conotrachelus carinifer, Conotrachelus naso*
- Primary Host: *Castanea* spp
- Affects Nuts
- Up to 80% yield loss in Europe

ORIENTAL CHESTNUT GALL WASP

POTENTIAL ECONOMIC IMPACT – HIGH

- Chalicd - *Dryocosmus kuriphilus*
- Primary Host: *Castanea* spp
- Affects Buds
- Recent serious outbreaks

CHESTNUT MOSAIC

POTENTIAL ECONOMIC IMPACT – MEDIUM

- Virus
- Primary Host: *Castanea* spp
- Could be *Apple mosaic liavirus virus*

CRYPTODIAPORTHE CANKER

POTENTIAL ECONOMIC IMPACT – MEDIUM to LOW

- Fungus – *Amphiporthe castaneae*
- Primary Host: *Castanea* spp

CHESTNUT CODLING MOTH

POTENTIAL ECONOMIC IMPACT – MEDIUM

- Moth (LEPIDOPTERA) – *Cydia splendana*

CHESTNUT MOTHS

POTENTIAL ECONOMIC IMPACT – LOW

High priority endemic pests of the chestnut industry

Bacterial blight

POTENTIAL ECONOMIC IMPACT – HIGH

- Bacterium – *Xanthomonas arboricola* pv. *corylina*

POTENTIAL ECONOMIC IMPACT – HIGH

-

POTENTIAL ECONOMIC IMPACT – HIGH

-

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.

POTENTIAL ECONOMIC IMPACT – MEDIUM

-

POTENTIAL ECONOMIC IMPACT – HIGH

-

High priority endemic post harvest pests of the chestnut industry

Moulds

POTENTIAL ECONOMIC IMPACT – HIGH

- Mould – *Aspergillus flavus and Aspergillus parasiticus*
- Can produce the toxin aflatoxin.
- Postharvest handling has a major influence on chestnut mycroflora
- Hot humid conditions can lead to mould growth on the nuts and to a high level of aflatoxin.

Appendix 8: 2014 February Field Day IDO Presentation

The Presentation can be accessed on www.chestnutsaustralia.com.au

Appendix 9: Chestnut Biosecurity and Orchard Sanitation Presentation at the November 2014 Conference

The Presentation can be accessed on www.chestnutsaustralia.com.au

https://www.chestnutsaustralia.com.au/images/2013pdf/biosecurity14.pdf

Appendix 10: Presentation at the February 2015 Conference titled 'Review of Phytophthora Root Rot of Chestnuts'.

The Presentation can be accessed on www.chestnutsaustralia.com.au

https://www.chestnutsaustralia.com.au/images/2013pdf/phytophthora.pdf

Appendix 11: Tech Note on Copper Suplhate

TECH NOTE

COPPER SULPHATE – Degradation

MELPAT INTERNATIONAL PTY. LTD.
ABN 18 066 067 507

There are good storage conditions and there are bad storage conditions.

Poor storage conditions will result in a deterioration of the product quality.

Copper Sulphate Pentahydrate contains five molecules of water for every molecule of copper sulphate: i.e.: $CuSO_4.5H_2O$.

When subjected to heat, anhydrous copper sulphate forms. When heated to 63°C, it loses two molecules of water followed by an additional two molecules at 100°C.

Melpat Copper Sulphate contains an anticaking agent and this will perform only whilst the product remains intact. Once the crystalline structure is altered through water loss, the anticaking agent will no longer function and lumps will form.

It is **not** advisable to double stack pallets of Copper Sulphate. There is also a relationship between double stacking, temperature and an adverse effect on the crystal.

In the case of double stacking, the caking action starts at a lower temperature. Compaction can also lead to a greater amount of "powdered" product.

It is therefore very important that correct storage conditions prevail, i.e. single stacked pallets in a cool, dry, well ventilated warehouse, and out of direct sunlight, especially during the Spring/Summer periods.

Regards,

Hamish Turner
Director/Technical & Product Development
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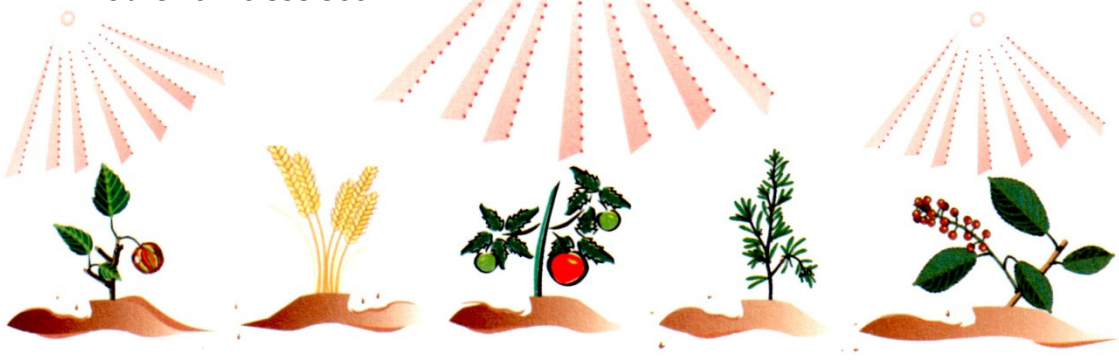
Mobile: 0420 855 500



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Appendix 12: DRAFT Cool Chain requirements on farm bulletin

GROWER CHESTNUT COOLING:

- Forced air cooling is extremely effective at reducing temperature of chestnuts without increasing moisture loss.
- Hydro-cooling works OK, but immersion time is important
- Cooling in an unlined bin may be OK, especially if ventilation pipes are added
- Warm chestnuts should NEVER be placed in a lined bin.

Freezing

- Development of freezing damage is a factor of TIME not just TEMPERATURE
- Freezing symptoms include:
    - Rancidity
    - Discolouration
    - Weight loss
- It appears that NO damage occurs in chestnuts stored at - 1°C
- Slight damage occurred to some chestnuts that are stored below - 2°C
- Moderate damage occurred when chestnuts were stored below - 3°C
- Most chestnuts that are stored below -4°C will be damaged
- All chestnuts stored below -5°C, even briefly, will be damaged

Chestnuts can take several days to fully re-cool after packing if inside a bag at the centre of a pallet.

Appendix 13: DRAFT Cool Chain requirements through the Supply Chain

SUPPLY CHAIN MONITORING – DOMESTIC

Introduction

Trials during 2014 found large differences in cooling rates when different methods were used. Room cooling in bins was extremely slow, although the process could be improved by adding ventilation pipes to increase air circulation through the stack. In contrast, forced air cooling chilled harvested chestnuts can be done within 2-3 hours.

The 2014 work also demonstrated that freezing damage could occur if chestnuts were stored at -2°C or less, and was a certainty if temperatures fell to -5°C. However, few obvious differences occurred if chestnuts were stored between 0 -5°C, at least for shorter periods. This suggested that storing chestnuts at 0°C would maintain quality while using less electricity (and incurring less risk) than the current industry practice of storing at -3°C.

Implementing these practices on farm has the potential to improve storability of harvested chestnuts.
However, it was not known what could occur once chestnuts left the farm gate.

As a smaller volume crop, chestnuts are usually transported with other fruit or vegetables. Truck temperatures may be adjusted to suit those other goods, which may be higher or lower than the ideal temperatures for chestnuts.

At the start of the 2015 season a shipment (or possibly several shipments) of chestnuts arrived at the Sydney wholesale markets with temperatures in excess of 30°C. This suggested that not only had the shipment been left unrefrigerated during transport, but that heat of respiration inside the tightly packed bags had further increased temperatures.
Incomplete cooling before transport may have also contributed. Discussions with wholesalers indicated this was not an isolated event, with a similar issue also occurring in Perth.

Although the Sydney wholesaler re-stacked the bags on arrival to facilitate cooling, temperatures likely remained well above 5°C for several hours or possibly days. Even a relatively brief exposure to such high temperatures could increase mould growth, significantly reducing quality and shelf life.

This project was therefore developed to monitor a number of supply chains, examining temperatures of chestnuts from the time they left the farm.

TRANSPORT:

Temperatures can be highly variable depending on the position of the nuts in the truck.

Temperatures during transport generally appear to be between 5 and 12 °C but have been recorded as high as 22°C.

MARKETS:

Long term storage in cool store optimised and stable conditions.
Chestnuts not always placed straight into cool rooms on arrival
Market stand to cool room fluctuations are regularly greater than 10 °C

Conclusions

Chestnuts packed inside sacks which are then stacked at the centre of pallets are extremely slow to cool during subsequent storage and transport. Under these conditions, self heating has the potential to become a major issue: respiration by the chestnuts increases temperature, which increases respiration, creating a positive feedback loop and escalating the problem. It

seems likely that this is what caused the high temperatures of some consignments of chestnuts when they arrived at the markets.

The polypropylene sacks which are used to pack chestnuts are not ventilated and, unlike the vented cartons commonly used for other products, do not allow airflow through a packed pallet. While they are a cheap and effective packaging material for cold chestnuts, care must be taken to re-cool chestnuts that have warmed during packing – perhaps by delaying full palletisation of a shipment, or increasing the rate of airflow across pallets.

The results also show that high temperatures can be experienced during transport. Transport temperatures were well over 5°C within the two longest supply chains monitored, to Brisbane and Perth. Chestnuts warmed up during transport in five of the six chains studied: only the transporter used by Farm E kept chestnuts fully chilled until delivery to market. There was evidence that the cooling system inside trucks was turned off at times, while product that spiked in temperature due to trans-shipping was slow to re-cool.

Finally, significant temperature fluctuations were noted during display at wholesale, as products were moved in and out of cool rooms. There is no easy answer to this issue, as clearly product must be placed on display in order to be sold. Minimizing stock on display and ensuring good stock rotation can reduce overall damage to any single consignment.
Moreover, keeping chestnuts cold up until this point will help ensure they are still fresh and mould free during display at wholesale and retail.

Recommendations

- If chestnuts warm during packing, care must be taken to thoroughly re-cool packed products. This may involve spreading bags out in the cold room rather than palletizing, or increasing air circulation around and through the stack.
- Temperature data loggers are increasingly cheap and easy to use. Single use loggers may be downloaded directly through the Internet without the need for postage back to source. By investing in a few data loggers, growers can monitor temperatures in supply chains and ensure that their transport company is following agreed procedures. Temperatures should be monitored inside bags, and preferably inside fruit, rather than external air temperatures.
- Promotional opportunities are likely to be better with independent retailers than with major supermarkets. Encouraging retailers to offer hot roasted chestnuts to customers has the potential to greatly increase sales.
- It is strongly recommended that the industry investigate options for packaging chestnuts for retail sale. Some greengrocers already pack chestnuts in bags, so packaging is acceptable to consumers. Packaging allows provision of information on variety specific preparation and cooking directly to consumers. It could help enhance the visual impact of chestnuts in supermarket displays, increase the volume of individual sales and possibly help protect chestnuts from poor handling and display conditions.
- Packaging options should initially be tested with both retailers and consumers to ensure they maximize their 'value add' to chestnuts.

Appendix 14: DRAFT Cool Chain requirements in the Retail Sector

RETAIL DISPLAY AND QUALITY OF CHESTNUTS:

INTRODUCTION:

Chestnut growers take great pride in the quality of their product. As an annual crop with a short marketing season of only a few months, it is essential to keep chestnuts fresh and appealing as they move through the supply chain. Only by ensuring that chestnuts are excellent quality at retail can the industry maintain or increase demand for their product.

Previous research has examined harvest and postharvest practices on farms. The supply chain monitoring activities identified that a number of breaks commonly occurred in chestnut cold chains.
However, the effect of such practices on retail quality was not well understood. Moreover, although chestnut sacks and cartons carry labelling stating they should be kept as cold as possible, retailers may not understand or follow these instructions. Even if everything else has been optimised, poor retail practices can potentially undo earlier efforts to optimise handling of chestnuts.

A recent study was undertaken to provide initial information on the type and quality of displays used for chestnuts in the retail sector - supermarkets and independent retailers.

Although by no means comprehensive, the aim was to identify whether there is an issue with retail displays, and whether there is potential to increase sales of chestnuts through improving their management at retail.

Display temperature

Some retailers were keeping chestnuts refrigerated, either in a wall cabinet or on a flat but refrigerated shelf display. In contrast, other retail stores surveyed were not using refrigerated display units for chestnuts. As a result, chestnut temperatures varied quite dramatically across retailers from 5.7°C to 13.8°C

The Chestnut industry recommends that all chestnuts displayed by retailers should be in or on refrigerated units/shelves.

Display format

Retail displays vary from a single small box or tray through to larger displays, with most being medium (A3 size or tray) or even larger. A number of retailers were using chestnuts as a focal point within the store, making the most of them as a seasonal point of interest to attract consumer attention

Because some retailers were keeping the chestnuts refrigerated, they were often in a box on the wall, so could be hard to spot on first inspection of the store. Chestnuts inside the box were largely hidden from view by the box itself and products on the shelf above but this type of display is certainly functional.

Quality of chestnuts

In most cases, chestnuts sold through the major retailers were of good appearance, or OK, with only a few recorded as being poor quality.

The larger size of the displays may have meant a lower rate of turnover. Combined with the lack of refrigeration this meant that some of the fruit on display had distinct mould growth on both the hilum and over the surface of the shell (Figure 1).

Figure 1 -- Chestnut quality at independent greengrocers varied from excellent (top) to poor (centre and base).

Packaging

Packaging chestnuts in net bags appears to be acceptable to consumers and is already used by some retailers.

Packaging offers an opportunity to provide information on variety, preparation and cooking method directly on every pack. Using this method could be particularly relevant to those retailers, who may lack the flexibility and specialised attention needed to increase sales of a seasonal and possibly unfamiliar produce category.

Packing into 500g or 1kg units may also help increase the volume of individual sales.

It appears unlikely that packaging would negatively impact on chestnut quality compared to the open displays currently used.

However, trials should test the effect of packaging system on chestnut quality – particularly if punnets are to be used, as this could possibly increase mould growth. Conversely, packing into punnets could help protect chestnuts from poor handling and/or display conditions by keeping humidity high and allowing ventilation of packed fruit.

It would also be useful to test different types of packaging with consumers, to ensure that instructions are clear and easily understood, and the packaging used adds value to the product.

Conclusions

The major retailers proved to be a reliable source of 'good' to 'OK' quality chestnuts. Fruit were kept refrigerated and sold at a reasonable price. However, displays were generally small, with low visual impact. In many cases the consumer would have to search for chestnuts in order to find them within the fresh produce section, as the produce on offer was not clearly or prominently displayed.

Independent greengrocers were highly variable, with chestnut quality ranging from 'excellent' to 'poor', with all qualities in between. Some of their displays were large, elaborate, and showed considerable care and effort. They clearly aimed to attract the consumers' attention to a special, seasonal product. Several were selling chestnuts in 1kg net bags, ready for consumers to take away. Some of the fruit available was lower quality, but in most cases prices had been reduced to reflect this.

It is not known what proportions of chestnuts are sold through independent grocers compared to the major supermarkets. However, it appears that greengrocers are more able to take advantage of a seasonal product than the major retailers, who tend to be locked into a standard pattern of displays and pricing. This suggests that targeting independent greengrocers through offering opportunities to promote chestnuts, display ideas, and even chestnut roasters could significantly increase sales. It is noted that Fresh Produce Group has already started this process, providing chestnut roasters to a number of independent greengrocer customers in suitable areas of Sydney.

Appendix 15: Technical Bulletin – 'Biology and Management of Nut Rot of Chestnuts'

PEST AND DISEASE INFORMATION BULLETIN

BIOLOGY & MANAGEMENT OF NUT ROT OF CHESTNUT

Chestnut Rot is a significant problem facing the Australian chestnut industry. Symptoms manifest as brown lesions on the kernel of the chestnut. The disease is often not visible externally, providing a challenge for growers and consumers alike.

A fungus named *Gnomoniopsis smithogilvyi* sp. nov. was identified living on decaying chestnut burrs and branches, was isolated from diseased chestnut kernels, and was isolated as an endophyte from asymptomatic chestnut flowers, leaves and stems.

Orchard sanitation is key to Chestnut Rot management. Targeting infected burrs by removal or placing a thick layer of organic mulch over top to block ascospores are options. Growing a range of varieties is recommended to spread out the flowering times of the chestnut trees and reduce the risk of floral infection.

The findings of this study show the key to reducing the incidence of Chestnut Rot is through improved orchard hygiene. Perithecia and ascospores of the Chestnut Rot organism were found growing as a saprophyte on decaying burrs on the orchard floor. Ascospores were determined as the primary source of inoculum in the infection of chestnut flowers, leaves and stems in December. Targeting the perithecia and ascospores on burrs is therefore critical for controlling the disease.

Recommendations for targeting infected burrs include:

Removal of burrs from the orchard floor
Removing and disposing of the primary source of inoculum will reduce the infection of chestnut flowers during the flowering period.

Mulching over top of burrs
Placement of a thick organic compost layer over top of the burrs to provide a physical barrier to ascospores. Organic mulches have also been found to contain antagonistic microbes that reduce the activity of pathogens such as *Phytophthora cinnamomi* Rands (You and Sivasithamparam 1995). This method has been particularly successful with *Persea americana* Mill. (Avocado) (You and Sivasithamparam 1995). Perithecia and asccospores are microscopic, and can exist on very small fragments of decaying burrs and branches. Therefore the layer of mulch would have to be thick enough and evenly spread enough over top of burrs to have a significant effect on blocking ascospore movement.

Watering burrs during non-conducive periods
Watering dead burrs on the orchard floor during non-infective periods may be an option for growers to reduce ascospore frequency during the flowering period. Research by Mondal et al. (2003) with *M. citri* found that ascospore release can be advanced by irrigating frequently during dry, non-infective conditions stimulating ascospore release when environmental conditions are unfavourable for infection.

Biological control
Biological controls and antagonistic fungi such as *Trichoderma* and *Gliocladium virens* Mill. Giddens and Foster have been found to reduce the activity of chestnut diseases such as *Cryphonectria parasitica* (Chestnut Blight) (Arisan-Atac et al. 1995) and *Phytophthora* Root Rot (Chambers and Scott 1995). *Trichoderma* based products are available in Australia including 'Tri-D25' which is a mix of *Trichoderma koningii* Oudem. and Trichoderma harzianum Rifai. (Zadco 2011). There is future scope to test the effectiveness of these control agents on *G. smithogilvyi*.

Variety selection
The results of this study show the selection of one variety over another is not the key to solving Chestnut Rot, even though variety selection has been previously advised (Rinaudo et al. 2009). The important commercial varieties (Decoppi Marone, Purton's Pride, Red Spanish) sampled in the 2008 and 2009 orchard and market surveys were all affected by Chestnut Rot. A more effective method is to plant a diversity of varieties that flower during different periods. This staggers the receptivity period of chestnut flowers and reduces the probability of an epidemic. If only one variety is grown, or varieties that flower at the same time, there is potential for the pathogen to infect all trees if the environmental conditions are conducive, for example, heavy rainfall during the critical period of flowering. This strategy spreads the risk of infection to achieve an overall reduction, rather than eliminating the risk completely.

Fungicides
The use of fungicides on perithecia and ascospores is not recommended for several reasons. The environmental impact of fungicides on the microflora of the soil could potentially make the conditions more favourable to pathogens by reducing the presence and action of antagonistic and beneficial micro-organisms (Jenkins 2005; Schreiner and Bethlenfalvay 2005). Fungicides also place the pathogen under high selective pressure, with surviving offspring possessing fungicide resistance genes quickly being selected and passing the genes on to their offspring (Dekker 1986; Ma and Michailides 2005). The presence of the teleomorph indicates the potential for sexual recombination, a higher genetic diversity and hence a greater probability of resistance genes occurring in Chestnut Rot fungus populations.

The use of these recommendations will hopefully reduce incidence to the target of <10%.

FIGURES

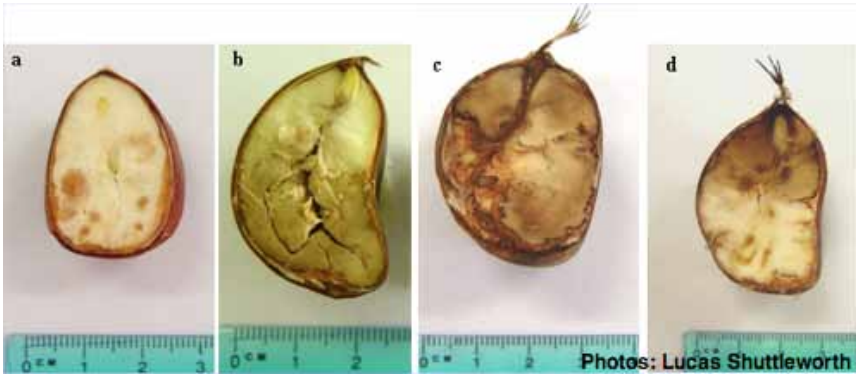

Fig. 1 Chestnut Rot symptoms. a=light brown spotting, b, c=medium brown rot, d=medium and dark brown rot.

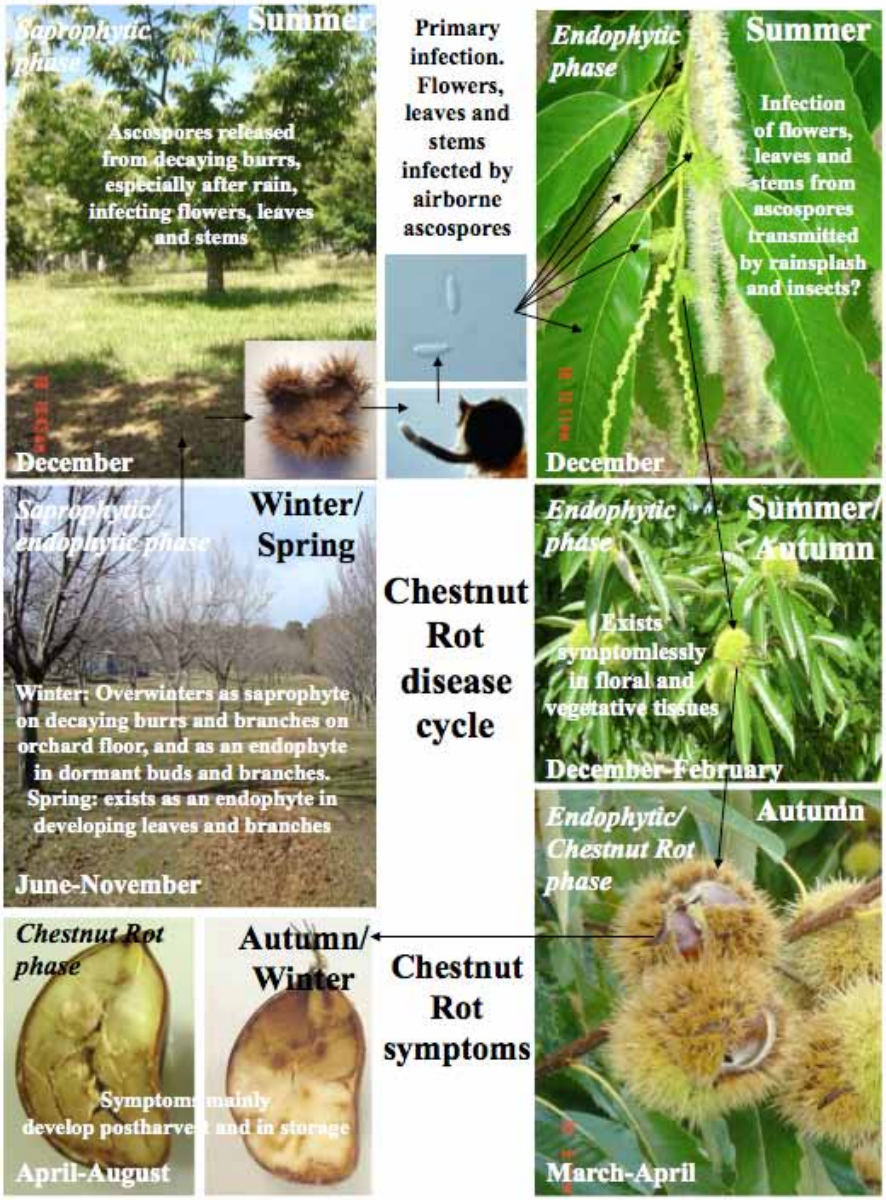

Fig. 2 The disease cycle of Chestnut Rot in *Castanea* sp. in South-Eastern Australia (Washington et al. 1999, Ogilvy 1998, Smith and Ogilvy 2008).

ACKNOWLEDGEMENT:

The information in this Technical Bulletin was extracted from the report *Biology and Management of nut rot of chestnut* prepared as part of Project CH07007
Authors: David Guest and Lucas Alexander Shuttleworth, The University of Sydney, New South Wales, December 2011.

Appendix 16: Bulletin – 'Chestnut Quality Assurance Requirements'

CHESTNUT QUALITIY ASSURANCE REQUIREMENTS:

The following are the Australian Chestnut Quality Parameters that should be adhered to:-

- Chestnuts need to be harvested every day or two, depending on temperature.
- Although chestnuts are durable compared with most other fruit, they are still susceptible to physical damage, surface mould development, internal rots and moisture loss / softening.
- Cooling chestnuts quickly, and keeping them cool, is a key to maintaining quality after harvest.
- To maintain quality and maximize shelf life, chestnuts should be cooled as soon as possible after harvest. This will also retain moisture within the fruit; while products are warm, they are losing water.
- The best way to reduce moisture loss is to cool chestnuts quickly. Once they are cold (zero), chestnuts will lose moisture extremely slowly, if at all.
- Internal and external moulds and rots are the most serious postharvest issue for chestnuts, especially those stored for extended periods. Contamination can occur during growth and at harvest but does not necessarily develop until after a period of storage.

Internal rots
Internal rots are a major issue facing the industry, the symptoms manifesting as brown lesions in the chestnut kernel. The disease is not externally visible and thus presents a challenge for growers and consumers alike.

Detection.
The majority of internally rotted fruit can be detected by putting them into water. Although some rotten fruit will still sink and some good fruit will float, this will help cull numbers of internally diseased fruit. Nuts sinking to the bottom of the tank can then be picked up either through direct suction or a mechanical conveyor.

Unfortunately some varieties are prone to floating, even when they are not internally diseased. This particularly includes 'easy peel' varieties such as Purtons Pride, which can contain internal air spaces. In some fruit up to 40% of such fruit may float, even though no internal disease is present.

To test nuts the following procedure MUST be undertaken with each batch harvested:

- Cut open a large sample (~100 fruit) and check for signs of internal decay.
- If <5% of fruit actually have internal decay, then place the fruit in the cold room.
- Select a further large sample (~100 fruit), keep for a week at room temperature, then cut open and check again for signs of decay.
- If rates of internal decay are low (<5%), and fruit show no external signs of rots, then pack as normal.

Chestnuts should be checked by cutting a sample as a standard quality assurance process.

Sanitisers.
External moulds are a common issue with chestnuts, particularly on the hilum area. The most common way to control these moulds is by using a sanitiser.
These are generally cheap and easy to use. Sanitisers kill mould spores on contact, but they do not provide residual or systemic protection. For this reason, some growers have found it useful to re-dip fruit during long-term storage, especially if mould spots start to develop on the fruit hilum. Keeping the packing area, bins and storage room clean is essential to prevent re-infection of the fruit.

Quality standards
Chestnuts sent to market should be mature, sound, clean, well formed and free of physical damage or rots and moulds. Chestnuts that have bird pecks or splits or are poorly formed, dried out or immature should be discarded.

Growers who send defective fruit to market will not only have their own fruit rejected but may also damage the reputation of the industry as a whole. Particular care needs to be taken in years when rain has occurred during blossoming, potentially resulting in high levels of internal rot. In years when chestnut rot is prevalent, give strong consideration to not harvesting rot-prone varieties.

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Appendix 17: Chestnut Nut Rot update

CHESTNUTS AUSTRALIA INC

REPORT ON NUT ROT

OVERVIEW:

The Executive Committee and the major growers were aware, early in the season, of the nut rot problem with the 2016 crop.

The initial response, by CAI, was to prepare a package of information and distribute to the growers with a particular emphasis on cutting nuts and leaving nut samples in the packhouse, out of cold storage, and assess how they reacted.

This issue has gained much reaction across the industry and through the supply chain as seen by the retail and consumer responses that have already been tabled:-

- Consumer reaction in WA
- Consumer reaction through Facebook as supplied by Harris Farms
- Nut purchase and cooking by Corrine Jasper
- Retailers indicating that they have stopped stocking chestnuts due to the quality problem
- Frustrated market agents.

It is obvious that the major problem has been with the early season nuts but there is still some nut rot in the later varieties but not to the same level.

As I am aware there were problems with nut rot at the end of the 2015 season reported to be due to the wetter weather. My personal assessment is that there has been a significant carryover of spores in the orchard and in the trees and with the right climatic conditions at the beginning of the 2016 season the disease(s) have exploded. With limited or no controls available there has not been any/much pre-season treatments and maybe orchard sanitation has not been sufficient.

My other assessment is that many growers are not undertaking their own quality assessments at the time of harvest and did not pick up the high levels of nut rot before sending nuts into the supply chain. Alternatively they were aware of the problem but still decided to send poor quality nuts

A list of growers whose product was in the markets at the time of my visits has been prepared and will be discussed with the Communications Officer to see who is a member and who is not. We will then look to communicate the issues with the non-members.

A sample of April Gold nuts was sourced from a grower and the nuts have been given to SARDI for cutting, assessment and pathological testing. The grower had some very substantial nut rot.

Based on some discussions with both agents and the growers substantial quantities of rotten nuts have been disposed of.

There is a range of issues right across the supply chain and it is necessary to work on each area and put some positive actions in place through some or all of the following recommendations.

RECOMMENDATIONS:

a) Further investigate R&D on the triggers for nut rot.

b) Develop a technical sheet on orchard sanitation as it relates to nut rot.

c) Establish an industry position on packaging – in particular sealed bags

d) Establish an industry position on pallet stacking.

e) Develop a nut rot session to take to specific growing regions between now and the flowering period.

f) Develop a set of protocols for harvesting in warm/hot conditions and also wet conditions.

g) Reinforce the cutting and reviewing of nuts at harvest by the grower and to give each batch a nut rot rating based on the % of nut rot found.

h) Establish an agreed industry position on the % of nut rot acceptable in a quality assurance program.

i) IDO to undertake a phone/visit interview with a number of growers to build an understanding of the flowering, growing and harvest period.

j) Establish and look to implement a Chestnut Industry Quality Assurance and certification program.

k) Look at other sources of funding and researchers to undertake some innovative research on how growers might better assess nuts with rot using some methods of sensory testing.

l) Consider recommending an orchard spray program with copper to help reduce the spore load.

SUMMARY:

The main issues that have come from the review of the 2016 nut rot problems are:-

- Varieties
- Understanding the triggers at flowering
- Understanding the triggers in the orchard
- Management of unfavourable harvest conditions – warm weather and/or wet weather
- Over wintering of spores in orchards
- Orchard sanitation
- Growers cutting each 'batch' to develop a percentage of nut rot at harvest
- Growers undertaking in packhouse quality assessments
- Removal of internal nut heat in harvested nuts
- Storage of nuts after harvest/grading
- Growers cutting each 'batch' to develop percentage of nut rot prior to putting into the supply chain
- Packaging – what is best to minimise nut rot expression
- Packaging – poly bags, netted bags, breathing holes in bags, cardboard cartons, 'clam shells'.
- Pallet packing of bagged nuts
- Transport of nuts – temperature during transport
- Management of nuts at the wholesale markets
- Rejection of nuts at the market
- Transport of nuts to retailers
- Storage of nuts by retailers
- Display of nuts by retailers
- Returns by retailers
- Growers managing their supply chain

- Growers visiting the markets to inspect their nuts.
- Growers visiting the retailers to inspect their nuts
- Disposal of rotten nuts in the orchard
- Managing agent, retail and consumer reaction to poor quality nuts
- Chestnut Australia Quality Assurance program – development and implementation.

ACTIVITIES:

At the request of the CAI Executive Committee I visited the wholesale markets to look at the nut quality.

ADELAIDE: Tuesday 5th April 2016

- Visited a number of agents and inspected product

SYDNEY: Wednesday 13th April 2016 and Tuesday 3rd May 2016

- Visited the Sydney markets on Wednesday 13th April and discussed nut rot with Dave Phillpot. Visited a number of other market agents to discuss the issue and inspect product.

  Cut substantial number of nuts and took photos.

  During the time at the market I met with Joe Ekman (FPG) and Sue Dodd to discuss relevant issues relating to nut rot and marketing.

- Visited the Sydney Markets on Tuesday 3rd May 2016 and along with Brian and Jane Casey and Chris and Lisa Dikkenberg met with Dave Phillpot to again assess the situation with nut rot.

  Cut nuts and took photos

MELBOURNE: Friday 15th April 201

- Visited the Melbourne markets on Friday 15th April and discussed nut rot with Joe Petroro.
  Visited a number of other market agents to discuss the issue and inspect product.

  Cut nuts and took photos.

- Following the visit to the Melbourne market I obtained nuts from a grower supplying the Melbourne market who had major nut rot problems and nuts rejected.
  Sample of nuts were taken to the pathologist at SARDI for testing and plating out.

ISSUES:

The following are some of the issues found both from discussions with growers and the agents:-

a) The early season varieties had the most problems with nut rot and while the later varieties appear to be better there were still examples of nut rot. Some of the worst appeared to Bouche,

Premium, Buffalo Queen, Menzies and April Gold.
Red Spanish and Purtons Pride appeared to be better and the latter ones appeared to have less rot.

b) Growers felt that one of the major problems was the warm period during nut fall and harvest.

c) Material coming into the market often had high temperatures – above 20°C.

d) Packaging of bags on the pallets are too high resulting in high temperatures being generated in the middle of the pallet. Some agents are restacking the pallets at a maximum of three high to reduce the problem.
Need air movement through the pallet or consider adding ice/frozen water bottles in the middle of the pallet.

e) The normal style bag with no air holes causes nuts to sweat particularly if the temperature is already high in the nut.

f) Some growers appear to be sending nuts to the market on 'speck' and expecting the agent to sell them.

g) Given the high level of nuts in bags, with nut rot, the assumption is that the growers are not undertaking their own quality assurance before sending the nuts. Saw bags that had only just arrived in the market with up to 50% nut rot based on nuts cut.

h) Some agents had one supplier ONLY and some were supplying in mesh bags and appeared not to have problems.

i) Agents losing retail customers and receiving very abusive/aggressive reactions from both retailers and consumers. This has forced demand and price downward.

j) Retailers have had nuts for a week stored at 4°C and were bringing them back for refunds due to the high level of nut rot.

k) Agents became frustrated and started to send nuts back to the growers.

m) Split nuts being supplied and often sold as 2nd's.

n) Growers not communicating with their agents and informing them of the problems.

o) No carryover of 2015 nuts so all the problems are with the 2016 harvest.

p) Some agents have a preference to 5 kg cartons rather than 10 kg bags.

q) Discussions with Joe Ekman from Fresh Produce Group indicated that they had not had rejections from Woolworths or Coles (at the point of the visit to the market).

r) While not specific to nut rot there are growers still sending nuts into the markets in plain bags and no or hand written information on the bags.

s) Surface mould seen on nuts in both bags and boxes.

t) Transport issues moving nuts to other markets – Adelaide, Perth.

u) Floating is not a full proof method for removing rotten nuts from the processing line.

PHOTOS:

Mould

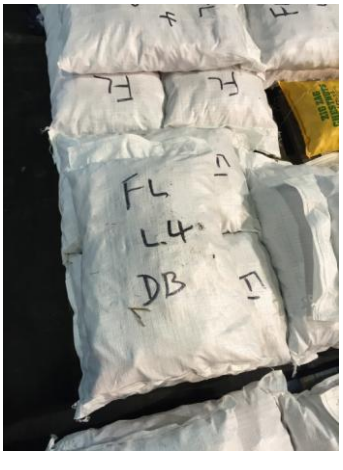
MOULD IN CARTONS

NUT ROT

SPLIT NUTS

SWEATING IN THE BAG

POORLY MARKED BAGS – NO AIR HOLES



Appendix 18: Technical Bulletin – 'Current Chemical options for Australian Chestnut Growers'

PEST AND DISEASE INFORMATION BULLETIN

CURRENT OPTIONS FOR AUSTRALIAN CHESTNUTS

PESTS AND DISEASES OF CHESTNUT

Whilst a number of pests and diseases can be found in chestnut orchards, the impacts on the crop are usually not great.

No insects or weeds have been listed as priorities for control or for action, although the use of the herbicide, carfentrazone to control sucker growth is being considered a priority tool.

Surface moulds are a high priority for post-harvest control and this is currently achieved with dipping. Three alternate agrichemicals are available via permit and the industry would like an additional option pursued via permit.

Phytophthora root and trunk rot is a high priority for control in chestnuts. There are few chemical options for control and it is important to maintain the use of phosphorous acid, currently under permit.

Phomopsis nut rot is only a low priority for control. Nevertheless greater knowledge of the disease and the most suitable control options is needed.

Vigilance is required to keep disease out of the crop. Awareness of potential problems, monitoring and implementation of sound cultural and hygiene practices will help to keep problems to a minimum.

The industry was threatened by the exotic disease, chestnut blight, over the last few years and quickly implemented measures to eradicate the disease. The steps taken appear to have been effective and it is hoped that eradication can be declared in 2016.

A permit is in place for the use of copper to control chestnut blight (although the major method employed in the eradication program was culling of infected trees).

FUNGICIDE OPTIONS FOR DISEASES OF CHESTNUTS

Pest	Active Constituents	Crop / comment	Chemical group	WHP, days
Brown rot (Blossom blight) (*Monilinia* spp.)	Penthiopyrad (FONTELIS^)	Chestnuts	7	14
Chestnut blight (*Cryphonectria* parasitica)	Copper [G] (PER13273, exp Mar 2017)	Chestnuts	M1	1
Phomopsis nut rot (*Phomopsis castanaea*)	Phosphorous Acid [G] (PER11979, exp Jun 2015)	Chestnuts	33	30
Phytophthora root and trunk rot (*Phytophthora cinnamomi*)		Chestnuts	33	30
Soil borne diseases (including *Fusarium* and *Verticillium* wilts, *Rhizoctonia, Pythium*)	1,3-Dichloropropene, +Chloropicrin [G]	Nut crops, pre-plant only	-	-
Surface moulds	Chlorine [G] (PER13640, exp Oct 2017)	Chestnuts, post-harvest	-	-
	Fludioxonil (SCHOLAR^) (PER13375, exp Oct 2017)		12	NR(H), 2(G)
	Peroxyacetic acid + hydrogen peroxide (PERATEC PLUS^) (PER12507)		M	NR

[G] Generic product, numerous trade name products

NR = Not required

INSECTICIDE OPTIONS FOR CHESTNUTS

Pest	Active Constituents	Crop / comment	Chemical group	WHP, days
Aphids	fatty acids - K salt [G]	Nut trees	-	NR
Mealybug				
Mite - Two spotted, spider				
Thrips				
Whitefly				
Fruitflies	Spinosad (SUCCESS^)	Nut crops	5	NR
Locust - Australian Plague	Chlorpyrifos [G] (PER13642, exp Aug 2017)	Tree nuts	1B	30(H), 2(G)
	Maldison [G] (PER13642, exp Aug 2017)	Tree nuts	1B	NR(H), 2(G)
Plant parasitic nematodes, symphylans (Garden centipedes), Wireworms	1,3-Dichloropropene + Chloropicrin [G]	Nut crops, pre-plant only	-	

[G] Generic product, numerous trade name products

NR = Not required

HERBICIDES REGISTERED FOR CHESTNUTS

Pest	Active Constituents	Crop / comment	Chemical group	WHP, days
Broadleaf and grass weeds	Glufosinate-ammonium [G]	Treenuts	N	NR
	Glyphosate [G]		M	
	Oxyfluorfen [G]	Treenuts	G	NR(H), *(G)
	Paraquat + diquat [G] (registrations and PER11731, exp Mar 2015. Formulations containing one or both of these active ingredients are available on registration under an orchard general registration. Industry doesn't need to renew the permit).	Chestnuts	L	1(G), 7 (graze horses), 3 (slaughter interval)
	Pendimethalin [G]	Nuts	D	NR
Broadleaf weeds 14(G)	Carfentrazone-ethyl [G] (SPOTLIGHT^)	Treenuts	G	NR(H),
Sucker control				
Broadleaf weeds	Isoxaben (GALLERY^)	Nut trees	O	NR
Grass weeds	Haloxyfop-P as methyl	Nut trees	A	NR

[G] Generic product, numerous trade name products

NR = Not required

* Do not graze or cut for stock food

Appendix 19: Technical Bulletin – 'Chestnut Bubbly Bark'

INFORMATION BULLETIN

BUBBLY BARK IN CHESTNUTS

What is Bubbly Bark?

Bubbly Bark is a condition of Chestnut trees characterised by bubbling and softness of the bark; poor bud development or bud death; wilting and dying of branches or the tree, usually above the graft.

History

Bubbly Bark was first noticed in north-east Victorian chestnut orchards during the late 1980s, and was first reported in 1993. Initially it was of relatively minor significance, causing tree deaths or severe setbacks in tree health in several orchards, but on a relatively small scale across the industry. Periodic outbreaks were severe in some orchards and minor in others. In 2005 its occurrence has spread geographically and its effect on chestnut orchards was more significant. Some orchardists reported losses of hundreds of trees in a single season.

Three research projects over 3 years from 2004 were conducted by the Australian Chestnut Industry:

a) David Klinac, a noted New Zealand chestnut researcher was employed in 2004 to complete a detailed summary of all the possible causes.

b) In 2005 Plantation Development Services Pty Ltd from Bright, Victoria was engaged to conduct trials and identify any pathogens on affected orchards.

c) A further project by Erin Powell and Michael Brain also attempting to isolate a pathogen and testing copper and antibiotic treatments.

No conclusive evidence as to the cause or remedy for Bubbly Bark was found

Impacts of Bubbly Bark

In most years Bubbly Bark has little or no impact on the chestnut orchards. The cumulative losses reported by growers in 2005/2006 indicate that affected growers lost about 3.4% of their total number of trees. The loss varied between growers from less than one per cent to about thirty per cent. The loss of trees in the most affected areas of orchards was up to 48%, with losses averaging 22%. The rate of symptom display can be very high, but tree losses may be low. At one site 97% of trees were affected, but only 4% of the trees had died.

Chestnuts Orchard Study

The 2005 study involved the monitoring of thirteen orchards during the 2005/2006 growing season, some with Bubbly Bark and others without. Growers were surveyed about the management practices and history of each orchard. To determine whether there are pre-disposing factors the following data was collected from the monitoring sites: Previous land use, rootstock variety, source of planting stock, pruning practice, soil texture, soil preparation for planting, weed control methods, herbicide use, fungicide use, nutrient analyses of foliage and soil, use of irrigation, slope, aspect, altitude, presence of native forest, apples, olives and other crops, andweather data from the Department of Sustainability's offices at Ovens, near Myrtleford. The data was analysed to identify any correlations with Bubbly Bark occurrence.

Pathogen testing on several samples selected from different sites was also conducted. In one case three two year old grafted trees with Bubbly Bark symptoms were potted up and transported to a glasshouse at a testing site and monitored for six months.

Further pathogen testing was completed during the Powell and Brain project.

Results

Many factors have been shown not to be correlated with Bubbly Bark incidence, including:

- Soil salinity,
- Soil nutrient levels of phosphorus, magnesium, potassium, sulphur, chloride, manganese, total nitrogen, copper, zinc, iron, boron, hydrogen, aluminium, calcium and sodium.
- Foliar nutrient levels of phosphorus, potassium, sulphur, chloride, manganese, total nitrogen, copper, zinc, iron, boron, aluminium, magnesium, molybdenum, calcium and sodium.
- Environmental factors including slope, aspect, elevation and adjacent vegetation.
- Management practices including irrigation, pruning, pruning intensity, weed control, use of glyphosate and previous land use.

Relevant observations include:

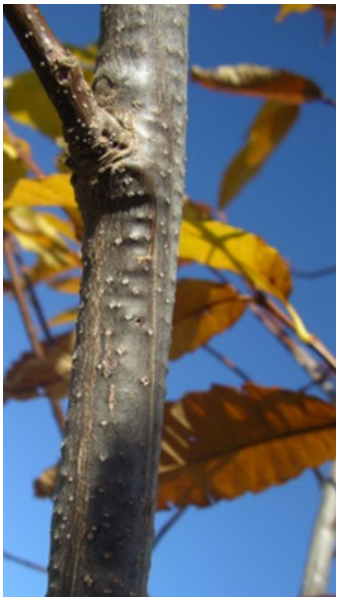
- Seedling trees rarely have Bubbly Bark; affected trees are almost invariably grafted trees.
- Many trees regrow from their base if the main trunk dies. It is rare for trees to reshoot above the graft. New shoots can grow in a healthy manner for over 15 years.
- Trees that are healthy in December do not contract the Bubbly Bark symptoms for the remainder of the growing season.
- Bark symptoms may be present in winter or early spring. Some of the affected trees may suffer bud death, while others may grow vigorously.
- It appears to affect all planted varieties to at least some extent.
- The age of trees affected is usually between two and ten years, and most commonly between two and six years. Older trees are infrequently affected.

Further Observations

- Bubbly Bark is most prevalent in spring when the July-October rainfall is high.
- Bubbly Bark is most prevalent in spring when the mean maximum temperatures for July-October are at their lowest.
- No pathogens have been found despite the study of over 25 Bubbly Bark infected trees and soils being sent to six pathology laboratories over a period of 16 years.
- Calcium soil levels and soil pH are significantly higher under Bubbly Bark affected trees compared to non-affected trees.
- Potassium levels are significantly higher in Bubbly Bark affected trees compared to non-affected trees.

CONCLUSION

Combining the results and observations it would appear that Bubbly Bark is a physiological response to certain environmental conditions, rather than a response to a pathogen.



Bubble effects on the bark of a young Chestnut tree.

A young Chestnut tree showing poor bud development and wilting leaves - typical symptoms of Bubbly Bark.

ACKNOWLEDGEMENT:

The information in this Technical Bulletin was extracted from the report *Investigation into pre-determining factors for Bubbly Bark outbreaks in chestnut orchards* prepared as part of Project CH05001

Original Author: Ray Borschmann, Bright for Chestnuts Australia Incorporated (CAI). Incorporating results from Horticulture Australia Limited (HAL) Projects CH05001 and CH06003.

Appendix 20 IDO Report – June/July 2016 'Nuts & Burrs' Newsletter

INDUSTRY DEVELOPMENT OFFICER REPORT – JUNE 2016

This is my last report in the capacity of the Industry Development Officer (IDO) for Chestnuts Australia Inc. During the period from the 1st January 2014 through to the 27th June 2016 I have had the opportunity and pleasure to work with and for the Australian Chestnut Industry in the role of IDO. The project, funded through chestnut levies and matched funds from the Australian Government, has concluded.

There are many issues facing the industry but for me the areas of real concern are the problems with pests and diseases – either tree or nut related. The following is a short overview on some of the pests/diseases:-

NUT ROT:

I have spent much of the last six months looking at this problem and a short overview on Nut Rot can be found within this edition of 'Nuts and Burrs'. More detailed discussions will take place over the coming period, including at the Tri-Nut Conference. From that CAI will develop a more comprehensive NUT ROT program.

ASIAN WASP: (listed as threat to UK's sweet chestnut trees)

The following article highlights the need for the Australian Chestnut Industry to be ever vigilant in relation to what products are brought into Australia that can also bring in pests like the Gall Wasp.

"An Asian wasp that threatens the UK's sweet chestnuts has been designated a high-priority tree pest for the first time.

The oriental chestnut gall wasp (Dryocosmus kuriphilus) was first found in the UK last year, in Farningham woods near Sevenoaks in Kent, and a street in St Albans in Hertfordshire.

There are 268 pests on the UK Plant Health Risk register but just 12 are ranked as high priority because of their impact and likelihood, including the fungus that causes ash dieback, sudden oak death disease and the emerald ash borer.

While the wasp poses no risk to humans and pets, its larvae cause abnormal growths — the eponymous galls — on sweet chestnut trees. These can weaken the tree and leave it more vulnerable to other pests and diseases.

The galls protect the species from insecticides, so eradication efforts have so far concentrated on felling. Felling trees at the "isolated finding" in St Albans appears to have wiped the wasp out there.

The commission said other eradication measures could be considered, "In the long term there could be the possibility of using a parasitoid organism to achieve a measure of 'biological control', but this would need careful research beforehand to ensure that the control organism itself would not cause environmental damage."

Nick Atkinson, senior conservation adviser at the Woodland Trust, said: "The arrival of another pest in the UK reminds us how pathways are still open for these threats, which is also why it's so important for anyone who loves trees and woods to be vigilant and help identify possible outbreaks at an early stage.

"We hope this may be an isolated case but we need to do all we can, particularly at our borders, to prevent new pests or diseases establishing."

Officials are investigating how the wasp, which is already found throughout much of mainland Europe, arrived in the UK. A 2010 European Food Safety Agency assessment of the insect found that it was highly likely to spread throughout Europe but its impact could be mitigated through management."

NUT MOULD

A new chestnut mould, not previously identified in Australia, was detected during a post-harvest fungicide dipping trial on stored chestnuts.

The fungus is a common storage mould of chestnuts and is known to be distributed worldwide and predominately in America, Italy and the United Kingdom, plus Chile and New Zealand.

The fungus can be controlled with chemicals.

More details on this new Nut Mould will be distributed to growers through a technical Fact sheet in early August 2016.

CHESTNUT BLIGHT:

Over the past 30 months I have participated on the Chestnut Blight Consultative Committee for Emergency Plant Pests (CCEPP) and the National Management Group (NMG) as the CAI representative. During that time we saw the isolation of a number of new sites resulting in eradication of trees, major on-going surveys by the Victorian Department and activation of the Emergency Plant Pest Response Levy to cover industry's contribution to the eradication program.

Having been actively involved I can report that the Australian Chestnut Industry, CAI and the relevant industry representatives are held in high regard for the manner in which they have acted over the past 6 years.

Hopefully in the coming months all parties including CAI can say that we have eradicated Chestnut Blight from Australia. This will be a major achievement.

In conclusion I wish the industry well for the future. I am not sure if there is a role for me going forward within a R&D funded project BUT if not then I will look to take up a role in another capacity so that I can continue to work with CAI in retaining a strong Australian Chestnut Industry.

Trevor M Ranford B.Sc., Dip MP (AIMSA), Adv Dip Hosp (Wine Marketing), CPMgr.
Industry Development Officer, CAI.

Appendix 21: Technical Report – Nut Rot update. June/July 2016 'Nuts & Burrs' Newsletter

NUT ROT REPORT - 2016

CHESTNUT NUT ROT WORKING GROUP.
Given the seriousness of the Nut Rot problem Chestnuts Australia Inc (CAI) Executive Committee has endorsed the establishment of a special Chestnut NUT ROT WORKING GROUP (NRWG).
The Working Group will have a nucleus of the CAI R&D Committee, representatives from some of the larger producers and other growers who have been involved in the past with the problem.
Those involved in one way or another include:-

Chris Dikkenberg	Andrew Hall
Tom Roberston	David McIntyre
Richard Guthrie	Brendan Thompson
Simon Quilty	Joe Rinaudo

In addition the NRWG is building a support technical panel of Australian and International chestnut growers and researchers to assist and guide the industry in establishing some solutions to the disease.

Those involved from a technical point of view include:-

Barbara Hall (SARDI)	Dale Griffin
Lucas Shuttleworth	Richard Bennett
Alison Saunders	

The NRWG will be holding its first meeting on Wednesday 3rd August at Beechworth and will be utilising the wealth of information, data and technical reports to establish a NUT ROT implementation framework to decide on the appropriate trials, research and extension that needs to be undertaken.
As relevant information and planning is undertaken the members will be kept informed through regular e-mails, technical reports and the website.
Below is a short overview of the information gathering that I have done over the past six months.

OVERVIEW:
The Chestnut Industry was aware, early in the season, of the nut rot problem with the 2016 crop and the initial response, by CAI, was to prepare a package of information and distribute to the growers with a particular emphasis on cutting nuts and leaving nut samples in the packhouse, out of cold storage, and assess how they reacted.

This problem gained a strong reaction across the industry and through the supply chain as seen by the retail and consumer responses:-

- Consumer reaction in WA
- Consumer reaction through Facebook
- Retailers indicating that they have stopped stocking chestnuts due to the quality problem
- Frustrated market agents.

It was obvious that the major problem has been with the early season nuts but there was still some nut rot in the later varieties but, at times, not to the same level.

I was aware there were problems with nut rot at the end of the 2015 season as a result of the wetter weather. My personal assessment is that there has been a significant carryover of spores in the orchard and in the trees and with the right climatic conditions at the beginning of the 2016 season the disease(s) have exploded. With limited or no controls available there has not been any/much pre-season treatments and maybe orchard sanitation has not been sufficient.

My other assessment has been that many growers were not undertaking their own quality assessments at the time of harvest and did not pick up the high levels of nut rot before sending nuts into the supply chain.

Alternatively they were aware of the problem but still decided to send poor quality nuts.

Through a number of wholesale market visits and meetings/discussions with growers the main aspects to come from the discussions was the need to establish a multi-layered approach with a number of components being undertaken concurrently:-

a) Orchard Sanitation:
- Finalise a fact sheet utilising information from Lucas Shuttleworth's report.
- Offer some concepts for trialling – mulching, utilisation of urea, etc.
- Set-up some grower trials – design the protocol and then assist in the processes and data collection

b) Chemicals
- Assess the in-vitro trial work from SARDI on a range of possible chemicals
- Establish a set of trials that can be implemented on grower properties – requires a protocol to be established and then trials to be overseen and data collected.
- Seek emergency permit applications for any appropriate chemicals.

c) Biological management
- Assess the potential of Trichoderma
- Establish a set of trials that can be implemented on grower properties – requires a protocol to be established and then trials to be overseen and data collected.

d) Scientific investigation of the organism.
- Look at triggers of temperature, humidity and rainfall
- Gather more information on the endophyte cycle of the organism and whether it can travel in the tree.
- Look at the specific point of entry into the flower.

e) General data collection
- Specific data on the past season and growers experiences with the warm conditions at harvest.
- Concepts to counter the seasonal variations
- Linkages of experiences with weather station information

f) Cool Chain
- Finalise technical bulletins on the cool chain
- Reinforce the cool chain to all across the supply chain
- Data loggers in packages to measure changes in the cool chain
- Review of packaging
- Development an enforcement of industry standards on components like number of bags per pallet, method of stacking.

g) Harvest
- Set nut testing requirements – nut cutting, placing nuts in the normal environment to see what happens regarding quality
- Establish a recording template for use on each batch of nuts to recorded relevant data.
- Establish and promote the industry standard in relation to level of nut rot acceptable to the supply chain.

FROM A R&D PERSPECTIVE THE FOLLOWING ARE THE PRIORITY AREAS:-

SHORT TERM PROGRAMS

1. Data Collection of growers practices including level of nut rot and environmental conditions.
2. Orchard Floor trial
3. Tree trial
4. Orchard sanitation – IDO to prepare a Tech sheet and distribute to growers

MEDIUM TERM PROGRAMS

5. Establish correct timings of sprays based on the disease and the tree physiology/phenology.
6. Undertake in vitro efficacy trials on a range of chemicals and bio-controls including those used on pistachio fungi.
7. Establish the critical levels of spores to cause an infection and what the environmental triggers are for temperature, rainfall and relative humidity at blossom.

LONG TERM PROGRAMS

8. Investigate the use of weather stations and prediction models.
9. Scope a multi-year project that includes integrated replicated trials and random block controls.

PHOTOS:

Mould

NUT ROT

SPLIT NUTS

SWEATING IN THE BAG

Report prepared by:

Trevor Ranford
Industry Development Officer,
Chestnuts Australia Inc

27th June 2016

Appendix 22: MEDIA RELEASE- *"COOL YOUR (CHEST) NUTS"*

29th March 2015 IMMEDIATE RELEASE MEDIA RELEASE

"COOL YOUR (CHEST) NUTS"

Harvesting of the 1,000 tonnes chestnut crop has commenced in some parts of Australia and will continue through until late April.

"'Cool your (chest) nuts' is the one single message that the Australian Chestnut industry wants the complete supply chain to implement" said Mr Trevor Ranford, Industry Development Officer, Chestnuts Australia Inc.

Fresh Australian Chestnuts should be stored as near as possible to 0° C from 'Paddock to Plate'.

"Chestnuts have a thin skin and are encased in a shiny brown shell but unlike most nuts, chestnuts are highly perishable. Due to their high moisture content (50%) chestnuts can dry out even in a cool environment if not stored correctly" said Mr Ranford.

Chestnuts Australia Inc has just release a new poster on the Cool Chain requirements for chestnuts and is circulating the information to growers, transport companies, market agents and retailers.

"The simple message for consumers is to look for chestnuts that are stored by retailers in refrigerated units and then take them home and store them in airtight containers, paper bags or perforated plastic bags in the crisper section of the refrigerator" said Mr Ranford

Chestnuts Australia Inc has produced a number of new recipes for Chestnuts which are now available at your local retail store.

For information on Chestnuts consumers can go to the Chestnut Industry website – www.chestnutsaustralia.com.au

Trevor Ranford, Industry Development Officer, Chestnuts Australia Inc
Mobile: 0417 809 172 E-mail: sahort@bigpond.com

Tanya Edwards, Communications Officer, Chestnuts Australia Inc
Phone: 03 5751 1466 E-mail: admin@chestnutsaustralia.com.au

For more information or background material contact Trevor Ranford.
Information on the Chestnut Cool Chain is attached to this Media Release.

Appendix 23: Article for Fresh Plaza news

Chestnut campaign for customer awareness

Harvesting of the 1,000 tonnes chestnut crop has commenced in some parts of Australia and will continue through until late April.

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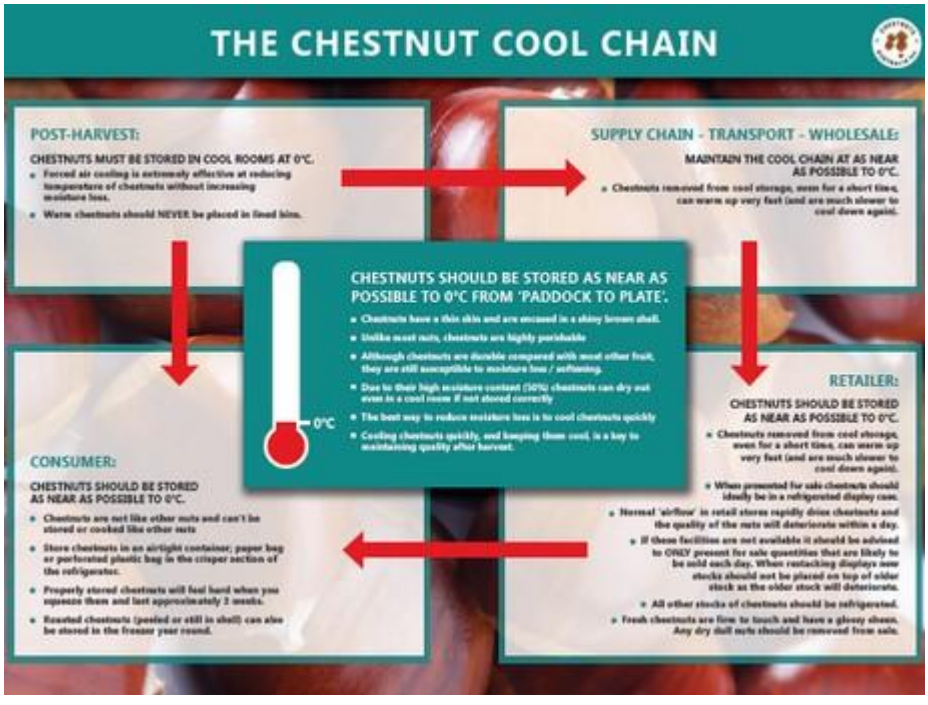

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Appendix 24: Chestnut Cool Chain Poster

THE CHESTNUT COOL CHAIN

POST-HARVEST:

CHESTNUTS MUST BE STORED IN COOL ROOMS AT 0°C.

- Forced air cooling is extremely effective at reducing temperature of chestnuts without increasing moisture loss.
- Warm chestnuts should NEVER be placed in lined bins.

SUPPLY CHAIN - TRANSPORT - WHOLESALE:

MAINTAIN THE COOL CHAIN AT AS NEAR AS POSSIBLE TO 0°C.

- Chestnuts removed from cool storage, even for a short time, can warm up very fast (and are much slower to cool down again).

CHESTNUTS SHOULD BE STORED AS NEAR AS POSSIBLE TO 0°C FROM 'PADDOCK TO PLATE'.

- Chestnuts have a thin skin and are encased in a shiny brown shell.
- Unlike most nuts, chestnuts are highly perishable
- Although chestnuts are durable compared with most other fruit, they are still susceptible to moisture loss / softening.
- Due to their high moisture content (50%) chestnuts can dry out even in a cool room if not stored correctly
- The best way to reduce moisture loss is to cool chestnuts quickly
- Cooling chestnuts quickly, and keeping them cool, is a key to maintaining quality after harvest.

0°C

CONSUMER:

CHESTNUTS SHOULD BE STORED AS NEAR AS POSSIBLE TO 0°C.

- Chestnuts are not like other nuts and can't be stored or cooked like other nuts
- Store chestnuts in an airtight container; paper bag or perforated plastic bag in the crisper section of the refrigerator.
- Properly stored chestnuts will feel hard when you squeeze them and last approximately 3 weeks.
- Roasted chestnuts (peeled or still in shell) can also be stored in the freezer year round.

RETAILER:

CHESTNUTS SHOULD BE STORED AS NEAR AS POSSIBLE TO 0°C.

- Chestnuts removed from cool storage, even for a short time, can warm up very fast (and are much slower to cool down again).
- When presented for sale chestnuts should ideally be in a refrigerated display case.
- Normal 'airflow' in retail stores rapidly dries chestnuts and the quality of the nuts will deteriorate within a day.
- If these facilities are not available it should be advised to ONLY present for sale quantities that are likely to be sold each day. When restacking displays new stocks should not be placed on top of older stock as the older stock will deteriorate.
- All other stocks of chestnuts should be refrigerated.
- Fresh chestnuts are firm to touch and have a glossy sheen. Any dry dull nuts should be removed from sale.

Appendix 25: Chestnut Presentation at the 2015 Australian Nut Industry Conference

The Presentation can be accessed on www.chestnutsaustralia.com.au

https://www.chestnutsaustralia.com.au/images/2013pdf/anc2015chestnut.pdf

Appendix 26: 2015 Production survey

CONFIDENTIAL

Chestnut Australia Inc

2015 Industry Survey

Statistical Information Request

How Can CAI help you? What happens if a disease affects my orchard? Why don't chestnuts 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 chestnut?

The Australian Chestnut 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.

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

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

CAI will be surveying all chestnut growers and processors and thank you in advance for your input into helping the Chestnut Industry grow and protect its members.

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

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

Chestnuts 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.

Chestnuts 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.

CONFIDENTIAL

Chestnuts Australian Inc

2015 Industry Survey

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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	Trees Planted	Area Planted
Red Spanish		
Buffalo Queen		
Purtons Pride		
De Coppi Marrone		
Bouche de Betizac		
Premium Delight		
Perfection		
King of the Valley		
MP2		
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 (tonnes)							

6. PROCESSING **Do you undertake post-harvest activities such:**

	Y/N	Total kilograms
Cooling		
Washing		
Drying		
Sizing		
Packaging		
Peeling		
Value adding (further processing)		

7. SALES

	YES	NO	PERCENTAGE
FARM GATE			
FARMERS MARKETS			
PROCESSOR			
WHOLESALE MARKET			
DIRECT TO RETAILER			
EXPORT MARKET			

8. 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:	**……**	

9. ON-FARM BIOSECUTITY PLAN/PROGRAM

Does the property run an On-Farm Biosecurity program (circle)?

YES NO

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

Email: sahort@bigpond.com
Post: 27 Ludgate Hill Road, ALDGATE. SA. 5154