Horticulture Innovation Australia

Final Report

Seed Potato Certification Review

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AUSVEG Ltd

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Executive Summary

Introduction

Good quality, healthy planting stock is the cornerstone of a sustainable industry. Therefore seed certification systems have been introduced to assure 'minimum quality', and for disease control. The disease control aspect has relevance for biosecurity and phytosanitary certification of quarantine regulated pests and diseases as well as non-quarantine pests and diseases.

Seed potato certification used to be delivered by state departments of agriculture as a service to their potato industry. Over the past 10 – 15 years, state governments have reduced services to agriculture and stepped back from all or most of seed potato certification services, depending on state department preferences. This development was a driver for the formulation of a National Seed Potato Certification Standard; the approved version was last published in 2007. Still, several regional or state based approaches to seed potato certification or quality management developed side by side to address the seed industry's requirements for certification services.

Some shortfalls of the National Standard and its interpretations that led to this review are:

- There is no National Framework to guide Seed Potato Certification, just a Standard
- Tolerances in the Standard do not use findings from established or more recent Australian research and development (R&D) on disease diagnostics
- Disease assessments, other than some virus testing, are usually done visually only
- The length of time between harvest and inspection affects the certification result but such time lag is not considered or stated anywhere
- Delivery of certification services relies on funding from seed potato growers; there is no or little independent oversight
- The current National Standard appears open to some interpretation and rules are being used inconsistently in each state
- More transparency about labelling and grading of seed potatoes appears to be desirable.

The above points and other preliminary assessments of the seed certification situation showed that a more in-depth and consultative review process would benefit all sectors of the potato industry.

Objectives

The intermediate aim of the review was to establish the requirement for:

- A national seed potato certification framework
- An alignment of standards, schemes and their delivery and/or
- Reasons for regional or industry sector based variations (e.g. processing, fresh markets, seed).

The ultimate objective, if supported by an initial industry consultation process, was to create a blueprint for a national seed potato certification framework that gives strategic and practical directions for the design and appropriate governance of seed certification that benefits all potato industry sectors nationally.

Methodology

The work included 2 stages. They were:

Stage 1 – Situation analysis and mandate to proceed to Stage 2 through an:

1. Investigation of seed production economics and supply chains via a desktop analysis and consultation
2. Examination of the role and delivery of seed potato certification via consultation
3. A 'buyer's view' appraisal and comparison of national and international certification standards covering disease tolerances via a desktop analysis
4. Approval from all industry sectors via the Industry Advisory Group (IAC) to move to Stage 2.

Stage 2 – Designing a national seed certification system via consultation and desktop analysis about good certification and standard development practice

Findings

From the **economic analysis** (Stage 1) we concluded that even if it were possible to produce a definite figure for the cost of production of certified seed, this would not represent its true value to a commercial grower. Growing a commercial crop from disease free seed as compared to using seed that caries disease, especially if it the disease can contaminate a paddock long term, has a enormous economic value. The value of not introducing diseases to a commercial crop and farm makes the cost of certification insignificant.

Many factors that affect the quality and performance of seed that is ultimately planted are independent from certification and cannot be solved by a certification scheme no matter how it is designed or delivered. Postharvest and production conditions as well as the management of a commercial crop can still produce poor results from certified seed that has been of good quality.

In order to get the full benefits from certified seed, certification has to be underpinned by production and post harvest management methods and a chain of custody that ensures original seed quality is maintained until planting. Major risk factors that are unrelated to certification or post harvest technology and which are often neglected include skills, knowledge, attitudes, levels of communication and organisational management, applied at each step along the supply chain.

The supply chain analysis (Stage 1) emphasised that business relationships ultimately determine seed potato supply chains and seed movements across ('open') state borders. The main types of relationships are described in this report.

Stage 1 consultation confirmed the importance of seed potato certification. Still, many commercial growers also use non-certified seed because they believe it is just as good as certified seed, or because the variety and physiological age they require is not available from their suppliers. We concluded that certified seed will have to show a significant advantage especially lack of virus infection compared to farm kept seed to be more widely used.

There was a general desire to improve several aspects of seed certification and all, independently of their opinion on certification, stressed the need for adequate custodianship of seed after harvest. Concern was raised about past changes to standards and or the process used to change them. Many

comments were made about possible improvements of certification delivery in addition to updating the standard itself. A need for integrity, consistency and transparency were often mentioned. A major suggested improvement was to use new technologies to objectively assess diseases. Many asked for independent oversight over certification, others would be content without it.

Concerns about a 'national scheme' mainly related to a loss of control over state specific issues and the loss of advantages a regional focus may have...

From the Stage 1 **review of the Australian and international standards** we concluded that the **National Standard** document and technical details it contains, especially those pertaining to disease tolerances, needed to be thoroughly reviewed, updated based on science and clearly defined so that they cannot cause confusion or misinterpretation. Scientific references must be given. Where a scientific basis for tolerances does not exist, the choice for selected tolerances has to be explained and an effort made to underpin them with science.

The Standard document itself needs to be presented and maintained according to good practice of 'standard writing' and be easy to understand. All procedures and technical details have to be explicit.

Apart from the review of all aspects of the Standard document, we advise a more detailed appraisal of state schemes and how certification actually operates in practice to ensure 'minimum standards'. This review would also identify all elements or rules from the National Standard that have been adapted or changed, and how and why this occurred (e.g. whether additions to virus/disease testing or tolerances have been applied to satisfy market requirements or other needs). It would also be beneficial to confirm what information is currently recorded and what is reported to seed buyers to understand whether interpretations of the Standards are consistent and transparent.

The National Standard and its delivery systems should then be reviewed at least biannually so that it remains current.

Minituber production assurance is not covered in the National Standard. This situation needs to be reviewed and rectified.

A National Standard has to sit under a framework that determines how it is administered and updated and which governance arrangements are in place for its application in different regions or states. It has to explain how it links with any regulatory bodies, as applicable. The framework has to ensure independence and transparency in all aspects of seed potato certification nationally. The Australian Seeds Authority Ltd (http://aseeds.net.au/) provides an excellent example of how seed potato certification could be set up and could operate in Australia.

Our partial comparison of **international standards** and the Australian Standard does not allow for an objective assessment on which standard would provide for better seed health than another one.

We concluded that given the current review of the "UNECE STANDARD S-1 concerning the marketing and commercial quality control of SEED POTATOES" 2011 edition, an in-depth comparison of international standards is not required for the purpose of an adjustment of the Australian approach to seed potato certification.

Australian representation with an UNECE working group is important because any updates to the Australian Seed Potato Certification Standard should endeavour to align with the UNECE standard S-1, including the requirement for 'official oversight' by a 'designated authority'. We believe this to be especially important for export development.

During Stage 2 consultation, more than 75% of respondents considered a uniform, transparent national seed certification approach as very important, and more than 15% believed it to be important. Most respondents provided a positive vision for a successful seed industry.

The main advice from a focus group consultation was to 'keep it simple', focus on the major disease issues and biosecurity concerns, and include accountability and some independent oversight. They did not want the Standard to incorporate anything that could affect good business arrangements or regional/state and any specific industry needs.

Similar to feedback from others, the focus group participants stressed that seed certification, however good the system, standards and delivery of certification would not guarantee high quality, high performance seed potatoes. The group identified an urgent need for better practise of curing, handling, storage and transport of seed potatoes. They pointed out that the information about how to manage seed postharvest is available; the issue is that many do not use it well enough.

Our **conclusions about certification** are that seed potato certification in Australia does currently not meet all criteria of robust certification practice. There are some issues that should be addressed:

- There is no overarching framework that includes governance arrangements to allow integrity and independent oversight of a national seed potato certification system (using the National Standard 2007) or of various certification schemes operating under the system;
    - There is no licensing and accreditation system for certifiers
    - Clear certification scheme guidelines, standards and operations procedures are mostly not freely accessible
- Ownership or funding for a scheme should not come predominantly from the businesses that rely on its certification services unless there is adequate independent oversight.

It was highlighted that document control, structure, content, references to science and the use of new science need improving so that the National Standard can deliver to industry expectations. An important aspect of **redeveloping the Standard** is the open process and cooperation that is required to come up with an effective standard that is accepted by all that it may affect (e.g. seed growers, minituber producers, processing and fresh potato growers, processing and fresh market companies, merchants, certification delivery agencies). Biosecurity aspects of the standard will be of importance to state and federal regulators, so they need to be involved as appropriate to get the right result. Technical experts need to be consulted to ensure the science background used for tolerances, sampling and analytical methods are correct.

One important aspect in updating the National Standard and introducing new technologies is that these technologies[1] are commercially available or can be commercialised for use in seed potato certification and be available at a cost that does not make their use unfeasible.

The process of redeveloping the standard should be lead by an impartial person. An overall framework and certification guidelines (for certification delivery agencies) should be a first step of improving seed potato certification.

The Australian Seeds Authority (ASA (http://aseeds.net.au/governance), provides one example how certification of seed potatoes could be organised and funded. Discussions with the ASA board could help to develop the governance and funding model.

[1] Horticulture Australia Limited, 2015; PT13013 'Gap Analysis of Australian Potato Research' Final Report

Vision for the industry

Consultation responses were used to summarise a vision for the industry.

"All sectors of the potato industry should be well informed, with a culture of good practices, communication, cooperation and continuous improvement, working to agreed systems that foster understanding, feedback, best practice, people development and value creation."

Vision for seed potato certification

The following vision was summarised for seed potato certification.

"Seed potato certification should be aligned, consistent, reliable, transparent, responsive and accountable, with independent oversight by a designated, trusted body; there should be a uniform, straightforward, cost effective system with standards that control the spread of diseases and allow agreed adjustments based on regional or industry conditions.

Recommendations

Technical review of the National Standard

In line with the 'Foreword' of the current National Standard (2007), it should be reviewed. Independence and integrity of the review are paramount. Therefore, the review should be led independently from organisations and or people involved in seed certification; the organisations should be consulted. Some official input into this process is recommended (e.g. by the Plant Health Committee). The technical review of the National Standard 2007 should at a minimum incorporate new science into the standard (e.g. APRP 1 & 2 information and diagnostic technologies).

National Standard procedures and rules, in particular about disease tolerances, must be clear, concise and unambiguous. The format and layout of the National Standard should allow any reader to easily understand tolerances and other conditions, and allow the minimum rules to be consistently applied in each state or region. Standards have to be 'controlled documents' that explain scope, authorship, version numbers/dates and custodianship.

There is a need to determine the requirements for state based amendments to meet the National Standard as a minimum and how state, regional or industry based variations to the Standard may be produced and approved.

The standard(s) should be publically available to all in the supply chain.

The general confusion about different schemes, QA compliance and oversight also need to be addressed with relevant state and federal departments as well as industry bodies. This is especially important were reference is made to seed certification as part of regulation, biosecurity planning or for other purposes.

Delivery of seed certification

Concurrently with a technical review, Australia should move towards a proper, uniformly set up Seed Potato Certification System. It will enable confidence in the benefits of using certified potatoes and allow seed growers to take advantage of export opportunities.

In line with other certification systems (e.g. ISO systems) the Australian Certified Seed Potato System should include accreditation and licensing of organisation(s) delivering certification. A seed potato certification framework should be developed by a suitable independent, HIA appointed group of people. Key features of the framework should include but not be limited to:

- Licensing agreements with and review of certifiers to maintain their accreditation (= authorisation to act as seed potato certifiers)
- Training requirements for seed potato certification officers
- Uniform documentation, recording, reporting and labelling requirements (based on the technical standard and label use guidelines)
- Due consideration of the UN Standard2 for seed potato certification (which e.g. asks for a "Designated Authority" overseeing a potato seed certification scheme).

A National Framework for Seed Potato Certification

Our main recommendation is to develop a sound National Framework for Seed Potato Certification.. The framework will describe the systems for field grown seed and minituber certification by accredited agencies and all processes required to achieve this. We recommend the following:

- HIA to drive the appointment of or appoint the Seed Potato Authority
- The Authority to develop or instigate and oversee the formulation of the Seed Certification Framework and its stepwise implementation. This includes the rules for the Authority and an independent accreditation system for certifiers and minituber producers as well as seed potato certification guidelines (refer to Section 8 of this document for details)
- The Authority to appoint a technical review panel to update the 2007 National Standard – Seed potato certification as well certification procedures. Guidance can be taken from of this document, especially Section 6 and the latest edition of the United Nations Economic Commission for Europe's "UNECE STANDARD S-1 concerning the marketing and commercial quality control of SEED POTATOES"
- The Australian Seeds Authority's set up (ASA (http://aseeds.net.au/governance), should be looked at as an example of how a seed potato certification system could be governed and funded.

The National Framework should allow individual certification schemes to operate under its umbrella so that they can meet specific regional or industry requirements, if deemed the best way to have an overall accepted, effective system. However, the Framework has to clearly outline minimum requirements that all schemes must adhere to, including labelling, documentation, recording and reporting. This would specifically cover internal biosecurity risks. The Framework has to show alignment with national and international biosecurity rules and agreements.

All entities operating under the Framework, including the Authority need to be reviewed at specified timeframes. This is to ensure that all entities maintain best possible governance and schemes are reliable and transparent.

[2] http://www.unece.org/fileadmin/DAM/trade/agr/meetings/ge.06/2011/2011_Leaflet_E.pdf

Additional

Given the strong feedback on the frequent quality loss of seed potatoes due to poor curing, handling, storage and transport, training appears to be required to assist all in the supply chain with appropriate stewardship of certified seed.

1 Introduction

1.1 Seed certification context

Good quality, healthy planting stock is the cornerstone of a sustainable industry. Therefore seed certification systems have been introduced to assure 'minimum quality', and for disease control. The disease control aspect has relevance for biosecurity and phytosanitary certification of quarantine regulated pests and diseases as well as non-quarantine pests and diseases.

Disease control is the main aspect of seed potato certification. Currently there is not much emphasis on ensuring that seed is 'true to type'. In comparison, certification of crop and pasture seeds by the Australian Seed Authority (ASA)[3] includes seed health testing but has a strong additional focus on verifying that the genetic make-up of a variety is as selected by the breeder, and on germinability/viability and physical purity of certified seed.

Independently from the focus of certification, its role is to ensure that seed growers have followed the 'certification rules' and that buyers of certified seed get a product that meets the certification standard. For instance, pasture and crop seed, which has been certified by an ASA-authorised certification agency, comes with the assurance that an independent authority is continually overseeing the standards and processes designed to give the buyer seed that complies with the seed scheme standards.

Seed potatoes do not represent a reproductive unit derived from flowers; therefore the potato industry is not involved with the Australian Seed Authority (ASA).

Seed potato certification used to be delivered by state departments of agriculture as a service to their potato industry. Over the past 10 – 15 years, state governments have reduced services to agriculture. As a result seed certification responsibilities and or financial support was dropped partially or completely over time, depending on preferences of individual states. As a result, several regional or state based approaches to seed potato certification or quality management developed to address the seed industry's requirements for certification services. The situation was also a driver for the development of a National Seed Potato Certification Standard.

1.2 The Australian National Standard for Certification of Seed Potatoes

An approved Australian National Standard for the Certification of Seed Potatoes (National Standard) exists[4]. Development of the Standard was funded from potato levy funds and matching contributions from the Australian Government via Horticulture Australia Limited and last updated in 2007.. AUSVEG as the Peak Industry Body for the potato industry was nominated to be its custodian and approved it on behalf of the potato industry. Its aspirational goals are to enhance the reputation of Australian produced seed potatoes both domestically and internationally and benefit all sectors of the potato industry including, seed growers, seed buyers, exporters and technologists.

[3] http://aseeds.net.au/
[4] Horticulture Australia Limited and AUSVEG 2007; Australian National Standard - Certification of Seed Potatoes

The Foreword to the National Standard explains:

> *"The National Standard (NS) replaced five separate state based standards with a single, uniform set of minimum field and tuber production standards for: disease, trueness to type and defects. The standard is accompanied by operational procedures".*

Still, seed potato certification arrangements across Australia remain somewhat diverse. Currently there are four agencies or systems independently delivering and administering seed certification services that are principally based on the National Standard. VICSPA manages seed certification in Victoria, and a majority of South Australia, while Tasmania and Western Australian schemes are operated through government with different arrangements. New South Wales operates a QA scheme for seed potato production that includes seed health management. All certification delivery agencies and the NSW QA scheme depend on seed potato growers for funding. This is due to the removal of adequate financial support from state governments.

The current National Standard deals with technical and procedural requirements for seed potato crop and tuber inspection; it provides disease or defect limits for certification. The National Standard does not refer to any Framework that underpins the alignment and integrity of certification schemes; i.e. outlines Certification Scheme Guidelines for the governance of schemes and/or a process for independent audits of certification schemes and/or delivery agencies.

The current Standard was published in two almost identical versions in 2007; both versions seem to coexist. Since then, the different delivery agencies have amended and or partially updated their own certification standards and or procedures. These changes have not been introduced as a result of annual reviews prescribed by the Standard and initiated by its custodian, AUSVEG. They are not officially recorded as amendments to the current National Standard document. There is currently no system to assure/certify that the State-based schemes, or any amendments made to them, are in accordance with the Standard.

Overall, the process of the Standard's development and its updates, including the consultation methodology used with seed growers and other sectors of the potato industry are not well documented. Scientific foundation information used for the 2007 version or later changes to it and authorships are not referenced in the Standard. The Standard itself could not be easily located on-line in 2014. Currently, only Western Australia provides their seed potato certification standards for open access on-line.

1.3 Why review the current situation?

As apparent from the previous section, current seed certification arrangements appear to lack a guiding framework, uniformity and transparency. Given the date of the current standard and the research on potato diseases conducted in the past 10 years, it can be assumed that certification across Australia is not consistently based on the latest diagnostic technologies and scientific knowledge, in spite of some 'updates' to the 2007 National Standard. The Standard may therefore be unreliable in achieving its fundamental goal – to minimise the potential economic impacts of potato seed borne pathogens on the Australian potato industries.

Members of the potato industry have estimated that only a proportion of all potatoes planted for commercial production in Australia are from certified seed, with the remainder being from 'farm-produced seed' or 'one-off-seed'. Estimates are based on the amount of minitubers produced vs the area planted to commercial crops. One reason mentioned for not using certified seed is that many potato growers consider certified seed as too costly; many are not convinced of its economic benefits. The gaps in the use of certified seed could be significant for understanding the spread of virus diseases in commercial potato crops, particularly Potato Virus Y (PVY), which is becoming a serious problem according to potato growers.

Many commercial growers believe that the 2007 National Standard and the variations applied in different states mostly reflect the standard seed producers can achieve, rather than customer requirements for healthy seed with high yield potential. There is some concern in regards to future seed exports, due to the confusion various certification systems may create for overseas customers, especially if they appear to deviate in various ways from a National Standard and are not transparent on many levels.

Some of the main shortfalls of current certification schemes and delivery mentioned by seed potato buyers and growers when investigating the need for a "seed potato certification review" include:

- They do not necessarily use findings from recent Research and Development (R&D) on disease diagnostics
- Disease assessments, other than some virus testing, are usually done visually
- They do not focus on **all** pests and diseases, i.e. Potato Cyst Nematode (PCN) is often neglected
- The length of time between harvest and inspection affects the certification result but such time lag is not considered or stated anywhere
- Attributes other than disease that would classify seed as 'good' or 'poor' are not acknowledged, such as physiological age, size distribution or nutritional status which can be important drivers of marketable yield; relevant life-cycle information for commercial growers on how and when seed was grown, harvested, transported and stored to enable matching this and physiological age with crop management, i.e. adjusting plant spacing, fertilisers etc. is not provided
- 'Good seed' at the time of certification can suffer substantially after harvest, during transport and holding on-farm prior to planting
- Delivery of certification services relies on funding from seed potato growers; there is no or little independent oversight.

Several growers from different industry sectors mentioned a need to update the National Standard. They provided the following views:

- There are potentially some problems with interpretation of the current National Standard and the rules are being used inconsistently in each state
- An updated version would help seed certification bodies with their jobs
- There is duplication of work for phytosanitary certification
- Seed buyers want confidence that all certified seed meets certain known standards

- Seed growers want cost efficient verifiable systems that enable them to assure quality
- The current National Standard is not up to date in relation to quarantine diseases (referring to the Potato Industry Biosecurity Plan)
- The current National Standard is not up to date in relation to PCN management (see PCN Management Plan)
- There are improved diagnostic services that should possibly be incorporated into the National Standard
- Better transparency about labelling and grading of seed potatoes would be desirable.

The preliminary assessment of the seed certification situation showed that a more in depth and consultative review process could be of benefit to the all sectors of industry.

1.3.1 Review objectives

The intermediate aim for this project is to establish whether there is a requirement for:

- A national seed potato certification framework
- An alignment of standards, schemes and their delivery and/or
- Reasons for regional or industry sector (processing, fresh markets, seed) based variations.

Supply chain, economic, technical and scientific factors had to be considered.

1.3.2 Outputs

If the situation and needs analysis established a requirement, the ultimate output from the project is the blueprint for a national seed potato certification framework that gives strategic and practical directions for the design of regional schemes and the delivery of certification services that benefit all potato industry sectors ('seed certification blueprint').

1.3.3 Desired outcomes

There are several fundamental questions that should be answered at the end of the entire project (conclusion of stage 2, phase three, refer to section 2 'Methodology'):

1. What should be included in a certification framework?
2. What should be included in certification standards? Should they be limited to disease control? Are there any other quality parameters that need to be included and if yes, what and why? How can assessment parameters be based on technical evidence and/or risk management principles? How should standards be kept up to date?
3. What constitutes appropriate certification delivery? How can this be done effectively in a national scheme? What would the costs be? How can growers assess the integrity of delivery and benefits of certified seed?
4. Where does minituber production fit?
5. What would national seed certification oversight look like? How would it be structured and governed? What would a body's responsibilities be and how would it be funded?

Ultimately, representatives from all industry sectors would have input into the final design of a robust, national seed potato certification system (System) before endorsement. Regulatory agencies would contribute as required for biosecurity and phytosanitary reasons. The System would then be endorsed by all sectors and implemented step by step in a transparent manner, supported by good communication with all sectors and parties concerned.

2 Methodology

2.1 Premises

The project's approach is based on several premises:

- The purpose of seed certification is to assure 'minimum quality' mainly delivered via 'seed health'. A focus is internal biosecurity via good phytosanitary practices (controlling the spread of quarantine regulated and non-quarantine pests and diseases)
- Seed customers in Australia and overseas, and other agencies want assurance about the health of seed potatoes they purchase.
- A common national certification framework can deliver assured seed health and ultimately benefit the Australian potato industry
- Effective seed certification can be a good marketing tool
- Phytosanitary certification is currently separate from seed potato certification under the National Standard, this may be reviewed in the future under a new seed certification framework
- Seed certification has no regulatory or other legislative legitimacy at any jurisdictional level, and this would not change for non-quarantine pests and diseases; quarantine pests or diseases are dealt with as per the industry's biosecurity plan
- A new seed certification framework may require adjustment of the potato biosecurity plan where it refers to seed potato certification.

2.2 Seed quality, seed health and certification

For the purpose of this study, seed quality is determined by a combination of:

- Seed health (as freedom from diseases and pests)
- Seed size or see tuber weight
- Seed vigour (determined by physiological age)
- Seed nutritional status.

Seed nutritional status, while possibly important and measurable, cannot be used in certification because the relationship between the seed's mineral composition and yield potential of the commercial crop are not well enough understood. Management of the commercial crop would most likely override the effect of any nutritional differences in the seed.

Physiological age (P-age) could be a principal indicator of seed quality together with seed health. However, at this point in time, there is no method available to objectively measure P-age. Even if it could be measured easily, physiological age could not be included in certification done just after harvest because handling, storage and transport post certification can have a major influence on P-age. Seed tubers are basically 'computing' what happens to them from the time they are formed and are expressing this in their physiological age.

Seed size / **seed tuber weight** is related to yield potential of the following crop and measurable, however planting density and crop management can have a major effect on how size affects yield. Therefore size distribution within a seed lot is not a suitable parameter to include in certification. However, seed buyer may ask for this information from their supplier to adjust planning densities and crop management. Buying seed by size (tuber weight) and tuber count could be an added benefit.

Seed potato certification can only deal with the quality indicator of seed health as a major measurable factor that will affect marketable yield potential.

Trueness to type is part of the visual assessments; tests are not conducted.

2.3 Stage 1 – Situation analysis and mandate to proceed to Stage 2

2.3.1 Investigation of seed production economics and supply chains

Stage 1 of the project comprised as a first step:

1. A primary **economic analysis of the value of certified seed**. i.e. what does it cost to produce seed potatoes and what is it worth to commercial growers (both fresh and processed potatoes)?
2. A basic **supply chain study**

2.3.2 Role and delivery of seed potato certification

The second step was to gain insights into the role and delivery of seed potato certification via consultation.

3. A predominantly phone based **consultation process** occurred with people from different potato industry sectors and stakeholders covering all potato producing states to:
    a. Check the supply chain findings
    b. Confirm / review findings from the economic analysis
    c. Understand strengths and weaknesses of current systems and delivery approaches nationally across existing seed potato certification systems and for seed potato supply chains, and
    d. Determine **requirements** for potato seed certification.

    Stakeholders included growers, exporters, processors, and owners of proprietary lines, minituber producers, seed grower groups, members of seed potato certification agencies and state agriculture department staff.

The consultation process determined whether industry mandates the progression of the project i.e. wants a blueprint for a consistent national seed potato certification framework.

The Peak Industry Body, and project leader AUSVEG, aided the subcontracted project manager in designing the Stage 1 consultation process and economic analysis.

A report was presented to the Processing and Fresh Potato Industry Advisory Committees (IAC) about Stage 1 findings (milestone 102). Reasons for industry support or lack of

support were documented, to enable a decision about the next stage and subsequent phases of the project. A decision to go ahead with Stage 2 was made in late July 2014 after presentation of the Stage 1 report (milestone 102, industry mandate to proceed).

2.3.3 Certification standards examination

In addition to the desktop analyses and industry consultation (Steps 1 and 2) a comparative assessment of national and international standards was included in the situation analysis as a third step.

The purpose of reviewing certification standards used in different schemes was to provide an objective appraisal of State/regional applications of the National Standard and any updates or amendments that could be identified. The review also aimed to determine whether a technical, scientific review of the National Standard was required, and which aspects could be improved based on findings of the comparative assessment and considering practicalities and costs.

Australian certification schemes

Maximum tolerances for diseases and disorders were reviewed for the National Certification Standard (2007) and one of the state based schemes, the Western Australian Certified Seed Potato Scheme Production Rules (2013) (which is based on the National Standard). At the time of the review, we were unable to find online, any standards used by the Tasmanian or ViCSPA seed certification schemes or information on how the New South Wales QA operates e.g. via a copy of the QA manual. We were informed about details of amendments to the National Standard made by Tasmania (by a working groups made up of industry and certification agency representatives), and that VICSPA had recently introduced an additional certification label (blue label).

International schemes

An online search was conducted for international schemes from countries that represent a range of production regions, encompassing regions with processing and/or fresh market focus to:

- Check how different countries presented their schemes for public access
- Provide a comparative overview of several of these schemes
- Prepare an outline of how the current Australian National Standard compares with well established schemes with a 'good name', especially potential export market competitors
- Provide insights into how publicly available Australian seed certification information might be viewed by national and potential overseas seed potato customers.

2.4 Stage 2 – Designing a national seed certification system

Stage 2 methodology of the project is described in this section. It was conducted after the Industry Advisory Committees (IAC) for fresh and processing potatoes gave the go ahead (based on milestone 102). Stage 2 relied heavily on further consultation and also included additional information gathering.

The main methods used for Stage 2 were:

1. Wide, open-for-all **consultation** and the analysis of responses
2. An assessment of **good certification practice and standard development**
3. A **synthesis** of all results from Stage 1 and 2 of the project to ultimately design the **blueprint** for an Australian Seed Potato Certification **Framework**.

Methods are described in more detail below.

2.4.1 Consultation

The Stage 2 consultation consisted of:

- An Internet based survey questionnaire that could be completed on-line (SurveyMonkey). This survey was publicised in the AUSVEG Weekly Update and through articles in Potatoes Australia magazine
- Additional phone interviews using the questions from the survey questionnaire; answers were recorded in the same survey questionnaire as the on-line ones to include them in the analysis
- Face-to-face meetings with Tasmanian industry representatives (minitubers, processing, certification, certified seed producer) and a meeting with the Victorian Seed Growers Association
- A group conversation (via teleconference) with leaders in the Australian potato industry.

The phone interviews and meetings included three individual members of Australian seed potato certification agencies (during Stage 1, three different certification agency representatives had already been consulted by phone). We also expected that certifiers responded to the on-line survey that did not ask for identification of individuals.

Participants in the teleconference were given a discussion paper with background information on the project (as submitted to HAL in milestones 102 and 103) and concepts for a seed certification framework blueprint.

In addition to the verbal consultation, several entities submitted written statements to represent views of a likeminded organisation, group or businesses. They were:

- Seed Potatoes Victoria – representing Victorian seed potato producers
- Crookwell Seed Potato Growers- representing NSW seed potato producers
- NSW QA scheme
- WA Seed Potato Producers Association
- A minituber producer - representing their business

- Seed potato certification agency's representative group.

The aim of the consultation, conversations and submissions was to capture experiences, expectations, ideas and a vision for seed potato certification from different regions, sectors and stakeholders. It was conducted to understand how certification is delivered, and whether individuals or organisations dealing with or relying on seed potatoes for their business see a need to review or upgrade the National Standard and or its regional interpretations, and or delivery of certification services and what they would like to see changed or maintained.

2.4.2 Certification practice and standard development

A desktop assessment was conducted to look at good certification practices and standard development in other industries. The aim was to take guidance from applicable examples.

2.5 Synthesis

The situation analyses conducted for the formation of this project and as a major part of it (via industry feedback and desktop studies) were synthesised to:

1. Develop a practical vision for seed potato certification
2. Formulate an industry position and appraise options
3. Design a blueprint for an Australian Seed Certification Framework

More detail on the three elements is given below. Each is building on previous work and each other.

2.5.1 Vision and goals

The declared aim of consultation, focus groups and desktop work was to formulate a vision and underpin it with realistic long, medium and short-term goals, objectives and aspirational timeframes (Logic Model).

2.5.2 Industry position and appraisal of options

The second element of the synthesis incorporates findings from the consultation on how well the current scheme(s) work for different sectors and regions, and how they may be enhanced. It considers the review of seed potato schemes in Australia and other countries. Additionally, the latest R&D on methods of determining disease levels of seed potatoes as well as their commercial availability and potential cost/benefit for Australian schemes was taken into account. The industry position and appraisal of options had to consider attitudes and drivers for or barriers to change.

Several questions needed to be answered including but not limited to:

- What should be included in a certification scheme? Should it be limited to disease control? Are there any other quality parameters that need to be included and if yes, what and why? How (well) can assessment parameters be based on technical evidence and/or risk management principles?

- What are appropriate certification procedures? How can they effectively be aligned and implemented nationally without ignoring specific industry sector or regional needs? What would the costs/benefits be? How can growers assess the benefits of certified seed?
- What would a body charged with national oversight of seed certification look like? How would it be made up, structured and governed? What would the body's roles and responsibilities be and how would it be funded?

It had to be determined how a national approach could be customer focussed without disadvantage to seed growers and unbiased towards specific production regions or states. How to use standards or thresholds that have a scientific basis or are based on a documented risk analysis, and include virus indexing that is not only based on visual inspection. It had to be established whether national framework have to include independent audit, appeal and/or conflict resolution systems.

Potential approaches to seed certification schemes were discussed as part of consultations. This included exploring options for their potential ownership e.g.:

- An industry-owned and managed, effective not-for-profit organisation
- Schemes founded and run as a businesses or non-for profit organisations
- A Board consisting of producers, seed customers and a technical advisor for each of the above
- Other ideas.

The results from synthesising the industry position and options are taken up in the Blueprint (Section 8).

2.5.3 Blueprint for a national seed potato certification system

The final element of the synthesis builds on all pervious analyses and provides strategic and tactical direction for national seed certification: it is a blueprint for a national seed potato certification framework.

3 Stage 1 Findings - Economic Analysis

3.1 Seed potato production costs

On a per hectare basis, costs of production (COP) for different generation seed vary. Variable production costs were reported to be between $12,000 and $ 14,000 per hectare (farm gate, including costs of seed and harvesting) by professional seed growers. They did not feel able or comfortable to provide COP details. Variable Production costs can be up to 50% higher than average costs shown here, and sometimes lower, depending on generation of seed, location, scale of production, efficiencies and seasonal conditions. Fixed costs are similarly variable. This makes it impossible to just determine a single figure for production costs per hectare or per tonne. Per tonne costs are strongly influenced by saleable yield (Figure 3-1).

Figure 3-1 shows differences in seed potato yield by state based on ABS statistics from 2011. ABS does not provide more recent data for seed potatoes. While the data has aged, it provides a reasonable indication of the potential variation in seed potato yields. It was outside the scope of this project to determine reasons for the variation in yield. The yield data for NSW, Queensland and Western Australia should be used with caution, due to high sampling variability.

Figure 3-1: Seed potato yield levels by state (ABS 2011)

For the purpose of the analysis for this study a yield range of 20-40 t/ha and variable field production costs of $11,000 to $ 18,000 were used (Table 2 1). As mentioned, fixed costs vary widely depending e.g. on the scale of production, business structures, land costs and equity and were therefore not included here.

Table 3-1: Seed production costs per tonne as influenced by variable costs and saleable yields per hectare

Paid seed yield (packout) [t/ha]	Variable costs [$ / tonne] at 4 levels of costs [$ / ha]			
	$11000/ha	**$13000/ha**	**$16000/ha**	**$18000/ha**
20	$550/t	$650/t	$800/t	$900/t
30	$367/t	$433/t	$533/t	$600/t
40	$275/t	$325/t	$400/t	$450/t

Table 3-1 demonstrates the impact of yield levels and variable costs per hectare on variable costs per tonne of potato seed. It highlights that seed growers need to aim for the lowest possible costs and reliably high yields to remain viable.

An **example** of a proportional split of variable, pre-farmgate seed potato production costs is provided in Figure 3-2. Data is based on gross margin information provided by state departments on their respective websites and feedback from growers. Depending on regional differences, scale and operational efficiencies, the breakdown of costs would differ; e.g. water costs can be substantial in some regions and low in others, harvest costs can be lower and inputs such as fertilisers or sprays vary widely. Land lease costs may have to be included depending on production conditions. Costs are often recorded and reported (e.g. as Gross Margins) using different breakdowns into cost centres, which makes direct comparisons difficult, even if seed producers had provided their data.

Many agricultural state department websites provide gross margin information for seed or commercial crops (by variety and or sector: fresh / processing). Growers can access these spreadsheets on department websites and modify these for their own purposes.

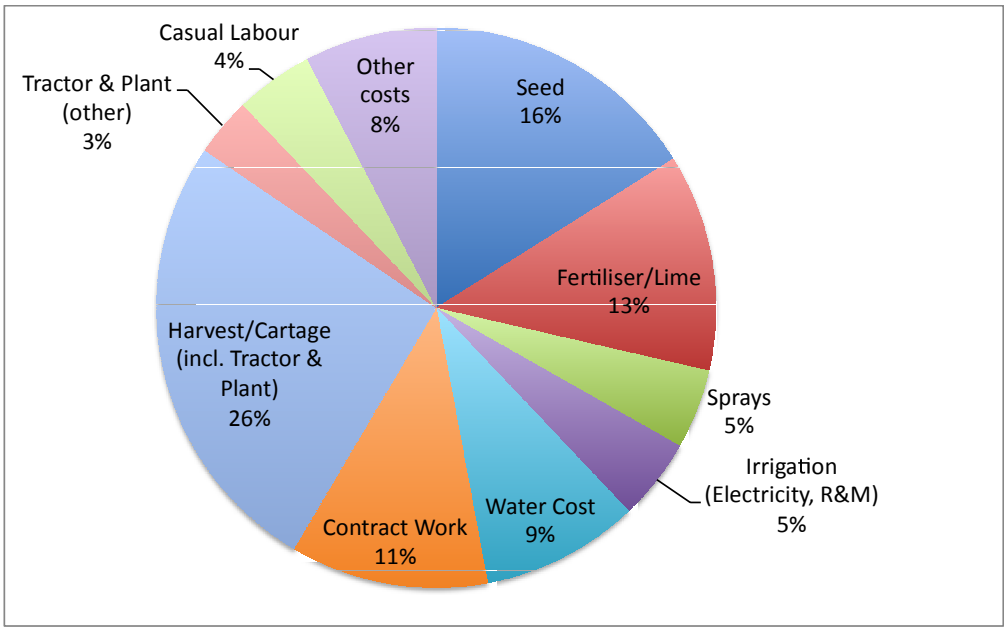


Figure 3-2: Example of variable costs of seed potato production

In this example, seed costs amount to about 16% of variable costs.

Reliable data about variable costs post harvest, e.g. for curing, storage, treatment, grading, dispatch, transport, bins & bags, cutting, for seed potatoes was impossible to obtain. Based on comments made during our consultation, these costs can vary even more widely than field production costs. The same variability would apply to the fixed postharvest cost component.

3.2 Economic evaluation of certified seed

Previously, an economic evaluation of certified seed potatoes was conducted through project PT10008[5]. The aim of the study was to determine the value of certified seed potato production and demonstrate benefits of certified seed compared to farm kept seed. Another objective was to identify the barriers/constraints to increasing the use of certified seed potatoes.

The main investigation method during this earlier project was a completion and analysis of an industry survey conducted primarily online. 71 growers completed the survey, the majority of those surveyed grew potatoes in Victoria and within Victoria most respondents came from Central Victoria. The online survey was supported with "a few random" phone interviews.

In the survey, 40% of respondents agreed that certified seed lowers cost of production, 30% disagreed, 25% did not know. Positive responses mostly came from seed growers, negative or indifferent responses from commercial growers. It is not clear to what extent growers' responses were based on their personal economic analysis or and/or on their observation and experience.

Similar to this current study PT10008 concluded that it is not possible to provide a guaranteed $ value on the advantage of using certified seed because too many other factors not related to certification influence the final results (saleable yield).

3.3 Production costs for commercial crops

Assuming a uniform market price, profit margins for commercial crops, similarly to those for seed crops, would vary depending on variable cost of production per hectare ($/ha) and especially paid yield (t/ha).

The proportional split of variable costs vary considerably in commercial potato production systems, similar to those discussed for seed (Figure 2-2). Still, based on feedback from growers, the proportion spent on certified seed appears to be reasonably consistent at about 10-15% of total variable costs. This means that the relatively small savings (i.e. usually less than $1000/ha, based on feedback) from using cheaper, non-certified seed would not have a major impact on variable costs while profit margins could be increased if certified seed provided superior performance (less disease and higher paid yield).

Marketable (paid) yield is the major driver of profit margins at a given price. Seed quality has a major impact on paid yield of commercial crops. Poor seed quality, especially poor health

[5] Crump N.S. and Shovelton J. 2012; Economic evaluation of certified seed in the Australian potato industry. Horticulture Australia Limited Project PT10008

can lead to seed piece breakdown, slow emergence, low resilience to soilborne diseases, poor root growth and function (affecting nutrient and water uptake), poor tuber set small tubers and low packout (paid yield). It is not possible to reach full yield potential when starting off with inferior seed. If certified seed was reliably superior in performance to farm-produced seed, the additional costs for that seed would have a high payback via higher paid yield. This is particularly clear when one considers the potential losses in production due to low quality seed. A difference in 5% in emergence or yield may equate to around 2.5 t/ha and when this is valued against the savings in seed then there is a net loss in using poorer quality seed. This assumes of course that a seed certification scheme is consistently delivering higher quality seed.

Generally, for commercial crops, depending on variety, planting density and certified seed source (and therefore handling, transport etc.), and also other variable costs, seed costs usually are between 14 and 15% of total variable costs.

Unfortunately, the use of certified, 'diseases free' seed alone does not guarantee that full yield potential is reached, even if it is treated well throughout the supply chain. This is because soil and crop management can still reduce it. Numerous studies (e.g. Phil Brown 2006) have shown that individual management and environmental factors consistently provide the highest variable in crop performance if seed quality is the same.

3.4 The potential costs of tuber diseases

The Australian Processing Potato Research Program, Phase 2 (APRP2) included an economic analysis of the effect of economically significant potato diseases on commercial crops (Project PT09039). The APRP2 program manager, Ann Ramsay, SED Advisory, conducted the analysis; she provided a summary for inclusion in this report, which is included below. The full analysis can be found in the final report for PT09039. *N.B.: costs only relate to the processing potato industry. This means total losses over the entire industry would be substantially higher.*

"Diseases of potatoes impose a variety of costs on the industry. These costs can be grouped into two broad categories:

- 'Direct' costs, including chemical treatments, on-farm discards, labour for on-farm discards, estimated yield loss beyond on-farm discards and factory grade-outs. It was possible to obtain reasonable estimates of direct costs in most cases – with the possible exception of yield loss
- 'Indirect' costs, such as changes to irrigation practices, variety choices and keeping fields out of production. These are real costs, but much more difficult to estimate and to attribute to particular diseases.

After extensive discussion it was concluded in PT09039 that the study would focus only on the annual, direct costs associated with the diseases under research in the APRP2 program: common scab, powdery scab, Rhizoctonia, Verticillium and bacterial wilt. This would provide a broad, if somewhat conservative, indication of the impact of these diseases."

Table 3-2: A (conservative) estimate of the annual costs of three major diseases to the Australian processing potato industry (Project PT09039)

	Common scab	Powdery scab	Rhizoctonia
Commercial	$1,406,748	$2,928,034	$3,423,925
Seed	$205,930	$877,168	$285,024
Total (without yield losses)	**$1,612,678**	**$3,805,202**	**$3,708,949**
Commercial including yield losses	$1,406,748	$11,970,649	$5,072,079
Seed costs including yield losses	$240,995	$1,396,574	$356,115
Total including yield losses	**$1,647,743**	**$13,367,223**	**$5,428,194**

Annual estimated cost of potato early dying to the processing potato industry

The impact of early dying as a result of Verticillium wilt appeared variable and often not well understood. As a part of the analysis, experts estimated that possibly up to 1% of overall yield was lost to early dying; some consider that this figure may be significantly higher. Several growers indicated their losses may be as high as 20% attributed to early dying with Verticillium possibly playing a large role in this.

A table of costs has not been generated for early dying. Some areas did not report early dying as a problem and in other areas the cause of the early dying was often hard to attribute. South Australia, Queensland, New South Wales and some parts of Victoria reported a presence and impact of early dying associated with Verticillium wilt.

The impact on overall yield at a very conservative estimate of 0.5% equates to a loss of over $1M, which does not take into consideration the losses from planting and growing the crop. Once DNA diagnostics for Verticillium are available this figure may be revisited.

3.5 Conclusion from the economic analysis

Even if it were possible to produce a definite figure for the cost of production of certified seed, the cost should generally be less than its value to a commercial grower, considering the losses that can occur from seed borne diseases. Growing a commercial crop from disease free seed as compared to using seed that caries disease, especially if it the disease can contaminate a paddock long term, has an enormous economic value. The value of not introducing diseases to a commercial crop and farm makes the cost of certification insignificant.

Many factors that affect the quality and performance of seed that is ultimately planted are independent from certification and cannot be solved by a certification scheme no matter how it is designed. Growing conditions and management of a commercial crop can still produce poor results from seed that has been of good quality at planting.

In order to get the full benefits from certified seed, certification has to be underpinned by production and post harvest management methods and a chain of custody that ensures original seed quality is maintained until planting.

4 Stage 1 Findings - Supply Chains

4.1 Supply chains and relationships

Seed potatoes are traded from areas of production to areas to areas of demand. The volumes and varieties traded within and between states are determined by various business relationships. Restrictions to trading are imposed by state biosecurity measures (e.g. in WA and Tasmania, PCN infested areas, seed protection districts). Seed demand and supply are also influenced by end market requirements (processing or fresh market variety preferences) and access to proprietary varieties (PBR).

Figure 4-1,

Figure 4-2 and Figure 4-3 show potato production area data by sector and state. They are based on 2011 ABS data because newer statistics do not provide the required breakdown by sector. Still, apart from the proportion of processing potatoes grown in SA the proportions would still provide a good reflection of current proportions. The figures illustrate that a majority of seed potatoes are traded from Victoria to other states (except to Tas and WA because they have quarantine restrictions on potato tubers).

Apart from the obvious supply and demand situation based upon production areas in each state, as well as consultation survey data (see section 5.2) and our experience/knowledge of seed supply chains, we know that:

- Seed growers from WA and Tasmania supply seed to customers in SA, NSW and even Qld
- SA seed would go to Vic, NSW and Qld
- Some Tasmanian seed is sent to WA.

Even if sufficient seed was produced in a state to plant its entire commercial potato cropping area, this does not happen. Commercial growers purchase seed where they get the varieties, volumes, quality or P-age they require.

Business relationships ultimately determine seed potato supply chains and seed movements across ('open') state borders.

Major supply chain relationships are described in Table 4-1. The table also explains the main seed quality management approaches including the use of certified seed.

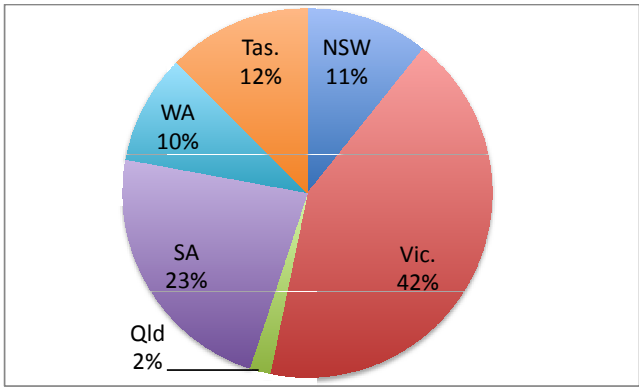


Figure 4-1: Proportion of seed potatoes (% area) produced by state (ABS 2012)

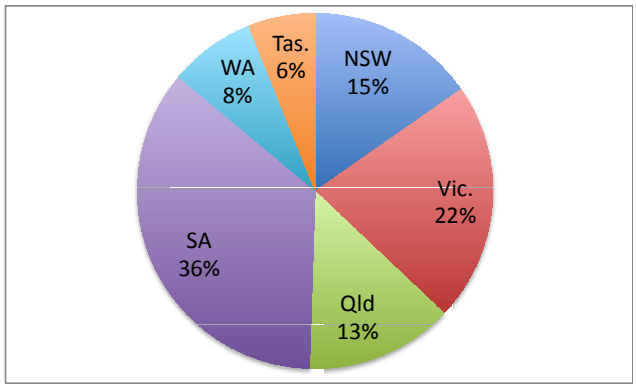


Figure 4-2: Proportion of fresh market potatoes (% area) produced by state (ABS 2012)

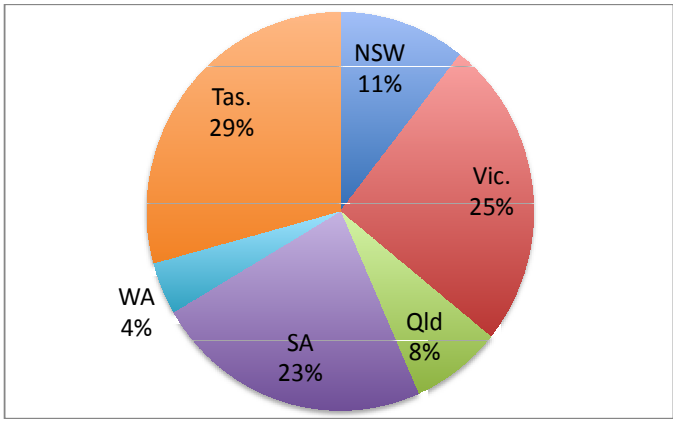


Figure 4-3: Proportion of processing potatoes (% area) produced by state (ABS 2012)

Table 4-1: Business relationships, seed potato production and quality requirements

Relationship determining seed production	Impacts	Potato seed certification matters
Processors contract and oversee seed production of varieties and volumes they require to meet factory and ultimately market demands; they usually manage the distribution of seed to their contract growers	Processing growers may have limited influence on the condition of seed and varieties they are planting Due to price pressures on processing potatoes reliable seed quality is paramount Seed price is set and fluctuates based processing price; not seed quality and how the buyers value it.	While processors stipulate the use of certified seed, factory supply requirements or seed crop failures may force them to use of non-certified seed at times While most certification standards relating to plant and tuber health are paramount i.e. diseases that impact in productivity, some that only cause skin blemishes in processing potatoes may be tolerated to some degree (e.g. powdery scab, black dot, *Rhizoctonia*)
Large scale fresh market producers who have supply contracts with major supermarkets need to supply agreed varieties and volumes to supermarket specifications (e.g. size, skin quality, washed or brushed) Most varieties in demand are proprietary lines These companies preferably contract seed potato growers to meet their market obligations; they may also contract fresh market growers	Due to market and price pressures, reliable seed supply and quality are paramount Seed producers have to meet quality and performance parameters set by their customers over and above certification	Certified seed is used Seed certification to reliably uniform standards is essential, especially for virus, bacterial diseases and PCN Tolerance to diseases causing skin blemishes very low Seed quality parameters other than those covered by certification are important (e.g. seed vigour)
Fresh market producers buy seed from seed producers to supply their own market or quotas (WA)	Each grower organises seed, usually from a long known source, either a seed grower or merchant Supply arrangements may not be firmed up before seed is harvested, especially if commercial crops are grown 'on spec'	Certified seed is used if available and deemed reliable in performance Farm kept seed is often used, either from own supplies or bought from other, trusted growers The drivers for using non certified seed are: price, lack of trust in the performance of certified seed, lack of suitable (standard applied, variety, volume) certified seed, late decisions on varieties and or volumes to produce (playing the market)

4.2 Supply chain matters

4.3 Minitubers

Minituber production underpins certified seed production of later generations; minituber supply chain information is summarised below.

There are three major minituber producing businesses, Solan, managed by Director Ken Morley, Toolangi Elite operated by ViCSPA, managed by Dr Daniel Isenegger (GM: Nigel Crump), Agronico Technology managed by Stewart McKay (MD: Julian Shaw). Cottle Wolly, managed by owners David and Barbara Carter is a smaller operation supplying the Crookwell Potato Association Inc. and also national and South Korean clients. Apart from Toolongi Elite, the abovementioned minituber labs / nurseries announce on their company website that they are ViCSPA accredited i.e. comply with the requirements for the laboratory facilities including hygiene protocols and processes. As part of accreditation, each production batch is inspected and audited against biosecurity protocols and during growth, leaves of plants are sampled from the polyhouse and tested for viruses. A nil tolerance for potato virus is applied. Toolangi Elite works under the same QA procedures. The minituber facility accreditation is a national function and covers all early generation material (G0) entering Certified Seed Potato Schemes in Australia.

4.4 National in vitro potato collection

The National public potato in vitro collection is maintained at ViCSPA, Toolangi with 94 cultivars/clones and at Stony Rise, Devonport at the Tasmanian Institute of Agriculture (TIA) having 147 cultivars/clones. All minituber producers manage cultivars under PBR.

The National in vitro potato collection is an important resource for the potato industry. The fate of and availability to industry of the public National in vitro potato collection was discussed at a meeting in June 2013 (NB: only one minituber facility, Cottle Wolly, NSW, was represented at the meeting). The recommendation from the meeting was to continue funding the collection with support from industry funds based on its value to the potato industry. Details about which of the major lab(s) would hold the collection (or parts thereof) were not discussed. The fate of the collection being the start of the supply chain for public varieties needs to be clarified.

4.5 Interstate Certification Assurance

Interstate Certification Assurance (ICA) is a system of plant health certification based on quality management principles. ICA provides an alternative to traditional plant health certification involving government inspectors. It has been introduced to reduce the regulatory burden on businesses trading interstate.

The ICA Scheme is a national scheme administered by all states and territories. The scheme enables a business to be accredited by a state or territory plant quarantine authority to issue plant health assurance certificates for its produce. To be accredited, a business must be able to demonstrate it has effective in-house procedures in place that ensure produce consigned to intra or interstate markets meets specified plant quarantine requirements. The plant quarantine authority regularly audits compliance by the business.

The ICA Scheme seeks to provide a harmonised approach to the audit and accreditation of businesses throughout Australia and the mutual recognition of plant health assurance certificates accompanying consignments of produce moving intrastate or interstate.

4.6 Phytosanitary requirements and export

The Australian Government, Department of Agriculture (DoA) provides information on phytosanitary requirements including for seed potato exports on its website (Manual of Importing Country Requirements, MICor). Ideally seed potato certification schemes could provide the required information to meet importing country requirements, making additional phytosanitary inspections obsolete (at least in most cases), thus streamlining the process for exporters of seed.

Many in the potato industry see export of seed as an upcoming opportunity. This is currently pursued on a state-by-state basis, with Western Australia and Victoria leading the initiatives. DoA recently initiated the development of a strategic export development plan for potatoes. This should contribute to developing export opportunities from Australia based on uniform, streamlined standards and procedures. The current situation of state based approaches and the lack of easy to find information on how Australia deals with seed potato certification and phytosanitary requirements must appear confusing to overseas authorities, especially when compared to other countries (e.g. Scotland/UK, Netherlands).

4.7 Conclusion from the supply chain analysis

Business relationships ultimately determine seed potato supply chains and seed movements across ('open') state borders.

Seed certification alone cannot guarantee that a commercial crop reaches full potential. Many crop and postharvest management activities (e.g. curing, grading, storage, packaging, transport) affect final seed quality and crop performance. Major risk factors that are unrelated to certification or post harvest technology and which are often neglected include skills, knowledge, attitudes, levels of communication and organisational management, applied at each step along the supply chain.

The necessity to use good practices for certified seed at all steps (custodianship) is not always fulfilled; seed may be, often unknowingly, 'mistreated' along the way. This is frustrating to seed producers and buyers alike, especially as, given current systems it would be nearly impossible to find out whether a poorly performing crop grown from certified seed is poor because of substandard certification delivery or poor custodianship somewhere along the chain (or poor crop production conditions after planting). Record keeping and communication are usually not good enough to allow this kind of trace back.

A national certification scheme should include looking after minituber certification and potentially maintenance of public varieties. A certification system should be the basis for efficient phytosanitary certification for interstate movement of seed and seed exports.

5 Stage 1 Findings - Industry Consultation

This section recapitulates outcomes from the Stage 1 consultation.

5.1 Method

Stakeholders consulted during Stage 1 were selected with AUSVEG. They included seed and fresh market / processing potato producers operating at different scales and with varying involvement in supply chains, a minituber producer, processing company representatives, owners of proprietary lines, and the seed certifiers group (Victoria, WA), the seed certifiers group (Australian Seed Potato Council, TAS, Vic) and a DEPI Government Department representative involved in trade negotiations, as well as researchers / advisers.

A total of 50 potato industry members were consulted, by phone (about 50%), and the remainder was interviewed in person. Phone interviews followed a survey guide and allowed interviewees to also express their views and motivations. Personal consultations were semi-structured interviews addressing the main topics from the survey guide. Structured survey results were captured via SurveyMonkey, which allowed the data to be analysed. Semi-structured and structured interviews and were analysed to identify major themes and the frequency of them being mentioned to get a view of major issues.

Phone interviews

25 phone interviews were undertaken using a survey question guide and allowed interviewees to also express their views and motivations. Respondents included representatives from Western Australia, South Australia, Tasmania, Victoria, New South Wales and Queensland covering the following supply chain members:

- Minituber production
- Seed production
- Table and processing potato production
- Seed merchandising and export
- Processing
- Seed certification
- Agronomy adviser.

Survey results were captured via SurveyMonkey, which allowed analysing the data.

Personal consultations:

- 25 semi-structured interviews were conducted, addressing the main topics from the survey guide
- These were analyses using xxxxx.

The structured and semi-structured data were combined (using Microsoft Excel) and analysed to identify major themes and the frequency of them being mentioned to get a view of major issues.

5.2 Findings

This section provides the overall response to the Stage 1 consultation. Consultation findings are also reflected in previous and subsequent sections of this report (e.g. economic and supply chain analysis, certification standards and delivery analysis).

The detailed findings that include numbers and percentages are based solely on the small survey population from the structured survey.

5.2.1 Seed Supply

Where does the seed come from?

The majority of seed used by interviewees originates from:

- Tasmania
- Ballarat, Victoria
- Kangaroo Island, S.A.
- Albany, W.A.
- Crookwell, N.S.W.

Within Victoria, the Otways, Portland, Kinglake and Gippsland were rated highly as 'good' seed growing regions. Victoria (Toolangi), South Australia (Waikerie) and North West Tasmania together supply most of the mini tubers (est. 85%).

Certification and seed quality, as well as knowing and trusting the seed grower, were the main reason determining where growers purchased their seed. Availability of a particular variety was also a main factor for some growers, as was proximity to the seed grower for convenience and affordability.

5.2.2 Use of certified seed vs non-certified seed

The main reason given for not always using certified seed was that commercial potato growers consider certified seed as too costly; many are not convinced of its economic benefits. They reported having similar good and bad experiences with certified and not certified seed and many therefore mentioned a lack confidence in the integrity of seed certification systems.

Some interviewees surmised that current volumes of certified seed produced would not be sufficient to grow the entire Australian crop from certified seed. The majority of growers interviewed (82%) used certified seed each year for some or all of their production.

The majority of survey participants mentioned they were operating with the following schemes:

- ViCSPA
- N.S.W./Crookwell schemes
- W.A. certified rules
- TasSeed, Tasmania.

A reduced risk of fungal, bacterial and viral diseases was believed to be the greatest advantage of using certified seed for processing and fresh potatoes. A more reliable performance and better crop emergence and establishment were also mentioned as benefits of using certified seed.

"You know exactly what you're getting. If there are issues present you know it's all less than 1-2%. You get better vigour and consistency" – seed potato grower & agronomist

"There's a strong QA and field inspection aspect (to using certified seed). I don't have time to personally inspect the seed crop so I need to trust in someone else to do that" – seed and processing potato grower

Still, 22% of survey respondents said there were *few* advantages of using certified seed and 11% said there were *no* advantages. Expense, a perception that certification makes no difference to tuber quality as well as seed availability and a lack of choice in varieties are the main reasons growers purchase non-certified seed. Some responses also alluded to distrust with existing seed certification schemes, in particular quality assurance and also seed handling concerns were mentioned.

"There are still too many problems with certified seed in handling and storage" – table potato grower

"Good non-certified seed with the right attributes can perform better than certified seed with defects and poor handling" – potato processor

5.2.3 Seed suppliers used

Price, availability of varieties and quantities, seed quality and timing were identified as important factors amongst growers when selecting a seed supplier. There was some diversity, for instance some growers like to try new suppliers and shop around for the best seed, whilst others consider their relationship with their supplier to be important and will remain with the same supplier for a number of years.

"I use three suppliers to help spread my risk" – processing potato grower

"There are a lot less people growing seed, which is a big problem. Suppliers are going out of business cause you to look elsewhere for other suppliers" – table and processing potato grower

5.2.4 Exports

There were mixed opinions surrounding the export of seed and ware potatoes. Twenty-eight percent (28%) of survey respondents said they would like to export seed potatoes in the future, and 11% said they would like to export ware potatoes. In contrast, 22% indicated they weren't interested and another 22% were unsure. One of the interviewees exports regularly already.

South East Asia was identified as a growing export market, with some participants already exporting there. Exporting to Asia did however raise some concerns, such as:

- The price on the domestic market is better
- It's difficult to compete with subsidised potatoes from Europe
- There needs to be stronger QA for exports.

"The (Asian) market is growing based on the service and quality of the product we are providing. We're getting more approaches each year from Asia to grow more spuds. But we don't want to pursue it too much and grow seed for overseas and ignore consumer demands here" – seed & processing potato grower

"We found price wise we were able to supply the domestic market without all the hassle of exporting. It's very difficult to be financially viable if you're producing an article that is competing with a subsidised product from Europe" – seed, processing & table potato grower

Opinion was divided as to whether a revised and aligned national certification approach would help or hinder potato exports. Some respondents believed a national scheme would make exporting easier. Interviewees were concerned about opportunities for seed exports, due to the confusion various certification systems that deviate from the national standard and have sub-standards may create for overseas customers. People with knowledge of and interest in exporting seed commented that some kind of official or third party oversight of seed certification would be desirable.

Others felt a national scheme could jeopardise existing relationships individual states have already formed with overseas customers. For example, if a disease is prevalent in Victoria but not in other states then it may taint the reputation of the nation as a whole (if customers do not know the origin of seed or national certification standards are put in place without considering regional/state issues).

It was mentioned that sending inferior seed overseas, no matter what the status of a national certification approach, would destroy future opportunities for the industry.

5.2.5 Seed Quality

Monitoring

A high proportion of survey respondents take some measure to monitor the quality of their seed and commercial crop. For example:

- 44% regularly scout their crops

- 39% have an agronomist visit their property
- 33% always get seed tested for disease
- 22% sometimes get seed tested for disease
- 17% send plants to a lab for identification of issues.

Only 6% of respondents said they never get seed tested for disease. Some survey respondents said they also undertake soil testing, leaf testing and sap testing. This is often done with the assistance of an agronomist.

Disease

The most commonly identified diseases and defects noted by survey respondents in their crops included (in the order of importance to them):

- Virus symptoms (unidentified)
- Seed piece breakdown (unidentified)
- Powdery scab
- Storage related issues
- Uneven emergence
- Transport related issues
- Common scab
- Tomato spotted wilt
- Handling damage, rough harvest, bruising.

It was difficult to determine from the survey responses, whether the occurrence and or severity of diseases or defects was higher in non-certified seed. Based solely on the limited survey data, the rate of disease found in non-certified and certified seed is similar.

Of the diseases and defects noted by respondents, PVY or Virus-Y and powdery scab were commonly identified as the most concerning issues and the hardest to manage.

"PVY is the biggest problem. You can try to prevent getting it, but once it's there you can't cure it, you can only try to manage it. It's been a big issue over the last 6 years of so in Victoria" – seed potato grower & agronomist

"PVY is (the hardest to manage). There is no chemical control of the pathogen and transmission is easy" – seed potato grower

"Soil borne diseases have been the biggest issue. ***Powdery scab used to be a problem, but soil testing and more resistant varieties e.g. Nicola have helped manage this"*** - agronomist

The occurrence of disease did vary according to geographic location. For example, PVY is a concern in Victoria, but has not been reported from Tasmania.

Virus diseases, bacterial wilt and PCN were of the diseases of greatest concern to interviewees.

5.2.6 Seed Certification

The overall opinion of the need for seed certification was positive. A high percentage of survey respondents believed seed certification, if done well, was necessary for a healthy, high yielding crop (72%) and a basic requirement of a sustainable potato industry (67%).

Many seed growers were also overall happy with their certification schemes; others would like to see improvements to how certification is delivered and feedback provided to them by certifiers. Motivations for change varied based on the respondent's position in the supply chain, business size, location and issues they have to deal with; however all mentioned a requirement for integrity and transparency of certification schemes. In theory, certification results by different agencies for the same crop, should come up with the same results and should be communicated to seed and commercial growers in a uniform way. Seed growers, more often than commercial growers, would like to maintain a regional approach to certification.

Commercial and seed growers agreed that better custodianship was required to preserve seed quality between harvest and planting (better custodianship in the supply chain). Some lamented a lack of scale and professionalism in certain sectors and believed that this was holding the industry back,

"Seed certification is vital for the industry to remain viable. Victoria has the harshest set of rules, but is producing the best seed and has the lowest disease level. Without certification you're much more exposed to disease" – seed potato grower & agronomist

"Seed certification is incredibly important to ensuring quality. "Don't plant a problem". Certification is vital for the industry" - agronomist

Of the survey respondents, 33% said that most of the time they are happy with the certified seed they purchase. Thirty-three percent said the benefits of using certified seed outweigh the costs and that the current certification standards meet their requirements; 17% disagreed with these two statements.

Thirty-nine percent of respondents said that the current certification standards are not clear and consistent across all states, and 50% felt that certification schemes should be reviewed regularly to keep up with new technologies.

Some interviewees stated that the 2007 National Standard and its variations or 'sub-standards' used in different states appear to mostly reflect the standard seed producers can achieve, rather than requirements of commercial grower for healthy seed with high yield potential.

Additional feedback on seed certification raised concerns, such as:

- Seed certification increases the price of seed, particularly if certification reduces overall seed availability
- The "main players are doing their own thing" and dictating the price of seed
- Certification (reform) will be placing more rules and regulations on seed growers

- Storing and handling seed are just as important in ensuring seed quality, but this is not recognised under a certification scheme e.g. "seed can meet all the (certification) rules, but still be bad"
- A feeling that enforcement and QA under current certification schemes is poor.

"The whole industry has become so expensive. The price of ware potatoes has decreased, but seed cost has increased" – table & processing potato grower

"It's a lot harder to get seed to a certification level and it costs more. People buying the seed are paying less. There's not a good margin in it at all….The certification body should be working with seed growers more to meet the market. We now get 20-30% less for our seed, and we should have the (disease) tolerance to match that. People are expecting a high quality seed for a low price". – seed potato grower

"Problems are mainly during production and storage and certification does not pick up on that" – potato processor

5.2.7 Should there be a national certification scheme?

56% of survey respondents outright supported a national seed certification scheme

Views about the look of a national seed certification scheme were mixed.

For example there was concern that a national system may not recognise regional differences. Respondents felt that it would be difficult to develop a system that is cognisant of the requirements of each state and growing region.

In contrast, other respondents felt a national system would make it easier to buy and sell seed interstate, as is currently happening, as well as better supporting export demands.

"Standards differ between regions reflecting regional conditions and what seed growers can achieve. A one-for-all system may put (seed) growers out of business" – seed potato grower

"Standards should be the same across Australia if selling nation wide" – seed potato grower

"A national scheme is the best way to go to meet export demands. But if there is a disease outbreak in one state then suddenly you could all be written off together. But I think the benefits of a national scheme outweigh the potential issues" – seed and processing potato grower

"A national system with more consistent regulations would make transport easier for growers and buyers. Currently it can be confusing with the varying regulations across states" - agronomist

"Don't want a system that is "dumbed down" to accommodate all the issues and problems across Australia. There are too many political minefields in going to a national based system." – seed, processing and table potato grower

Other elements of a good certification scheme mentioned ((i.e. agreed/selected from a list of statements) included standards that are recognised by overseas customers (39%) and a strong QA system (39%).

Thirty-three percent of respondents felt that the current schemes, with some improvements standards and how schemes operate, would suffice. As highlighted by the ownership and management section, only 11% wanted to preserve the status quo.

One issue mentioned by several respondents was a recent change in some standards or ranges applied, specifically for virus, and additional labelling. It appeared difficult for some to get feedback from their scheme on the actual percentage of virus or other defects in their crops.

What would a national certification scheme look like?

According to survey respondents, a national certification scheme would include the following elements (percentages reflect 'partly agree' plus 'agree' answers from the survey):

- Customer focussed (82%)
- Reliability (82%)
- Provide value for money (76%)
- Transparency (71%)
- Not favouring a specific production region or state (65%)
- Be simple to administer (65%)
- Use standards and thresholds that have a scientific basis or are based on a documented risk analysis (53%)
- Include virus indexing that is not only based on visual inspection (53%).

Even though customer focus rated highly as an important component of a national scheme, there were some reservations about this, as the following responses highlight.

"It should be customer focussed, but not to the detriment of the seed grower. If they (the customer) want quality, they should pay for it" – seed potato grower

"It needs to be whole of industry focussed….to meet everybody's needs not only the customer" – seed and processing potato grower

"Can't be all customer focussed, otherwise we won't have a scheme because it will be too hard for growers and they (commercial growers) won't buy certified seed" - agronomist

Other considerations for a national certification scheme, as identified by respondents, included good communication both internally (e.g. between a board and CEO) and with growers; not being too difficult for a seed grower to comply with; changing attitudes and awareness of commercial growers towards seed certification; addressing potential shortfalls in seed supply and making use of new diagnostic methods that are cost effective.

One respondent also noted that there is a potential role for a national certification body to participate in the resolution of disputes between growers and suppliers in situations relating

to diseased seed. There may also be a role for a national body to work with growers in identifying future seed varieties that should be grown in to meet consumer demand.

Ownership and management of a national scheme

Many responses expressed support for a certification scheme to be industry owned and managed (39%) and have a board made up of producers, seed customers and technical advisors (50%).

"Needs to be a grower group, they need to have input into their own scheme, otherwise they won't respond well to being told what to do" – seed potato grower & agronomist

There was less support for a scheme to be set up and run as a business (17%).

Again, support was stronger for a national industry scheme (33%) as opposed to a scheme being run by state or regional grower groups (17%) or there being no change from the current systems (11%).

There was divided opinion regarding the role government should play in a certification scheme. Some believed government should be involved to provide oversight and help manage the costs, whilst others believed government involvement would lead to too much bureaucracy.

"It (a certification scheme) has to be well financed so there's not a temptation to skimp on the number of inspectors….the standard and reputation of any national scheme needs to be maintained and continually improved" – seed & processing potato grower

There was also some concern about whether there should be equal representation from all states. As one respondent explained *"Victoria produces the bulk of the seed in Australia, therefore having equal representation from other states may not be favourable"*.

Overseas examples

When asked if survey participants were aware of any overseas examples of well functioning seed certification schemes, the following countries and schemes were identified:

- The United Kingdom, in particular Scotland
- The Netherlands
- France
- Some United States schemes, in particular Wisconsin.

"The UK has a very good seed system. They know where every paddock is planted and it's mapped from aerial view. It's Government controlled. This would be very costly and hard to do in Australia" – agronomist

"The UK system is second to none. I spent two years working in the potato industry there. They have tight legislation around how seed can be grown and produced. They have brought in generational certification" – seed potato grower & agronomist

5.2.8 Keywords from the consultation

Keywords were analysed via SurveyMonkey.

Certification

The following table provides an overview of keywords relating to certification. It should be read by column from left to right to understand which terms were used more often or less often during interviews.

Integrity	Technologies	Rigour
Value for $	**Trust**	**Reputation**
Whole of industry	**'Old rules'**	**Quality**
Flexibility	**Efficiency**	**Meaningful standards**
Consistency	**Streamlined**	**Use new science**
Transparency	**Regional needs**	**Cost / benefit**
Reliability	**Customer focus**	**Export readiness**
Virus issues	**Limitations**	**Governance**
Performance	**Health and variety**	**Other factors**
Import prevention	**'Bent rules'**	**Sufficient rules**

Industry Outlook

The following table provides an overview of keywords relating to the industry outlook. It should be read by column from left to right to understand which terms were used more often or less often during interviews.

Consolidation	Profitability	Variety access
Scale	**Attitudes**	**Competitiveness**
PBI	**Understanding**	**Professionalism**
Adaptation	**Awareness**	**Viability**
Supply chain	**Storage**	**Commitment**
Handling	**Honesty**	**Technology**
Transport	**Relationships**	**Trust**
Communication	**Stratification**	

5.2.9 Stage 1 consultation conclusions

Stage 1 consultation confirmed the importance of seed potato certification. Still, many commercial growers also use non-certified seed because they believe it is just as good or that certified seed of the variety and P-age they require is not available from their suppliers. Certified seed will have to show a significant advantage (e.g. noticeably less disease, especially virus, better establishment, higher saleable yield) compared to farm kept seed to be more widely used.

There was a general desire for improvement of several aspects of seed certification and especially custodianship of seed after harvest. Many comments about possible improvements related to certification delivery rather than the standards. Still, concern was raised about changes to standards and or the process used to do so. A need for integrity, consistency and transparency were often mentioned or agreed/selected from provided statements. The major other suggested improvements related to the use of newer technologies to objectively assess diseases. Many asked for independent oversight for certification.

Concerns about a 'national scheme' mainly related to a loss of control over national or state specific issues and the loss of advantages a regional focus may have e.g. if some areas have less disease issues than others.

Even if they are not 100% happy with the status quo, some in the supply chain and current certification delivery agencies may still oppose changes to current certification systems for a variety of reasons. Some resistance usually occurs whenever changes to established systems are made, even if they are improvements.

6 Review of Certification Standards

The Australian National Standard (National Standard or Standard) for certification of seed potatoes (2007)[6] currently sets the minimum standard. Different states or regions developed and subscribed to their own schemes to at least meet, or exceed, the National Standard. Four major schemes exist; ViCSPA manages seed certification in Victoria, and a majority of South Australia, while Tasmania and Western Australian schemes are operated through government with different arrangements. New South Wales operates a QA scheme for seed potato production that includes seed health management. All certification delivery agencies and the NSW QA scheme depend on seed potato growers for funding.

The purpose of this review of certification standards was to:

- Provide an objective appraisal of the National Standard
- Determine whether a technical review of the National Standard is required, and which aspects may have to be improved based on findings from the Standard's appraisal comparative assessment
- Advice on any potential certification delivery issues based on the current National Standard and its interpretations
- Conduct a comparative assessment of state/regional interpretations
- Understand how the Australian National Standard and schemes compare to others internationally, especially those that target the same export markets as Australia.

From the outset, the objective was not to conduct a wider review and not perform a detailed technical audit of the Standard and new science to come up with updated tolerances or an operational review of certification delivery services (performance and compliance audit).

6.1 The Australian National Standard

This section provides and overview and recommendations on where, why and how the National Standard may be improved. It offers a starting point and guidance to potential reviewers. A full technical review would have to go into more detail and refer to all relevant science. Relevant Australian research funded through HAL from potato R&D levies, including opportunities and limitations for seed certification, has been reviewed in HAL projects PT13013 'Gap Analysis of Australian Potato Research'. This work will be valuable for a technical review of the National Standard.

6.1.1 National Standard documentation

At the time of this review, the only publically available version of the National Standard was found online at the Tasmanian Institute of Agriculture (TIA) website (2014): (http://www.utas.edu.au/__data/assets/pdf_file/0006/563478/National-Standard-31Jul07.pdf). This document is titled: 'National Standard for Certification of Seed Potatoes'; it was updated in August 2007, most likely from a 2004 version. The 2004 version date is based on the following reference; http://www.vicspa.org.au/pdfs/NatStand04 (link defunct).

[6] Horticulture Australia Limited and AUSVEG 2007; Australian National Standard - Certification of Seed Potatoes

When referring to the National Standard in this section, it is to the version that is available online.

A second document titled: 'Australian National Standard Certification of Seed Potatoes', dated August 2007, had been on file, downloaded from the ViCSPA website in 2011. This 2007 version, which appears to be identical in content to the first mentioned version of the National Standard can no longer be found online even though the cover of the National Standard documents state that the information is "*also accessible on the web at: www.vicspa.org.au and www.ausveg.com.au*". Reasons for why there are two documents, and only one of them is publically available through the Tasmanian certification agency, was not part of the scope of this project to explore.

The Potato Biosecurity Plan 2013 (pg. 57) refers to the ViCSPA website for access to the National Plan but the link is no longer active and it is unclear if this linked document was the same as the 2007 Standard used for this review (NB link name: suggests a possible different file name). The same, seemingly out of date web link to a 2004 National Standards is also referred to in the NSW Government Gazette, November 2013 as follows:

> ***Australian National Standard for Certification of Seed Potatoes*** means the National Standard for the certification of seed potatoes approved by AUSVEG Limited (publication available at http://www.vicspa.org.au/pdfs/NatStand04.pdf.)

Recommendation:

A current version of the National Standard should be available online and it should, as a minimum, provide authorship and version control (version numbers and dates) as is the rule for official, approved documents such as standards, rules and QA procedures. This would enable readers to confirm that they are using the latest official version. Regional or state standards, if different from the National Standard, should also be available and clearly identify variations to the National Standard and reasons for variations.

It is desirable to eventually have a single document that describes the 'minimum standard'. Regional, state or industry sector based amendments (e.g. processing vs fresh potatoes) should be included in this document. This would provide transparency and clarity about how seed potatoes are certified in Australia.

6.1.2 Disease tolerances

This document shows current disease tolerances in Appendix 2.

In the National Standard, disease tolerances are listed in Appendix 3 of the Standard document. However, there is no reference to Appendix 3 anywhere in the body of the document. Therefore, readers could miss applicable tolerances or get confused between those mentioned in the body of the document and those in Appendix 3. Some issues are highlighted below.

A tolerance for Late / Irish Blight is listed in Appendix 3 but is not listed in the body of the Standard under Rule 27 in the table for 'Disease/nematode tolerances'. Therefore, depending on which part of the document is read, a slightly different list of tolerances emerges.

The tolerance levels listed in the Standard's Appendix 3 do not have consistent use of decimal places compared to those within the body of the document (e.g. 2% cv 2.0% - does this suggest a crop that has 3% disease is it rejected or does rejection start at or 2.1%?).

Due to the layout of the document, Appendix 3 could easily be mistaken as part of its Appendix 2, which suggests the future adoption of higher standards.

Based on our industry consultation and reviewing the assessment criteria in the Standard, there is confusion about the purpose or intention of Appendix 3. This, combined with overall irregularities in the National Standard documentation, means that there is potential for different interpretation of the standard in each state or region, and by different inspectors; some examples for possible confusion are:

- Is Late Blight included in disease tolerances or not?
- Are the individual tolerances for some viruses considered - in particular for PVX and PVS, for both rating 1 and 2? (N.B.: individual tolerances are listed in Appendix 3 and not in the rules in the body of the document that does not refer to Appendix 3)
- 'General Operating Procedures' refers to Appendix 4 for the PCN testing protocol, but Appendix 4 does not exist; the PCN testing protocol is in Appendix 1.

Recommendation:

A complete list of disease tolerances should be available in one place and not leave anything open to interpretation so that any reader can easily understand which diseases are included and what the tolerances are, i.e. when and why a crop may fail certification. Having all disease tolerances listed in an appendix is a good idea, but it must be consistent with other information provided in the rules in the body of the document. Cross-referencing has to be clear and correct.

Any updated versions of the National Standard should use clear headings and sub-headings and ensure that all appendices have clear titles and are referenced accordingly in the rules. This will ensure that the National Standard is easy to understand and is unambiguous.

Tolerance for Common scab:

The disease tolerances for common scab in the National Standard are 4% in Tasmania and 2% in other states. Australian research in 2006 by Pung (HAL project PT02016[7]) found that:

- Common scab infected seed was an important source of transmission onto daughter plants **only in new ground**
- In 'old ground' with a history of potato production scab was mainly caused by soil-borne inoculum
- Substantial increases in the incidence of common scab were only noted at 10% or higher (and no obvious common scab transmission due to infected seed with 2%, 4% and 8% visible scabs)
- Most of the infected seed in Australia have light scab cover of less than 5% surface cover
- **There was no scientific evidence to support the current tolerances in Australia**

[7] HAL (2006) Common scab threshold on tuber seeds for processing potato crops. Dr Hoong Pung. HAL project PT02016

- 4% of tubers with 2% surface cover was suggested as a good benchmark
- Seed certification schemes overseas often include tolerances based on incidence and severity (percentage cover) and scab depth (see also section 5.3 of this report which shows tolerances for some international schemes).

Tolerance for Powdery scab:

The tolerance for powdery scab is 2%. However, Pung (2006) found that:

- Scab incidence on seed lines of less than 10% did not result in increased powdery scab incidence in commercial crops
- Seed with a high proportion of severely common scab infected seed were shown to result in an increased incidence of powdery scab and deep common scab.

Although we have not conducted a detailed review for information on common scab or powdery scab, the abovementioned research suggests that the current tolerances are not based on the science (which already was completed before the 2007 Standard was published or any new research findings). The Standard does not reflect current potato and seed potato management practices such as irrigation and seed treatments.

A more detailed review of all tolerance percentages including incidence and severity / level of disease is warranted (i.e. explain exactly what is counted as disease symptom – style/level of disease - and how to arrive at a disease rating for a crop based on % tubers infected and % surface area of tubers). The National Standard shows examples of styles / level of disease (Rule 32) but this information is only used to a limited extent in the Standard and is not referred to in any of the tolerance tables.

Recommendation:

The disease tolerances need to be reviewed to reflect the latest science and diagnostic technology. This should include consideration of incidence and severity of the disease e.g. for scab % coverage and lesion depth and % tubers infected.

Interpretation of all tolerances and how to assess them must be unambiguous.

6.1.3 Pathogen testing

Virus testing

According to the National Standard (NS), testing is only required for initial stocks (starting material) for a range of diseases including the following viruses:

- Potato leafroll virus (PLRV)
- Potato virus A (PVA)
- Potato virus M (PVM)
- Potato virus S (PVS)
- Potato virus x (PVX)
- Potato virus Y (PVY)

- Tomato spotted wilt virus (TSW)
- Potato spindle tuber viroid (PSTV)
- Calico, caused by Alfalfa Mosaic Virus (Rule 1, NS).

The WA rules require that, in addition to testing for initial stocks, all G3 seed be tested for a range of viruses.

Standard operating procedures in Tasmania suggest that all G2 crops are virus tested.

Potato Cyst Nematode (PCN)

The National Standard includes a zero tolerance for PCN and states that PCN testing is required in Victoria. It does not mention any testing required in other States. However the final report for HAL project PT10011 (2011 Seed Potato Certification Officers Workshop) states "*Victoria and South Australia have a soil PCN test requirement*."

The Tasmanian Standard mentions PCN testing but the Standard does not state what is required i.e. the rules.

The PCN testing requirements in the Standard have been superseded when by all states (bar WA) accepted the Australian National Potato Cyst Nematode Management Plan's[8] recommendations for managing high-risk pathways and high-risk land. The WA Standard asks for PCN testing of seed.

New national movement conditions for Potato Cyst Nematode (PCN) risk items came into effect on 1 November 2013; they have been taken up in relevant state regulations (Plant Protection, Biosecurity or Quarantine Acts or Regulations). All states now require PCN testing of all seed potato crops and an 'area freedom certificate' to allow movement of seed across their state boarder. Each state has published its rules and there are slight differences between jurisdictions.

The rules that apply to determining freedom from PCN (area freedom) and other quarantine pests and diseases are set out in International Standards for Phytosanitary Measures (ISPM, Appendix 6) through the International Plant Protection Convention (IPPC, www.ippc.int). Australia is signatory to the IPPC. The Department of Agriculture is the responsible Federal Authority.

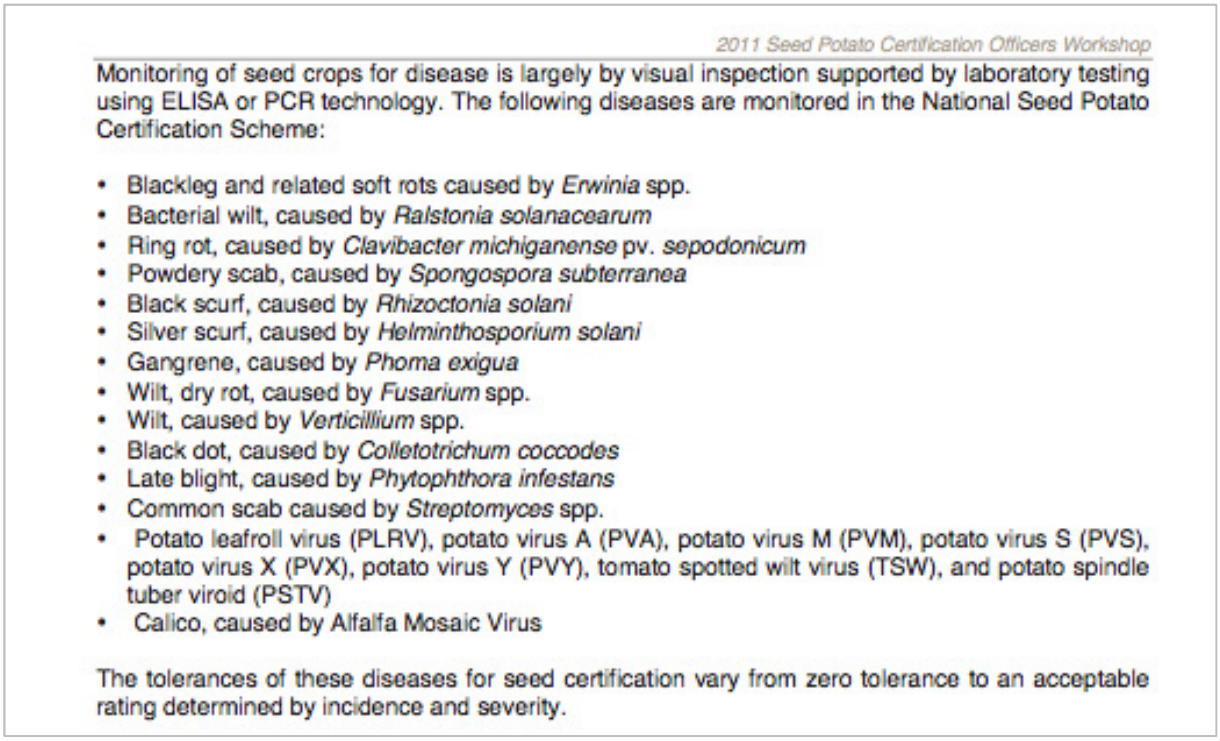
Importing countries require PCN freedom of seed. Requirements are set out in the importing countries biosecurity / quarantine regulations.

Other diseases

A report on a 2011 Seed Potato Certification Officers Workshop (HAL project PT10011, a follow on from PT04013) lists diseases that are "*monitored"* in the National Seed Potato Certification Scheme" (Figure 6-1). It is not clear from the report (or the Standard) how these diseases are monitored and what is done with monitoring data; how is it recorded and used? In addition, and based on our consultation with industry, it is not clear, if, or how, Late Blight is assessed as discussed previously.

[8] Australian National Potato Cyst Nematode Management Plan 2012, http://ausveg.com.au/rnd/Potato_Cyst_Nematode_Plan.htm

The list of diseases in Figure 6-1 appears to be the list of diseases that 'initial stocks' must be free of (as per Rule 1, NS). If that is correct, there is not clear information given on how seed crops that are due to be sold to commercial growers are monitored and assessed.



2011 Seed Potato Certification Officers Workshop

Monitoring of seed crops for disease is largely by visual inspection supported by laboratory testing using ELISA or PCR technology. The following diseases are monitored in the National Seed Potato Certification Scheme:

- Blackleg and related soft rots caused by *Erwinia* spp.
- Bacterial wilt, caused by *Ralstonia solanacearum*
- Ring rot, caused by *Clavibacter michiganense* pv. *sepodonicum*
- Powdery scab, caused by *Spongospora subterranea*
- Black scurf, caused by *Rhizoctonia solani*
- Silver scurf, caused by *Helminthosporium solani*
- Gangrene, caused by *Phoma exigua*
- Wilt, dry rot, caused by *Fusarium* spp.
- Wilt, caused by *Verticillium* spp.
- Black dot, caused by *Colletotrichum coccodes*
- Late blight, caused by *Phytophthora infestans*
- Common scab caused by *Streptomyces* spp.
- Potato leafroll virus (PLRV), potato virus A (PVA), potato virus M (PVM), potato virus S (PVS), potato virus X (PVX), potato virus Y (PVY), tomato spotted wilt virus (TSW), and potato spindle tuber viroid (PSTV)
- Calico, caused by Alfalfa Mosaic Virus

The tolerances of these diseases for seed certification vary from zero tolerance to an acceptable rating determined by incidence and severity.

Figure 6-1: Diseases monitored in the National Seed Potato Certification Scheme (Source: HAL project PT10011, final report).

Recommendation:

Any future technical review of the National Standard should especially consider advancing virus testing and take into consideration the testing techniques / technologies now available[9] as well as expectations of seed buyers.

Advanced testing technologies for testing of other diseases and pests should also be considered and used if these tests can provide more reliable results than visual assessments and are cost effective.[10]

The National Standard should be up updated to accurately reflect PCN testing requirements.

6.1.4 Industry Biosecurity Plan for the Potato Industry

The National Standard lists 15 diseases as 'Quarantine Diseases from **National Potato Industry Biosecurity Plan**' and these have a zero tolerance (Appendix 3, National

[9] Mortimer-Jones, S.M.;2010; Development of Diagnostic Tools for the Seed Potato Industry. PhD Thesis, Murdoch University
[10] Horticulture Australia Limited, 2015; PT13013 'Gap Analysis of Australian Potato Research' Final Report

Standard). The Standard says that this list will by necessity have to change if the status of any disease on the list changes. We note that the Industry Biosecurity Plan for the Potato Industry was updated in November 2013 and version 2.0 is now available.

Recommendation:

The list of quarantine diseases in the National Standard should be reviewed, as it most likely needs updating to align with the National Potato Industry Biosecurity Plan.

In the interest of biosecurity, full traceability should be included in the National Standard.

6.1.5 Minituber production

The National Standard refers to laboratory multiplication of stocks as follows:

Page 4: *"Accredited laboratory means a laboratory approved by AUSVEG to produce minitubers, microtubers and plantlets for further multiplication."*

Page 6: (NB there is no point 1)

"*2. All laboratories and associated facilities (e.g. glasshouses etc.) which accept pathogen-tested stocks from approved repositories, to produce Generation O (G0) seed – e.g. minitubers, microtubers, plantlets, or other defined propagules must be accredited.*

3. Accreditation of laboratories is vested by AUSVEG, in State agencies. The accreditation standards shall be those currently implemented by ViCSPA in Victoria and other participating States. Further details of the accreditation process maybe found at www.vicspa.org.au

4. Accredited laboratories will be inspected annually by the approved agent of the AUSVEG sub-committee to ensure that standards are being maintained."

Page 16 *"Accredited Laboratories*

Pathogen tested stock may be multiplied to produce plantlets and/or minitubers and microtubers in any laboratory accredited by AUSVEG or its agents.

Laboratories in four States (New South Wales, Victoria, South Australia and Tasmania) are currently accredited to produce minitubers, microtubers, and plantlets. These are listed on www.vicpsa.org.au.

Protocol for Accreditation

Details of the protocols for accreditation of laboratories can be found at www.vicspa.org.au."

Currently, protocols for accreditation are not publically available via the links given in the Standard. ViCSPA accredits minituber production facilities and runs its own facility. It is not clear how the accreditation of the ViCSPA facility is handled or how ViCSPA came to accredit other facilities that operate in the same commercial space as its own facility.

An in-depth study of minituber production and accreditation of facilities was not included in the scope of this review. However, comparing the statements from the Standard with what how the system operates, and feedback from consultation, suggests that minituber production protocols and accreditation of facilities should be included in an updated system of seed potato certification.

Recommendation:

Review relevant minituber production and accreditation protocols as part of updating the National Standard.

6.2 Australian schemes

This section provides an overview of the Australian National Standard compared to state based schemes with a major focus on the important aspect of disease tolerances. The purpose of this part of the review was to:

- Obtain information on field and tuber assessments and disease tolerances used in Australia
- Consider how the state based schemes align with the National Standard and in particular what, if any, additional conditions are applied in each state
- Provide an indication of how Australian certified seed might be viewed or assessed by potential buyers.

6.2.1 Application of the National Standard in each state

The purpose of the National Standard (NS) for Certification of Seed Potatoes is declared to:

"... *ensure that irrespective of the state of origin seed potato, buyers have the opportunity to receive seed potatoes, which have met, or exceeded, an agreed standard. The standard describes minimum conditions required for seed potatoes to be certified in each state, including:*

- *Rules for certification*
- *Selection and multiplication of stocks (in the laboratory and in the field)*
- *Accreditation of laboratories*
- *Crop inspections*
- *Tolerance levels for disease, varietal contamination and other contamination/defects." (Potato Biosecurity Plan, Plant Health Australia, 2013)*

The National Standard does not include rules for how regional amendments to the Standard may be produced and how they would be approved. Still, each scheme appears to deviate from the current Standard in different ways. It is not always documented how and why these deviations occurred and responses to this question posed during consultations differ.

Based on our review of available documentation and consultation with industry representatives, we found what is described in the following sections.

Western Australia.

The Western Australian Department Of Agriculture and Fisheries is responsible for delivering certification services. WA seed growers provide funding for the service. The Western Australian rules include all of the rules from the NS, with some additional conditions such as rules for crop failures, lower virus tolerances and clarification of the styles of disease accepted for some defects. WA tolerances compared to the National Standard can be found in Appendix 3. The WA rules are a comprehensive document and incorporate information from the National Standard. The WA rules have been updated several times to address problems or opportunities. The WA standard does currently not fully comply with requirements for PCN surveillance. Australia is a signatory to the International Plant Protection Convention (IPPC) and therefore International Standards for Phytosanitary Measures (ISPM) apply. The main ISPMs pertaining to PCN are highlighted blue in the in Appendix 6 (listing of all ISPMs).

Tasmania

The Tasmanian Institute of Agriculture (TIA), TasSeed, is responsible for certification in Tasmania. The Tasmanian Standard was not available online but was available from TIA. We did find the following documents were available on the TIA website:

- Standard Operating Procedures for inspections under the national standard
- National Standard for Certification of Seed Potatoes (File name: National-Standard-31Jul07).

Tasmanian tolerances compared to the National Standard can be found in Appendix 4.

The Tasmanian Standard says "*the following Tasmanian Standards override or be additional to the National Standard for Certification of Seed Potatoes*". It is a two-page document, outlining additions or alterations to the NS. Given the confusion about diseases tolerances (e.g. listed in Appendix 3 of the National Standard), the Tasmanian Standard is not clear on how tolerances are applied in accordance with the National Standard for some conditions / rules (see sections 5.1.2 and 5.1.3 above). If the Tasmanian Standard does override (as suggested in the Tasmanian Standard header) the National Standard, then it cannot be consistent with the National Standard. It does not provide more clarity than the NS. Tasmania needs to check whether it currently complies with IPPC standards.

Victoria / South Australia

Rules or standards were not available online or made available for this review. ViCSPA delivers certification services in Victoria and South Australia as a non-for-profit organisation. Seed growers provide funding for the service.

New South Wales

Rules or standards were not available online or provided for review. We were informed that the Crookwell Potato Association operates a self-funded QA system, which is currently being reviewed and updated to comply with the National Standard.

6.2.2 Comparison of disease tolerances in the National Standard and state schemes

The information listed in Appendix 2 compares disease tolerances for the National Standard and those used in state based schemes. Note that this table lists the data for certified seed destined for the customer for commercial production (processing or fresh potatoes) and not for assessment of earlier generations. Tolerances shown are for rating 3 (for tolerances for rating 1 and 2 seed refer to the Standard). The table also does not include more detailed information such as thresholds for first inspections (refer to the relevant rules / guidelines in the Standard for further details). NB In-depth comparisons are required for a detailed technical review and update of the Standard.

As explained above, the Western Australian rules were found online. The Tasmanian Standard was not available online but was obtained from The Tasmanian Institute of Agriculture (TIA). Standards or rules for New South Wales and ViCSPA were not made available and could therefore not be compared.

The comparative table in Appendix 2 lists:

- Tolerances for **field inspections (second inspection),** then
- Excluded diseases
- Zero tolerance diseases, and then
- Tolerances for **tuber inspections.**

Comparing WA Certified rules and the National Standard

In WA, rules exist for the *Certified* Seed Potato Scheme as well as the *Registered* Seed Potato Scheme. The WA Certified rules include those from the National Standard, but with some additional conditions/rules important to the state highlighted in Appendix 3.

Comparing Tasmanian Certification and the National Standard

The 'Tasmanian Certification Standard' provided by TIA is a two-page document outlining the rules or conditions that "*override or be additional to the National Standard*". Appendix 4 shows a comparison of the Tasmanian Standard with the National Standard.

6.2.3 Compliance of Schemes and QA systems with the National Standard

Comparisons of the Tasmanian and WA schemes show deviations for deviations for, and/or additions to the National Standard, which were put in place to address regional differences. The WA Scheme has improved on the 2007 National Standard in providing some stricter rules and adding clarity.

The Tasmanian changes to the National Standard do not add clarity or rigour to the National Standard as it stands.

We cannot comment on compliance by ViCSPA or the NSW QA Scheme at this point in time because current rules or standards were not available publically or on request. Consultation highlighted that commercial growers were concerned that ViCSPA had changed rules for virus tolerances so that two different sets and labels were available. Many lamented that

information about the actual infection levels were not made available or presented to them even on request.

We note that the DEPI Victoria website (viewed August 2014[11]) states the following in relation to PCN and movement of potatoes:

"seed potato certification scheme deemed to meet National Standards means the ViCSPA Seed Potato Certification Scheme or the Tasmanian Certified Seed Potato Scheme (TasSeed)."

Although this statement on the DEPI website is in relation to PCN, it is not explained why the WA scheme is not listed as a certification scheme that meets the National Standard. We also note that the National Standard says the "*QA systems currently operate only in Victoria and Western Australia"*. NSW is not mentioned as operating a QA system while WA does not claim to operate under QA. ViCSPA operates a QA system that allows self-certification of seed growers under QA.

Based on a review of documents and statements on departmental or scheme websites available, it is not clear which states are deemed to comply with the National Standard or which states operate QA systems, and whether QA systems comply.

6.3 Conclusions about the National Standard and Australian schemes

Consultation so far provided insights mainly into how certification is perceived by seed and commercial growers and other stakeholders, and to a lesser degree, into how certification agencies operate their schemes. The review of the National Standard and state or regional schemes provided additional information on the quality of documentation, clarity of procedures and tolerances, obvious omissions and the use of objective technical information[12].

The National Standard was intended to be the guideline that uniformly supports 'minimum quality conditions' for seed potatoes throughout Australia. This appears to be the case to some degree. Still, the Standard, how it is applied and how certification is delivered lack uniformity and transparency.

Although we have not reviewed all state based schemes, feedback from consultation suggests that inconsistencies in these are likely e.g. in how the National Standard is interpreted, applied and updated or amended.

We conclude that the National Standard document and technical details it contains, especially those pertaining to disease tolerances, need to be thoroughly reviewed and updated so that they cannot cause confusion or misinterpretation. References to scientific publications must be given. Where a scientific basis for tolerances does not exist, the choice for selected tolerances has to be explained and an effort made to underpin them with science.

[11] http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-insects-and-mites/potato-cyst-nematode/movement-of-potatoes-into-vic.

[12] NB The scope of this project did not include an operational review of certification delivery or an in-depth technical review of tolerances and underlying or new science.

The document itself needs to be presented and maintained according to good practice of 'standard writing' and be easy to understand. All procedures and technical details have to be explicit.

Apart from the review of all aspects of the Standard document, we advise a more detailed appraisal of state schemes and how certification actually operates in practice. This is to determine all elements or rules from the National Standard that have been adapted or changed, and how and why (e.g. whether additions to virus/disease testing or tolerances have been applied to satisfy market requirements or other needs). We expect that many changes could be used in an updated National Standard.

This would also be required to understand how the Standard's (or its adaptation's) rules, procedures and tolerances are interpreted in practice and whether improvements are required to practices to make sure they are aligned and consistent. It would for instance be helpful to examine various seed certification records to confirm how the National or state standards are applied. It would also be beneficial to confirm what information is currently recorded and what is made available to seed buyers to understand whether interpretations of the Standards are consistent and transparent.

A more detailed technical and operational review will help in updating the existing National Standard, including which of its rules need to be clarified e.g. any rules that might be interpreted or applied differently by different schemes or by different people. At the same time the science background for certain rules and assessment methods has to be assessed and new science and technologies incorporated, to improve the service and outputs from certification.

A well-written standard in all its aspects, together with independent, transparent certification delivery, recording, reporting, labelling and feedback systems, would improve confidence in the integrity and value of seed certification. However, if standards are poorly written, open to interpretation, not easily accessible or do not remain current, then different approaches can develop which makes for a nationally inconsistent approaches to seed certification. Then seed growers can have little confidence in the system and buyers feel they have no certainty about what they are getting when buying certified seed.

The National Standard and its delivery systems should be reviewed biannually or more often if required so that it remains current.

Minituber production and accreditation of laboratories are not in line with the National Standard. The National Standard should include or refer to minituber production standards. This needs to be reviewed and rectified.

A National Standard has to sit under a framework that determines how it is administered and updated and which governance arrangements are in place for its application in different regions or states. It has to explain how it links with any regulatory bodies, as applicable. The framework has to ensure independence and transparency in all aspects of seed potato certification nationally. The Australian Seeds Authority Ltd (http://aseeds.net.au/) provides an excellent example of how seed potato certification could be set up and could operate in Australia.

Recommendations:

The National Standard procedures, rules in particular about disease tolerances must be clear and unambiguous. In addition, the format and layout of the National Standard should allow any reader to easily understand tolerances and other conditions, and allow the minimum rules to be consistently applied in each state or region. Standards have to be 'fit for purpose' clear, concise and unambiguous. They have to be 'controlled documents' that explain scope, authorship, version numbers/dates and custodianship.

There should be an independent technical and operational review and then at least biennial audits to ensure that a National Standard and the way certification is delivered meets changing or varying needs rather than each state adding (or omitting) rules to their own Standard / guidelines as they see fit.

A system of minituber certification should be included in the arrangements about seed certification of field grown tubers. Current arrangements therefore need to be reviewed.

Independence means reviewers are qualified for the different tasks required in the review, impartial and can objectively consider the needs of all in the supply chain.

There is a need to determine the requirements for state based amendments to meet the National Standard as a minimum and how state, regional or industry based variations to the Standard may be produced and approved.

The standard(s) should be publically available to all in the supply chain.

The confusion about different schemes, QA, compliance and oversight also need to be addressed with relevant state and federal departments as well as industry bodies. This is especially important were reference is made to seed certification as part of regulation, biosecurity planning or for other purposes.

The review of the National Standard should consider the need for different ratings e.g. AA and A (which could meet the differing needs of different seed customers) and what the disease tolerances should be for those ratings.

6.4 International schemes

This section gives an overview of selected international schemes. An online search for international schemes was conducted. Schemes from countries were selected to represent a range of production regions encompassing regions with processing and/or fresh market focuses. The purpose of this part of the review was to provide an outline of how the Australian National Standard compares with well-established schemes with a 'good name', especially potential export market competitors. It also tries to provide some insights into how information might be viewed by potential seed customers.

We have examined maximum tolerances for diseases and disorders for the following schemes (Appendices show relevant excerpts):

- **Britain:**
  Explanatory Guide to The Seed Potato Classification Scheme and Approved Stock Scheme (2013).
  http://www.fera.defra.gov.uk/plants/publications/documents/SPCSGuide0313.pdf
  (Appendix 7)
- **Canada:**
  Canadian Seed Regulations, Part II, Seed Potatoes
  http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._1400/FullText.html (Appendix 8)
- **New Zealand:**
  New Zealand Seed Potato Certification Authority, Seed Potato Certification Scheme Rules, 18th October 2013
  http://www.potatoesnz.co.nz/users/Image/Downloads/PDFs/2013-14%20NZ%20Seed%20Potato%20Certification%20Scheme%20Rules%2018%20October%202013.pdf (Appendix 9)
- **Idaho & US:**
  Idaho Crop Improvement Association, Inc. Rules of Certification for Seed potatoes in Idaho
  http://www.idahocrop.com/StandardDocs/2014Potato-R&R.pdf (Appendix 10)
- **United States Standards for Grades of Seed Potatoes** (1987, reprinted 1997)
  http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5050320 (Appendix 11)
- **Scotland:**
  Seed Potato Classification Scheme (SPCS) http://www.sasa.gov.uk/seed-ware-potatoes/classification-scheme (Appendix 12)
- **Netherlands**
  Inspection of Seed Potatoes http://www.nak.nl/

  Promotional presentation summarising Dutch seed inspection: http://www.unece.org/fileadmin/DAM/trade/agr/promotion/2010_Indonesia/SeedCert-NL-workshop-UNECE.pdf (Appendix 13)
- **Argentina**
  We were unable to find any Argentinian guidelines online. These would have allowed a comparison to another southern hemisphere producer.

6.4.1 International schemes comparison

Our comparative overview of international schemes included disease and defect tolerance levels for field and tuber inspections of 'certified' seed. It is summarised in Appendix 5 as a comparison to the National Standard.

The following were **not** examined:

- Tolerance in previous generations such as basic or pre-basic
- Disease status and/or testing requirements of initial stocks
- Crop isolation requirements
- Sampling sizes

- Labelling rules
- Storage guidelines/rules.

We have found that each scheme and the structure of their rules/guidelines vary considerably. This would make it challenging for seed buyers to compare each scheme, even if looking only at diseases. In addition, the number of field generations to produce certified seed varies greatly between schemes e.g. Scotland up to 12 generations, and Canada up to 7.

Some information for the Scottish system e.g. field inspections was found in 'Explanatory guide'. Other information for tuber inspections found in 'England The Seed Potatoes (England) Regulations 2006. Comparisons are difficult due to different individual and group tolerances, different classes etc.. A table in the Scottish regulations does not state if tolerances refer to field or tuber inspections.

Appendix 5 attempts a comparison of the Australian National Certification Standard (2007) with other schemes overseas. It highlights the variation between schemes and that overseas documents are also not always clear and open to interpretation.

A comprehensive comparison of international standards was beyond the scope of this project. The comparisons we did perform indicate that statements made during consultation about how the Australian National Standard compares with international standards are not based on an actual comparison of guidelines. It is likely that judgments were made after discussions with growers or technical people involved in certification or inspection.

6.4.2 Previous comparative assessments of international standards

The United Nations Economic Commission for Europe published an 'Overview of National Schemes for Seed Potato Certification'[13] in 2004. Although it is now ten years old and therefore may be partly out-dated, it provides comprehensive comparisons including:

- Requirements for growing crop
- Types and size of sample on the growing crop
- Haulm destruction
- Minimum number of official field inspections
- Criteria measured and/or recorded on the seed potato crop
- Field inspection standards
- Post harvest control
- Pathogens evaluated by post harvest control
- Tuber inspection requirements
- Tuber standards
- Fungicidal disinfectants
- Requirements for packaging and labelling

[13] UNECE (2004) Overview of National Schemes for Seed Potato Certification.
http://www.unece.org/fileadmin/DAM/trade/agr/wgroups/ge_06/ncs_schemes/ncs_all_2004_03_31.pdf (accessed Aug 2014)

- Seed potato shipment
- Characteristics of packages allowed
- Seed tags.

The extensive tables showing details of the comparisons can be found on the web at: http://www.unece.org/fileadmin/DAM/trade/agr/wgroups/ge_06/ncs_schemes/ncs_all_2004_03_31.pdf (accessed Aug 2014).

We found that direct comparisons of each certification scheme can be difficult due to the following:

- There is no standard way of presenting the information in certification rules / standards
- The relative risk for a particular disease occurring may depend not only on the tolerance levels of the certification scheme but also whether it is present in that region / country. This information is not always obvious
- Sometimes zero tolerance or quarantine diseases are somewhat 'hidden' in the text rather than listed clearly in tolerance tables
- Inconsistent use of common names. Common names such as "eelworm" can cause confusion if the Genus and / or species are not specified. Some schemes state the Genus only e.g. "Meloidogyne sp."
- "Blackleg" can mean different species and in Scotland for example there are two organisms causing blackleg, which have different tolerances
- Use of different disease names e.g. 'Corky ring spot' in Idaho scheme but other schemes refer to 'Tobacco Rattle Virus', which causes 'Corky ring spot'
- Information about specific diseases may be found under one or multiple sections of the scheme rules. For example, if 'bacterial wilt' is of concern, it could be found in certification rules under 'testing of initial stocks', 'field inspection tolerances' and/or 'tuber inspection tolerances' or specific rules e.g. rules about paddock selection
- Combined tolerances are an issue e.g. some schemes have a combined tolerance for "dry rots", while others have a specified tolerance for individual dry rot diseases
- Grouping of disease tolerances and variations on how diseases and/or defects are grouped for total tolerances. E.g. English regulations group II includes several bacterial diseases, fungal disease as well as frost damage. In other schemes the groupings differ e.g. fungal diseases, bacterial diseases, defects, insect damage
- Terminology e.g. different terminology is used for naming of generations
- Complexity due to a combination of different terminology for different generation of seed, variation in the number of generations allowed, different disease tolerances for each generation, different tolerances for different seed ratings; disease severity (e.g. % of skin covered) and exceptions to the rules.

As far as practicable, Standards should be written so that it is easy to look up a particular disease / issue and determine when and how it is assessed, what the tolerance level, and if it is present or not (e.g. zero tolerance quarantine diseases).

6.4.3 International work to align seed certification systems

The United Nations Economic Commission for Europe "UNECE STANDARD S-1 concerning the marketing and commercial quality control of SEED POTATOES" 2011 edition is in the process of being updated; a draft document is available. (N.B.: Nigel Crump, ViCSPA represents Australia on the UNECE technical committee specialised section on seed potatoes.)

Any updates to the Australian Seed Potato Certification Standard should endeavour to align with the UNECE standard S-1, including stated overall goals:

- Facilitate fair international trade and prevent technical barriers to trade
- Improve producers' profitability and encourage production of high-quality produce
- Protect consumer interests.

The document's section on "Classification (of seed)" (=certification) commences as follows:

"Seed potatoes shall be classified according to variety and the standards given below. Their classification shall be subject to official control in the producing country. The Designated Authority (DA) is responsible for the maintenance of all classification data to provide traceability. Seed potatoes shall be placed in two classes within each of three categories as defined below:" (details follow).

The DA oversight in countries applying the UNECE Standard allows its use for export and import. Currently Australia does not have a DA that could provide oversight and ensure national and international buyers of the integrity of seed certification standards in Australia.

6.4.4 Conclusions from the comparison of the Australian and international standards

Our partial comparison of international standards and the Australian Standard dos not allow for an objective assessment on which standard would provide for better seed quality than another one. This may be possible to do, if the 2004 UNECE survey was repeated. The benefit of this investment would be low.

Given the current UNECE review, an in-depth comparison of international standards is also not required for the purpose of this review or an adjustment of the Australian approach to seed certification. Australian representation with a UNECE working group is important.

6.5 Stage 1 Synthesis and Recommendations

Prerequisites

- Seed certification has no regulatory or other legislative legitimacy at any jurisdictional level, and this would not change

- Seed customers, importers and other agencies want assurance about the quality of seed potato they purchase
- A common national certification system can deliver assured seed quality and ultimately benefit the Australian potato industry.

6.5.1 Certification schemes and standards

When comparing the requirements written into the current Australian national potato seed certification standard with those of other countries, they could be seen as somewhat comparable. Depending on the thoroughness of comparison, it could also be said that marked differences exist, especially for particular bacterial and fungal diseases (esp. tolerances for common scab, Hoong 2006). Differences also lie in the execution of certification, especially the level of official oversight or external control.

Similar to most countries potato seed certification was originally conducted by government departments and had a regulatory aspect. Due to the federal nature of Australia, state governments delivered the certification service. As state governments discontinued this role, the currently existing schemes evolved concurrently, with the National Standard as a starting point; some appear to have changed from that over time.

Current certification standards, their sub-standards and assessment methods can be seen as interpretations of the 2007 national standard. They are now becoming out-dated in many aspects due to advances in potato disease research and technology (e.g. APRP1 & 2). They consequently fall short of achieving their goal to minimise the potential impacts of seed borne pathogens of seed potato for buyers in Australia and overseas.

The shortfalls identified with current certification are:

- They do not automatically use findings from new Research and Development (R&D) on disease diagnostics; there is no process for this to occur
- Visual disease assessments for all diseases (other than some virus testing). Most virus testing is done visually especially after G 2 and there are many varieties that do not display visual symptoms especially of Y. The APRP2 work with common and powdery scab did confirm that for these diseases the visual system does work. What is of concern is that grading out infected tubers to reach an acceptable threshold does not reduce the impact of disease in daughter tubers
- Testing for Potato Cyst Nematode (PCN) is a requirement for all seed crops since November 13, but it appears to be not uniformly applied in certification standards and or delivery
- The length of time between harvest and inspection affects the certification result but such time lag is not stated or addressed uniformly; some schemes appear to require reassessment of tubers if the time between inspection and dispatch is substantial
- Many seed buyers have little confidence that certified seed provides an economic benefit through improved productivity (especially crop health and yield).

Apart from issues with the execution of the national standard, a concern is that seed certification in Australia is not set up like proper certification systems. Proper systems include a structure of internal and external (third party) audits/reviews by an accreditation

body i.e. not only standards and procedures but also the certifying bodies are reviewed regularly and are accredited by a responsible authority. This continuous improvement approach ensures to customers that schemes continue to be up to date with technology, reliable, transparent and focussed.

Current certification scheme operators have agreed amongst themselves that the current National Standard needs updating. They are prepared to do this and have formed the 'Australian Seed Potato Council' to advance the issue, and address other matters related to seed potatoes. This preparedness to conduct an initial internal review is a good initiative.

Still, in light of the above account on the need for a sound certification system to have independent, transparent external reviews and accreditation of certifiers, an internal review of the current standard alone cannot be the cornerstone of a credible seed potato certification system.

A future robust system would need to include independent oversight over the national certification guidelines/rules including the standard to keep it current and in line with regulation where appropriate (e.g. via involving subcommittee members of the Plant Health Committee) and suitable external reviews of certifiers to maintain accreditation.

Seed quality and chain of custody (stewardship)

A lack of adequate technical information exists on how to use attributes other than seed health (e.g. nutritional status and physiological age) in a certification system. Still, it would be desirable for commercial growers to have the best possible information on important drivers of marketable yield, which would classify seed as 'good' or 'poor'. Relevant life-cycle information for commercial growers on how and when seed was grown, harvested, transported and stored, as well as size distribution, to enable matching this with crop management, i.e. adjusting plant spacing, fertilisers etc. could be provided. Record keeping and communication systems are currently not set up to do this.

On top of a proper certification system, seed growers and buyers need successful supply chains where custody of seed is shared and there is 'something in it for all' based on agreed procedures and communication. Based on our consultation, some desirable supply chain attributes to strive for are:

- Reliability and integrity
- Value, cost savings and efficiencies are a shared goal along the chain
- Expertise and knowledge support best practices
- Dealing effectively and responsibly with issues and with unexpected events
- Commitment to continuous improvement by all involved
- Commitment to new technologies
- Positive culture, "can-do."
- Strong communication and management by all partners
- Traceability and history ('seed potato passport' and crop management records of commercial crops)
- Shared goals, value potential and long term vision.

6.5.2 Stage 1 Recommendations

Technical review of the National Standard

In line with the 'Foreword' of the current National Standard (2007), it should be reviewed. The review should focus on incorporating new knowledge and diagnostic technologies about diseases carried on or in seed potatoes. This review should be conducted independently from organisations and or people involved in seed certification; 'official oversight' of this process is recommended (e.g. by a Plant Health Committee, PHC, subgroup). While official oversight may not be critical, independence and integrity of the review are paramount. This means that, while current certification bodies and others in the seed potato supply chain have to be consulted for the technical review, they must not be in charge of it. If official oversight was not part of the technical review process, consultation with the PHC should be included. The technical review of the National Standard 2007 should at a minimum:

1. Incorporate new science into the standard (e.g. APRP generated information and diagnostic technologies)
2. Consider costs of changes to seed and commercial growers (no competitive disadvantages)
3. Consider practicality of execution of changes (in relation to timing of seed harvest, sales and seed use as well as alignment of certifiers and training certification officers)
4. Consider that the standard for fresh and processing seed may differ in some aspects (relating to skin quality)
5. Incorporate a biennial independent technical review.

Delivery of seed certification

Concurrently with a technical review, Australia should move towards a proper, uniformly set up Seed Potato Certification system. This can then be the foundation of a professional seed potato industry; it will restore / enable confidence in the benefits of using certified potatoes and allow seed growers to take advantage of export opportunities.

In line with other certification systems (e.g. ISO systems) the Australian Certified Seed Potato system should include accreditation and licensing of certifiers (= the organisation(s) delivering certification). A seed potato certification framework (including implementation plan) should be developed by a suitable independent group of people. Key features of the framework should include but not be limited to:

- Licensing agreements with and review of certifiers to maintain their accreditation (= authorisation to act as seed potato certifiers)
- Training requirements for seed potato certification officers
- Uniform documentation, recording, reporting and labelling requirements (based on the technical standard and label use guidelines)
- Due consideration of the UN Standard14 for seed potato certification (which e.g. asks for a "Designated Authority" overseeing a seed potato certification scheme).

[14] http://www.unece.org/fileadmin/DAM/trade/agr/meetings/ge.06/2011/2011_Leaflet_E.pdf

Seed Potato Stewardship

The peak industry body may consider the development of a Seed Potato Stewardship Training Program to improve custody of seed potatoes in the supply chain. It would address issues that affect seed quality which cannot be addressed by certification, especially stresses due to poor storage, packaging, transport and handling practices.

7 Stage 2 - A Potato Seed Certification Framework

7.1 Stage 2 Consultation

Feedback from the second round of industry consultation has been a major contribution to sections 6.3 to 6.4 of this report. These final sections describe how seed potato certification may be adapted to meet requirements of all stakeholders. Even though feedback and attitudes varied widely in some aspects, there are many common requirements and aspirations, and there is a good knowledge base to start from to build an effective system.

7.1.1 Outcomes from Stage 2 phone and survey consultation

All industry sectors and representation from each state were included. The survey was publicised via AUSVEG media to ensure all interested growers could participate either by completing the online survey or talking to the project manager.

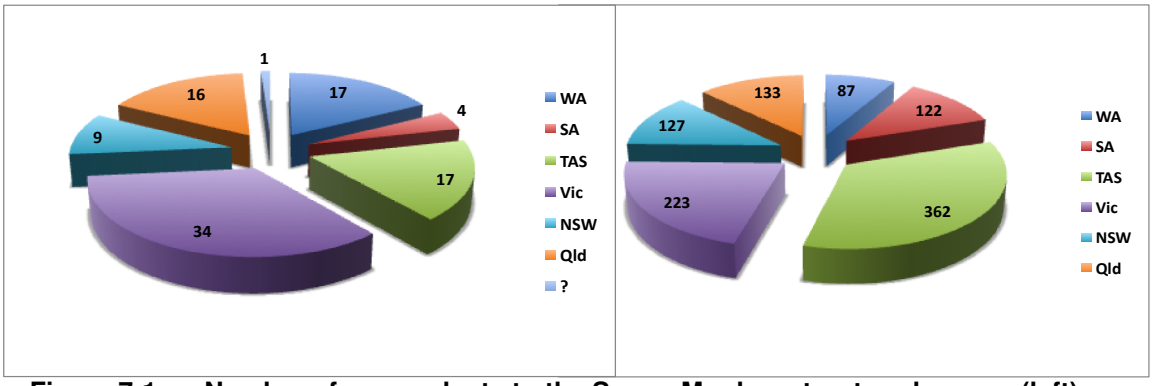


Figure 7-1: Number of respondents to the SurveyMonkey structured survey (left) and number of businesses growing potatoes in each state (right) based on ABS data

Table 7-1: Proportion of survey responses from each state based on the number of businesses

State	Businesses responses as % of total number of businesses
WA	19.5
Vic	15.2
Qld	12.0
NSW	7.1
TAS	4.7
SA	3.3

The following points provide a summary of the main themes to emerge from the general consultation that has taken place:

Seed growers were the largest group of respondents. A relatively large number of responses came from Victoria (Figure 7-1), however, the greatest proportion of responses came from WA (

- Table 7-1). Tasmania and South Australia participated at the smallest level. The level of responses might reflect the general interest growers in different states have in a review of the seed certification system and standards
- More than 75% of respondents considered a uniform, transparent national seed certification approach as very important, and more than 15% believed it to be important
- 71 respondents out of 98 provided a vision for a successful seed industry. The below image illustrates a keyword analysis of 64 responses. Seven were not included in formulating the overall vision in Section 6.4; because they were off topic (statements not offering a vision). The vision for 13 people was in essence that nothing changes from the way is it now for them or minor adjustments are made

- The most important expectations of advantages from certified seed for fresh and processing growers are in order of priority: less virus diseases, reliable performance, less bacterial and fungal diseases, better emergence and crop establishment and higher marketable yield. These expectations match issues respondents had observed in crops i.e. especially virus infections and other diseases appear to be a concern. The only additional major issue mentioned was negative effects from storage, transport and handling
- Certification, if done well, is seen as a basic requirement for healthy high yielding potato crops and for a sustainable potato industry in general. The vast majority of survey respondents supported this view
- The cost of certified seed was identified as the main reason (selected from a list of options) that growers do not use it at all or not all the time (NB respondents included growers and others in the supply chain. So, their responses to this question were provided based on industry experience/knowledge/observations rather than reasons from growers who do not use certified seed alone) However the majority of survey respondents (74%) still believe the benefit of certified seed outweighs the cost. Some respondents said they couldn't afford the risk of not using certified seed. Some commented that 'farm kept' seed does not produce a different result from certified seed. The variation in comments may reflect experiences growers had with certified seed and the issue that there is no firm data on the benefits of using certified seed. As mentioned by most, certified seed of good quality at the time of certification can drop in quality due to handling, storage and transport and certification cannot address this issue
- A total of 34% of all respondents believe that the current certification standards meet their requirements
- Overall there is broad support for a uniform system operating across the states. There are many examples of what such a system might look like, but the resounding message is for greater consistency, transparency and uniformity
- Even though there is support for a more unified system, there is also recognition that if a national-based system is to be implemented, it needs to be able to accommodate

different regional requirements. Similarly there is an opinion that it is important that a unified system be relevant to all varieties e.g. processing, table and crisping potatoes, which may mean having different tolerance for some skin defects

- Industry representation is seen as being important in a certification scheme. Of the survey respondents, 66% would like a seed certification scheme that is industry owned and managed and run as a not-for profit organisation. Most favour a board made up of producers, seed customers and technical advisors
- A more uniform certification system is seen as central to supporting a viable export market. A total of 78% of respondents favour a system that is recognised by overseas customers
- The impacts to seed arising as a result of handling, storage, cutting and transport are not addressed through certification. A total of 82% of respondents believe seed should be accompanied by 'life-cycle' information relating to growing and storage etc
- Most respondents believe that certification should not only focus on disease. 57% per cent agreed that certification should ideally include quality indicators that addressed physiological age, nutrients etc
- Many respondents believe that a certification scheme should embrace new technologies and be based on a culture of continuous improvement. According to 91% of survey respondents, certification schemes should be reviewed regularly to keep up with new technologies
- There is support for a certification scheme that is "well-connected" and allows for greater communication and feedback between commercial growers and seed growers.

The report from project PT100082, the economic evaluation of certified seed, cited comments made by seed and commercial growers in the survey form. These, in the main, reflect our findings for comparable questions. Recommendations from that study drawn from as consultation are still relevant and were considered in this project.

All responses from the Stage 2 survey have been used in designing the blueprint for a certification system in section 8 of this document. A copy of the survey questions and the responses to the question about the industry vision are provided as Appendix 14 (NB a copy of all raw survey data has been provided to HIA).

7.1.2 Feedback from industry leaders (focus group)

Feedback from the group discussion with industry leaders has been recorded in meeting notes; which have been provided to HIA.

While participants were overall okay with the schemes they worked with, they could see benefits from a review, especially of the standard and its science as well as some aspects of certification delivery. The main advice was to 'keep it simple', focus on the major disease issues and biosecurity concerns, and include accountability and some independent oversight. Do not incorporate anything that could affect good business arrangements, regional/state or specific industry needs.

Similar to feedback from others, the focus group participants stressed that seed certification, however good the system, standards and delivery of certification would not guarantee high

quality, high performance seed potatoes. The group identified an urgent need for better practise of curing, handling, storage and transport of seed potatoes. They pointed out that the information about how to manage seed postharvest is available; the issue is that many do not use it well enough.

7.1.3 Written submissions

Several organisations assisted this review with written submissions; which have been submitted to HIA. They stress issues and reasons for and against a review of the seed potato certification system, the National Standard and how certification is delivered. They also highlight the complexity various interests and aspirations can bring to the table. Therefore, the following sections briefly examine the principles of and guidance for certification and standard development. The idea is to use findings in the synthesis of this review and suggestion for 'a way forward'.

7.2 Certification considerations

Certification schemes that provide product certification usually operate under a set of publically available guidelines or rules; standards and procedures are subsets of these.

Seed potato certification is product certification.

> "Product certification is the process of certifying that a certain product has passed performance tests and quality assurance tests, and meets qualification criteria stipulated in contracts, regulations, or specifications. Product Certification Services provides third party assurance that a particular product meets the specified requirements of a nominated product standard. Certification can be a useful tool to add credibility, by demonstrating that a product or service meets the expectations or criteria of customers. For some industries, certification is a legal or contractual requirement".

ISO Guidelines[15] for product certification exist; they could be referred to for ideas on the development of a robust system, even if the resulting certification system will not be an ISO accredited one.

The usual advice to those seeking certification of their product or services is to check that the certifier is accredited. Accreditation is not compulsory, and non-accreditation does not necessarily mean it is not reputable, but accreditation does provide independent confirmation of competence and integrity.

[15] ISO/IEC 17067:2013 - Fundamentals of product certification and guidelines for product certification schemes

"Accreditation is a type of authorisation in which the competency and credibility of an organisation (or person) to provide certification services is established. Accreditation does not refer to the legality of being able to conduct certification. (NB licensing could do this if administered by a governmental entity.)

Accreditation means that organisations that (independently) certify third parties against endorsed standards are themselves formally accredited by an impartial accreditation body. The accreditation process ensures that their certification practices are acceptable. Typically this means that they are competent to assess and certify third parties, behave ethically, follow the scheme rules i.e. employ endorsed procedures and standards."

7.2.1 Examples of certification

As part of this project, several industry schemes that provide certification to ensure product quality have been examined. This section provides selected examples.

The Australian wood packaging certification scheme

The Australian Wood Packaging Certification Scheme (AWPCS) is a certification scheme that ensures that Australian treatment providers and wood packaging manufacturers produce wood packaging material that meets the ISPM 15 standard for exports (Figure 7-2). ISPM 15 is the International Standard for Phytosanitary Measures Publication No. 15—Guidelines for Regulating Wood Packaging in International Trade. It represents the first international commodity based standard and sets out criteria for regulating wood packaging material used in international trade.

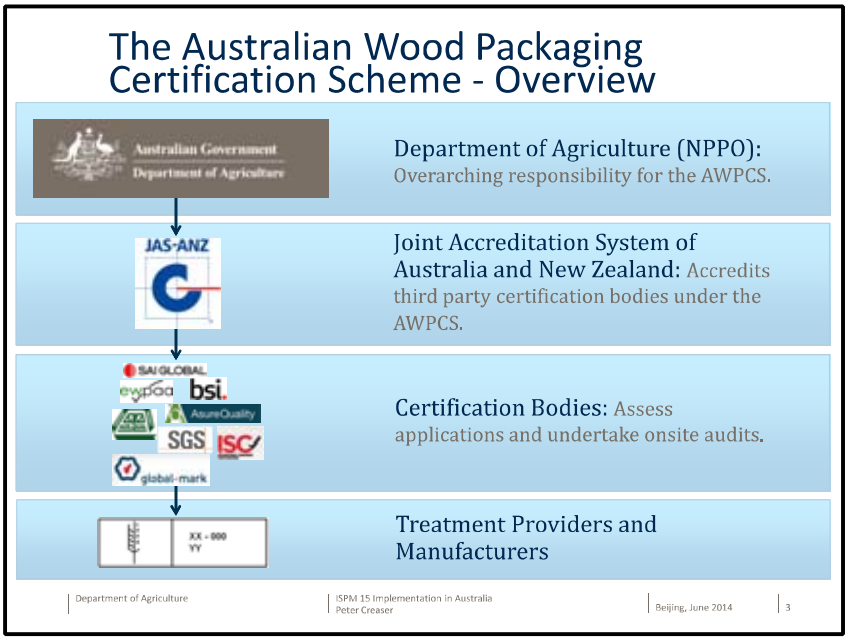


Figure 7-2: Overview of the Australian wood packaging certification scheme

This scheme is set up to fulfil export requirements and therefore has strong regulatory control[16]. This type of control would not be required for domestic seed potato certification. However, a robust certification system could be built upon to reduce red tape for exporters of seed potatoes.

Australia's official subscribing to International Standards for Phytosanitary Measures (Appendix 6) in the Biosecurity Bill 2014 provides a basis for this to happen. The government introduced the Biosecurity Bill 2014 and supporting legislation into Parliament on 27 November 2014[17].

The Australian Seeds Authority

As mentioned previously, the Australian Seeds Authority (ASA) provides a good example of a set-up that can deliver high integrity certification services. It is set up similarly to certification schemes in other industries. Information on governance arrangements and a copy of the ASA constitution can be found on the ASA website (http://aseeds.net.au/governance). In short:

ASA is a not-for-profit company, jointly established in 2002 by the Australian Seed Federation (ASF), and the Grains Council of Australia (GCA). With the demise of the GCA in 2009, Grain Producers Australia (GPA) is now the seed grower body jointly sharing control of ASA. ASA has a Board of 7 Directors, a CEO and an Executive Officer and reports to DAFF and to ASF and GPA.

The ASA is responsible for controlling seed certification (crops and pastures) in Australia, and oversights two certification schemes:

1. The OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade, and
2. The Australian Seed Certification Scheme

ASA is licensed by the Australian Government Department of Agriculture (DoA) to undertake the role of the National Designated Authority for the OECD seed schemes, and, at the request of the Australian seed industry, operates the Australian Seed Certification Scheme which is used principally for seed not destined for export. The rules of the Australian Seed Certification Scheme are essentially the same as for the OECD seed schemes, with only a few differences in the requirements for post-control testing.

ASA licenses three certification agencies, Seed Services Australia, AsureQuality and Agwest Plant Laboratories, through formal Authorisation Agreements to undertake the day-to-day operations of seed certification. Each of these seed certification agencies is required to achieve, and maintain, accreditation with NATA (the National Association of Testing Authorities) for their management and record systems to ensure that they are meeting the requirements of ASA in conducting seed certification programs which comply with the rules of the OECD and the Australian Seed Certification schemes.

[16] http://www.agriculture.gov.au/biosecurity/export/wood-packaging
[17] http://www.agriculture.gov.au/bsg/biosecurity-reform/new-biosecurity-legislation

ASA also co-ordinates official Australian interaction with the International Seed Testing Association (ISTA) on international seed testing policy and practice, and has signed Authorisation Agreements with four ISTA-accredited laboratories to test certified seed prior to its final release as certified seed.

ASA has established two committees to assist in its operations. The ASA Technical Advisory Committee (ASATAC) is composed of representatives of certification agencies and the seed industry and provides advice on technical matters to the ASA Board.

The Public Variety Maintenance Panel (PVMP) is responsible for oversighting Maintenance Agreements on older public varieties for which the breeder is no longer willing or able to continue a supply of Basic Seed of varieties for which there is an ongoing demand for certified seed. Further information on ASATAC and PVMP is available elsewhere on this site.

An ASA performance review takes place every five years. Major stakeholders provide feedback on performance and opportunities for improvement. They review achievements over the previous five years, the ASA Constitution, the latest updated Corporate and Annual Operational Plans and ASA Annual Reports to form their opinion.

7.2.2 Conclusion about certification

Seed potato certification in Australia does currently not meet all criteria of robust certification practice. There are some issues that should be addressed:

- There is no overarching framework that includes governance arrangements to allow integrity and independent oversight of a National seed potato certification system (using the National Standard 2007) or of various certification schemes operating under the system;
    - There is no licensing and accreditation system for certifiers
    - Clear certification scheme guidelines, standards and operations procedures are not accessible
- Ownership or funding for a scheme should not come predominantly from the businesses that rely on its certification services unless there is adequate independent oversight.

The ASA provides a good example how certification of seed potatoes could be organised.

7.3 Standard development

A certification standard is at the core of a certification scheme and the most important part of its guidelines.

> "A technical standard is an established norm or requirement. It is usually a formal document that establishes uniform technical criteria, methods, processes and practices." In other words, it is about everyone doing a certain task or procedure the same way."

Much has been written about standard development and could be included here. However, reviewing this topic and its application to seed certification in any detail is outside the scope

of this project. A review of the National Standard must include a review of how it is presented and how the document is controlled.

A simple, much-praised publication on standard development may help with some basic concepts, even though its target is engineering. A couple of excerpts from the publication "The Ten Commandments for Effective Standards" [18] are cited below as a reminder that developing a good standard for all is not a simple task.

"As with any good thing there is a dark side, a constant struggle between the forces of good and evil. The best standards are produced when the participants in the process come together in the spirit of cooperation with the objective of producing a mutually beneficial output, which optimises the collective objectives of all involved. Unfortunately, efforts to develop standards can fall prey to the forces of evil, whose devilish antics serve to eliminate cooperation and skew the output to benefit the objectives of a limited few."

The 10 Commandments:

1. Cooperate on standards, compete on products
2. Use caution when mixing patents (e.g. pbr) and standards
3. Know when to stop
4. Be truly open
5. Realise there is no neutral party
6. Leverage existing organisations and proven processes
7. Think relevance
8. Recognise that there is more than one way to create a standard
9. Start with contributions, not from scratch
10. Know that standards have technical and business aspects.

7.3.1 Conclusion about standard development

It was highlighted previously that document control, structure, some content, references to science and the use of new science need improving so that the National Standard can deliver to industry expectations. An important aspect of redeveloping the Standard are the open process and cooperation that are required to come up with an effective standard that is accepted by all that it may affect (e.g. seed growers, minituber producers, processing and fresh potato growers, processing and fresh market companies, merchants, certification delivery agencies). Biosecurity aspects of the standard will be of importance to state and federal regulators, so they need to be involved as appropriate to get the right result. Technical experts need to be consulted to ensure the science background used for tolerances and sampling methods are correct.

A trusted representative from each group that the Standard affects and somebody with the required technical expertise must have a change to contribute directly. The process has to be lead by an impartial person. An overall framework and certification guidelines (for certification delivery agencies) should be a first step.

[18] Karen Bartleson, 2010; The Ten Commandments for Effective Standards: Practical Insights for Creating Technical Standards.

7.4 Stage 2 Synthesis

The synthesis of Stage 2 of this review picks up viewpoints from the Stage 1 consultation, and findings from the examination of Standards. It combines these with outcomes from the Stage 2 consultation and considerations about good practices in certification and standard development. This section describes the vision and goals for the future of the industry and seed certification, summarises the industry position and refers to a good example for an alternative option to the current system.

The main output of the synthesis is the blueprint for a national seed potato certification system, presented in as section 8.

7.4.1 Vision and goals

The individual responses to the visions and goals question, formulated by individuals are listed in the final segment of Appendix 14. The majority of responses offered a vision (i.e. an aspirational description of what they would like to see accomplished in the mid-term or long-term future). Others made useful statements about how to improve the status quo. Some stated that they wanted to maintain the current situation while the majority had a vision that required change to the present system. A small number of responses offered no future aspirations or suggestions but rather a reflection on the past and a desire to recreate it.

While a vision is aspirational, a goal should be a measurable target. From responses we formulated the following vision and goals.

Vision for the industry

All sectors of the potato industry should be well informed, with a culture of good practices, communication, cooperation and continuous improvement, working to agreed systems that foster understanding, feedback, best practice, people development and value creation.

Vision for seed potato certification

Aligned, consistent, reliable, transparent, responsive and accountable with independent oversight by a designated, trusted body; a uniform, straightforward, cost effective system with standards that control the spread of diseases and allow agreed adjustments based on regional or industry conditions.

Goals

> *"Obstacles are those frightful things you see when you take your eyes off the goal."*
> Henry Ford

Feedback from the survey identified the following main goals (as actual responses):

- All potato industry sectors to be profitable
- Uniform rules accepted by all states
- New science and technology is used in seed certification
- Disease free seed is verified to be true to type

- All seed growers are content with their chosen certification provider
- Commercial growers see the value in certified seed
- Substantial increase in the use of certified seed, "certified seed is used by all"
- The certification system to allow for some differentiation of quality and or tuber size and different 'grades' are priced accordingly
- Improvements in curing, handling, storage and transport (chain of custody)
- Export ready as a national industry (not state-by state)
- Sufficient diversity in the seed potato production system to manage risks if disease or other environmental issues affect some growing areas.

7.4.2 Industry position and appraisal of options

Industry position / situation

The situation could be summarised as follows:

Once state governments relinquished funding and, to varying degrees, control over seed certification, several systems developed under the 2007 National Standard. While the different schemes amended their own Standard informally for various reasons and using different processes, they were never formally reviewed or updated. QA systems for seed potato production were developed in some regions to replace 3rd party certification.

Certification agencies have different arrangements with their growers but all more or less depend on funding from seed producers. A national certification framework and governance arrangements/oversight for a national certification system to which the different schemes subscribe, does not exist. Without such arrangements, independent reviews of schemes to ensure they are current and maintain integrity are not possible.

Minituber production QA sits alongside certification schemes. An independent audit system for minituber producers does not exist.

Experiences and views about the quality of the current National Standard and its application in different seed certification schemes vary widely. A majority of growers and representatives from all sectors believe that improvements to the certification system (how certification operates) and Standard itself can and should be made. Opinions vary depending on the scheme growers currently subscribe to. Some who are overall content with their certification situation still felt that revising present arrangements now would 'future proof' the industry and underpin professionalism, growth and economic viability (e.g. through export growth).

The Standard itself is not clearly written and open to some interpretation. There are no references to a scientific basis or a risk analysis for tolerances. Newer diagnostic technologies are not included. How interpretations of the Standard work in practice in the different certification and QA schemes was not investigated in detail. Feedback from many was that the delivery of certification requires more consistency, transparency and integrity.

It is very challenging to compare the Australian Standard with international certification systems because of vast differences in how they are set up and documented. A major difference to the current Australian situation is that international systems operate under official (usually government) oversight.

In summary, many aspects of seed potato certification have to be enhanced to create a robust, trusted system that serves all sectors of the potato industry into the future.

Appraisal of options

An appraisal of certification systems in other industries has been conducted and examples of approaches have been discussed in Section 7.2. The recommendation is to use the example of the Australian Seeds Authority (ASA) as a main guide for developing a proper national seed potato certification framework. Discussions with the ASA board could help with identifying a suitable governance and funding model. These discussions should be valuable and avoid issues the ASA may have had to deal with in its early days of operation.

One important factor in updating the National Standard and introducing new technologies is that these technologies[19] are commercially available or can be commercialised for use in seed potato certification at a cost that does not make their use unfeasible.

[19] Horticulture Australia Limited, 2015; PT13013 'Gap Analysis of Australian Potato Research' Final Report

8 Blueprint for a national seed potato certification system

This section presents the overall synthesis of consultations and background research about seed potato certification in Australia.

8.1 Fundamental questions

Fundamental questions to answer for the future of seed potato certification and certification delivery are:

- What will a robust, reliable, trusted seed certification system look like, and
- How to get there? What are priorities and steps?

8.2 Premises

All industry sectors largely support the development of a robust certification system for Australia that is 'fit for purpose' and that does not involve extra 'red tape' or unjustified extra costs.

- Certification only deals with seed health and trueness to type. It was concluded that at this point certification couldn't include further quality parameters because there is no reliable mythology available to assess and certify them
- Seed Potato Stewardship to recommended to improve custody of seed potatoes in the supply chain and issues that affect seed quality, which cannot be covered by a certification system (e.g. stresses due to poor curing, storage, packaging, transport and handling practices)
- Good aspects and strengths of the current system / Standard and individual schemes should be maintained and weaknesses eliminated
- The development of a robust, accountable national system will be a transparent, inclusive process that is managed objectively; any subjective efforts to hinder or jeopardize it will be rejected by those who support an open and fair process.

8.3 Key features

In line with proper certification systems, an Australian Certified Seed Potato system should include accreditation and licensing of certifiers (= the organisation(s) delivering certification). A suitable accreditation and certification framework should be developed. Key features of the framework should include but not be limited to:

- Due consideration of the UNECE Standard20 for seed potato certification (which includes the need for a "Designated Authority" overseeing a potato seed certification scheme)
- Accreditation and licensing agreements with and review of certifiers to maintain their accreditation (= authorisation to act as seed potato certifiers)
- Certification Scheme Guidelines or Rules that include a National Certification Standard that clearly describes scientifically derived, sensible tolerances and covers uniform

[20] http://www.unece.org/fileadmin/DAM/trade/agr/meetings/ge.06/2011/2011_Leaflet_E.pdf

documentation, recording, reporting and labelling requirements (based on the technical standard) and label use instructions

- Training requirements and clear procedures for seed potato certification officers.

8.4 A national seed potato certification scheme

"Professional standards are needed for those whose activities affect others (individuals or businesses); these cover product certification, management and conduct."

8.4.1 Objectives

A Seed Potato Certification System (System) that is structured and administered in a manner that can reasonably assure to all in the potato supply chain that it is delivering what it claims to achieve (seed potatoes that are free of disease or have minimum, agreed levels of certain diseases, are true to type, and meet phytosanitary and biosecurity requirements). Individual certification schemes would subscribe to the National System.

Some particular objectives are:

- Maintaining high standards of certification (adhering to the national standards and procedures)
- Enhancing transparency and consistency for all in the seed potato supply chain
- Having a process in place that may identify ways to improve the scheme e.g. via a systematic ways of assessing and incorporating corrective actions, new science and concepts
- Having a fair and equitable system of conflict resolution
- Having an objective system of licensing / accreditation of certifiers (achieving / maintaining accreditation, and denial, revocation, or suspension of accreditation)
- Maintaining to a Code of Conduct.

Further objectives may be added as required.

8.4.2 Design

The national seed potato certification system will have to be designed by a specifically appointed, competent small group that can fairly look after the interests of all in the supply chain involved in:

- Seed production from minitubers to field production
- Selling / marketing
- Using seed potatoes to produce commercial processing and table potato crops.

The design will describe System processes and function of people/groups involved; it will define the operating framework and roles and responsibilities of all entities with a stake in the seed potato certification.

Horticulture Innovation Australia Limited (HIA), being grower owned, may by best suited to appoint the group or instigate a selection process. The method could be an election or people could be asked to apply for a position with the group through an open tender and or interview process.

The following sections recommend a seed potato certification system design.

8.4.3 Recommended seed potato certification system components

Documentation

The diagram in Figure 8-1 shows System documents that determine the delivery of certification.

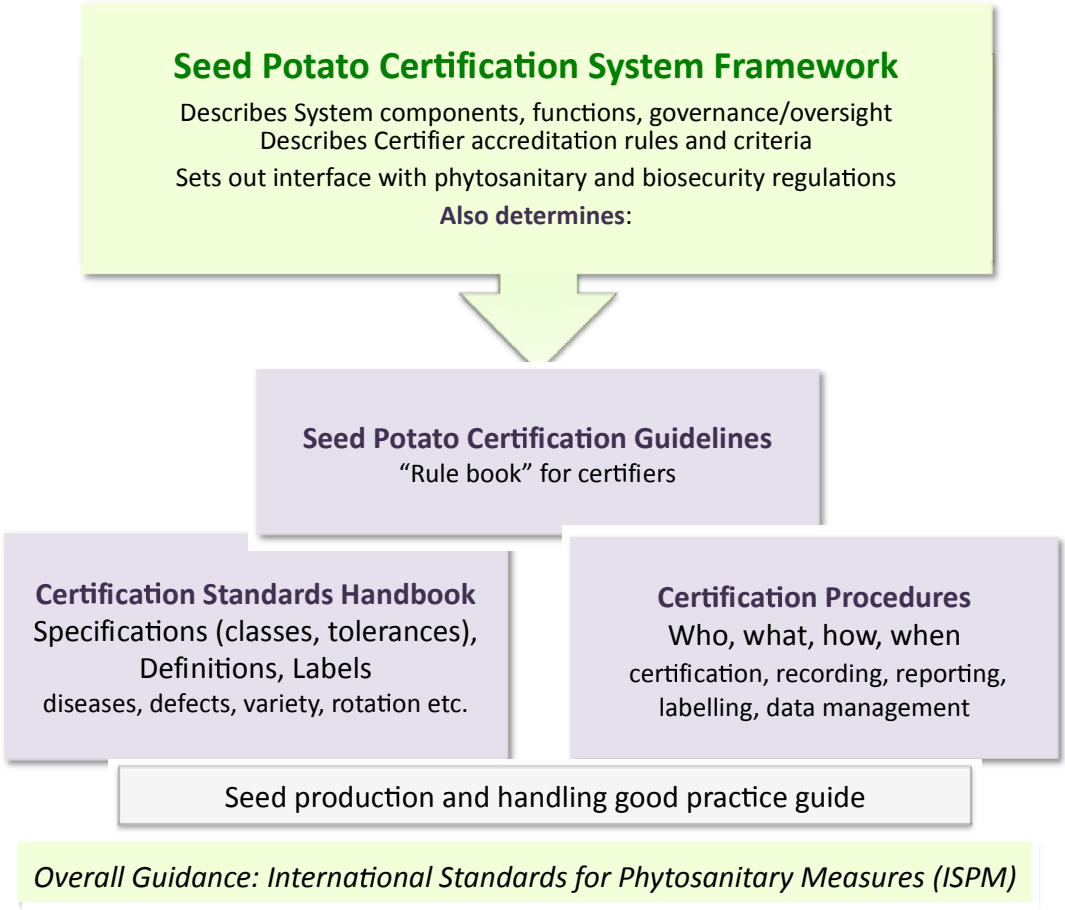


Figure 8-1 Documentation relating to the certification of seed crops under the seed potato certification framework

The Framework as a strategic document would describe the System's design and function including roles and responsibilities of people/groups. It would describe the interface with relevant existing frameworks, regulations or certification schemes and how these will be used with to the System. The intention of developing a proper framework and building on or using some existing official processes and protocols is threefold. It provides:

a) A sound foundation and the necessary element of official oversight and thus legitimacy ('Designated Authority')

b) Alignment with international rules (ISPM[21]), which Australia acknowledges and uses as a basis for regulation

c) Streamlining and cost saving.

The 'Seed Potato Certification Guidelines', an operational document, would replace the current Australian National Standard (for) Seed Potato Certification (AUSVEG 2007).

The diagram (Figure 8-2) describes the main existing frameworks and schemes that would interface with and assist aspects of the seed potato certification system.

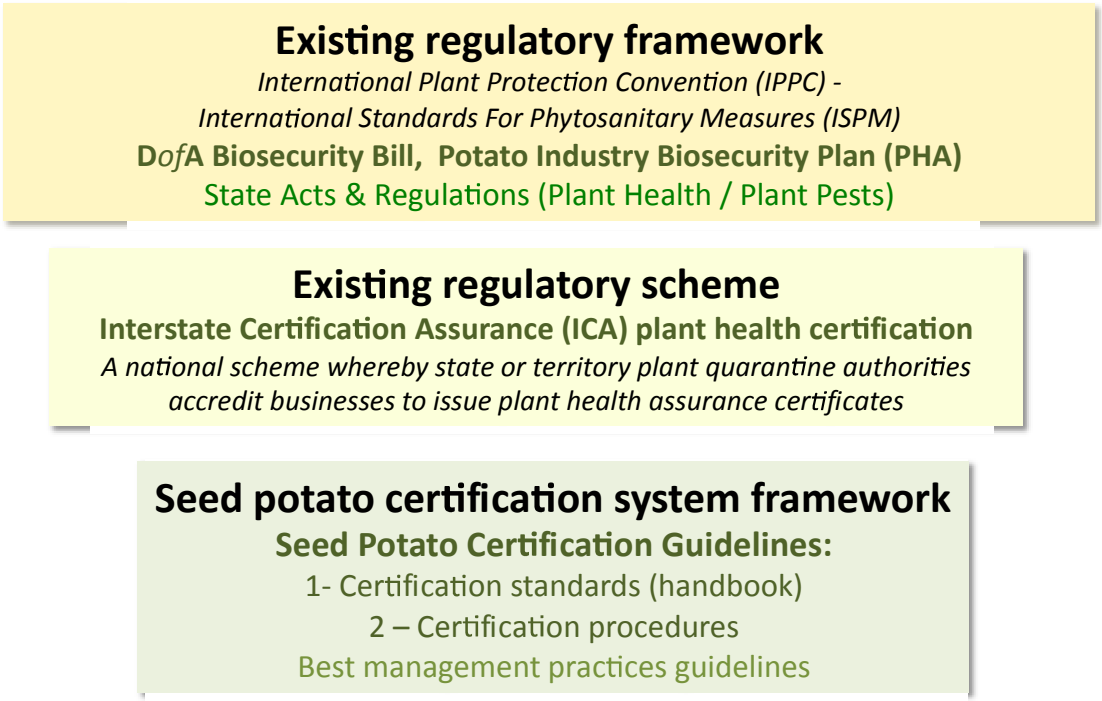


Figure 8-2 Context - existing structures relevant to a seed potato certification framework

Supplement 1 of this section provides information on Interstate Certification Assurance (ICA). The Potato Industry Biosecurity Plan is available from Plant Health Australia (PHA), Supplement 3 includes information from the Plan.

The following table (Table 8-1) provides more detail about Figure 8-1 and Figure 8-2. The table covers most aspects of a sound foundation for seed potato certification but would need to be reviewed for implementation.

Note: Minituber production requirements are not adequately included in Figure 8-1 and Figure 8-2 *or below table. They should ideally be included in the System but would require their own set of guidelines and procedures. Current QA procedures may suffice while the guidelines would need to be adjusted to sit under the Framework.*

[21] Produced by the FAO Secretariat of the International Plant Protection Convention (IPPC), refer to: www.ippc.int/core-activities/standards-setting/ispms

Table 8-1: Details of a Certification System Framework

Documentation types, tiles and interface	**Purpose / Content**
Strategic document: **Seed potato certification system framework** *Link to:* *Biosecurity surveillance* *Potato Biosecurity Plan* *Interstate Certification Assurance (ICA)*	Describing the system, its rules, function and governance including e.g.: – Appointment of a governance and accrediting body (Committee) – It's roles, responsibilities and boundaries – Transparency and conflict resolution Describing accreditation rules and criteria including e.g.: – Who can be a certifier, requirements, application and assessment / auditing process – Assessing / auditing seed potato certifiers to appoint them and maintain, deny, revoke, or suspend accreditation – Assessing / auditing seed potato minituber production facilities to approve them and maintain, deny, revoke, or suspend accreditation – Compliance criteria, issues and timeframes – Data handling and access (interface with biosecurity surveillance) Describing how the Seed Potato Certification Scheme Standard and Procedures are used and reviewed / updated and documents controlled, Describing the national training program for accredited certifiers, their certification officers and accredited production facilities Defines how seed certification can link with phytosanitary certification (e.g. via ICA) and how it links with any biosecurity surveillance Explains how Australian terminology relates to that used in other countries Other details as required
Operational document **Seed potato certification scheme guidelines, Part 1:** Certification Standards Handbook	Describing minimum standards for the presence of diseases, defects and true to type requirements, definitions – Describing tuber classes – Describing special requirements (e.g. by market or region) – Defining recording, and record keeping requirements – Defining labelling requirements and rules – Other as required
Seed potato certification scheme guidelines, Part 2: Certification Procedures *Link to:* *Biosecurity surveillance* *Interstate Certification Assurance (ICA)*	Describe how seed potato certification is conducted (including provision of clear work instructions for certification officers and growers) – Classification based on inspection findings and production records – Plant and tuber sampling – Soil sampling procedures (e.g. for PCN and disease risk prediction) – Recording, labelling and reporting – Other as required
Best management practices guidelines	Best management practices to achieve disease free seed potatoes – Rotation – Hygiene – Soil testing (disease risk prediction) – Record keeping (general surveillance)

8.4.4 Organisation and operation of the system

The diagram in (Figure 8-3) describes different entities and stakeholder groups that will ensure seed potato certification is conducted in a transparent and reliable way.

These different entities and stakeholders, through their different roles, responsibilities and advisory functions, will assure the system is robust, efficient, adaptable to specific needs and makes use of scientific insights and new technologies.

The diagram appears complex. However, all entities apart from the Seed Potato Authority and the Certification Standard Review Panel already exist. Their roles, responsibilities and lines of communication however, need to be formalised somewhat.

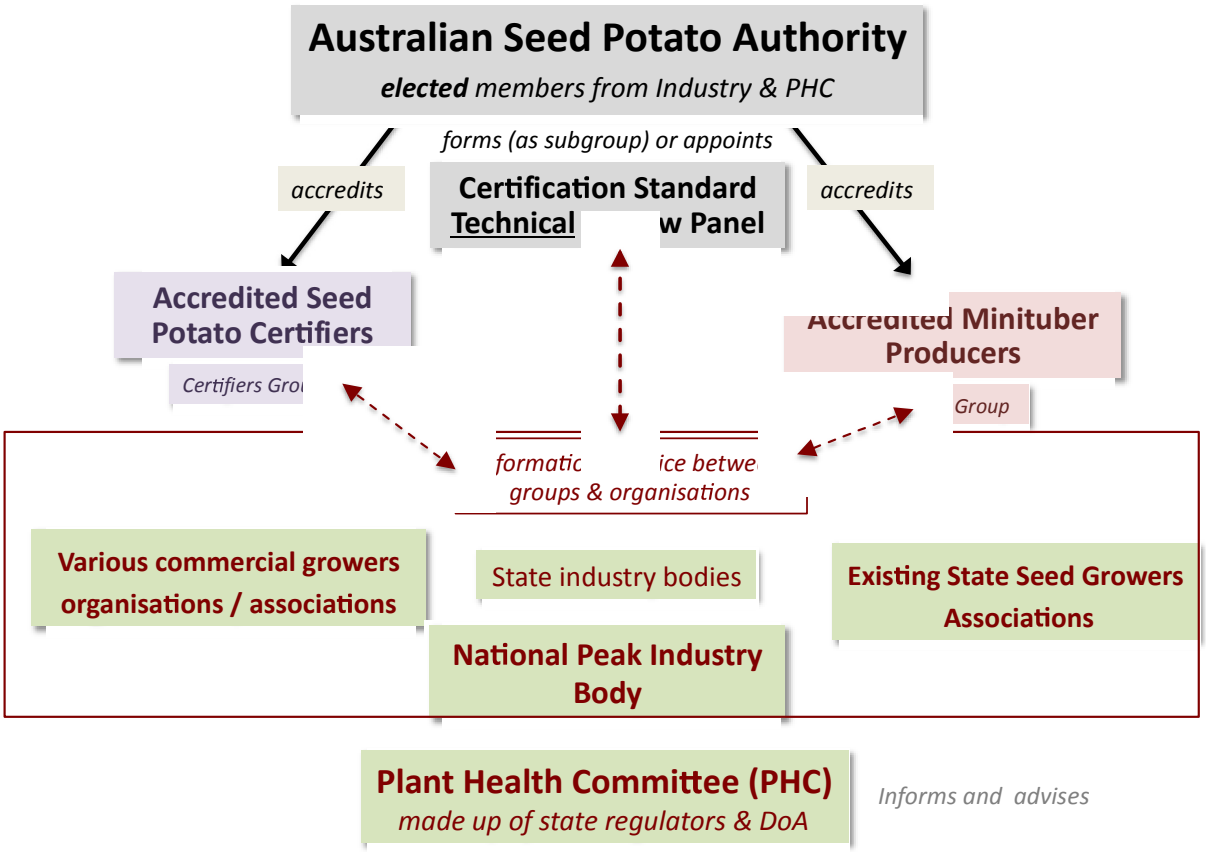


Figure 8-3 Seed potato certification, entities and main functions (existing entities in green boxes, supplement 2 provides information on the Plant Health Committee**)**

The Table 8-2 and the following sections provide more detail on Figure 8-3. The table may not yet not cover all aspects of a System's organisation and certification scheme in sufficient detail yet. NB: It should be considered to use NATA or another independent provider to conduct accreditation for the Authority.

Table 8-2: Suggested entities make up and functions to assure effective certification
(some questions for consideration are highlighted in blue)

Entity & appointment	Make up	Function
Australian Seed Potato Committee (Committee) Appointed via HIA? "Industry Vote or tender"	State representatives with relevant knowledge and experience Plant Health Committee (PHC) subcommittee members plus industry representatives Or Industry only? No conflict of interest (impartial) Not for profit	'Designated authority' to oversee certification (refer to UNECE direction) Custodian (endorsement) of the certification system (i.e. accreditation rules, certification guidelines, standards, document control etc.) Accredits certifiers to conduct seed certification under the certification scheme rules etc Accredits minituber producers In charge of maintaining, denial, revocation, or suspension of accreditation based on assessments / audits; conflict resolution Overseeing and approving training plans Ensuring reviews, updates and document control of all scheme documents, appoints Seed Potato Certification Technical Review Panel Maintaining a website - communication with all in the supply chain about certification issues (via representative groups?) Feedback to whoever appointed it on 'how it is going' challenges and recommendations
Seed Potato Certification Standard Technical Review Panel (TRP) Appointed by the Committee or Industry Vote PHC subcommittee representation and or Draw from Potato Industry Biosecurity Group & consulting scientists	State representatives with relevant technical (& some regulatory) knowledge and (certification) experience Technical advisers (science) No conflict of interest (impartial)	Biennial review of the certification standard handbook and procedures manual for seed certification including labelling of seed lots Biennial review of minituber production standards and procedures Aligns standards and procedures with phytosanitary / biosecurity requirements and procedures (referring to the Biosecurity Plan and Interstate Certification Assurance (ICA))
Accredited Seed Potato Certifiers (Certifiers)	Organisations or individuals accredited to conduct certification under the certification standard	Organisations employ and train certification officers, Certification delivery under Scheme rules Individuals deliver certification
Certifiers Group Self organised	Group with representation from each accredited certifiers	Advice to Committee and TRP, on 'how it is going' (challenges and recommendations for improvement)

Entity & appointment	Make up	Function
Accredited Minituber Producers (propagators)	Accredited minituber laboratories produce and sell G0 seed potatoes	Ensure G0 seed availability Maintain PBR varieties Built stock of newly imported varieties Maintain public varieties?
Propagators Group	Group with representation from each accredited minituber propagator	Advice to Committee and TRP, on 'how it is going' (challenges and recommendations for improvement)
Seed growers associations Self organised	State based seed grower interest groups	Look after seed growers' interest and advise the Committee of issues, challenges or complaints
Commercial growers associations / groups Self organised	State based commercial grower groups	Look after commercial growers' interest and advise the Committee of issues, challenges or complaints
Peak industry body Representation of all potato industry members	State and national bodies	Representation of all sectors of the potato industry, advice to funding body on RD&E needs, communication of R&D outputs Advice to Committee

8.4.5 New elements and aspects of the suggested system

The Australian Seed Potato Authority

HIA appoints the 'Australian Seed Potato Authority (Authority) based on a vote or tenders. It will be the 'designated authority'[22] to oversee the seed potato certification system in Australia. The Authority consists of unbiased state representatives with relevant knowledge and experience and no conflict of interest and has representation from regulators who assure that seed potato certification aligns with regulatory requirements as appropriate. Appointments should be for 3 years and tenure should only be renewable once.

The Authority ensures all certifiers and minituber producers nationally are accredited by an independent provider via initial assessments / audits against the accreditation rules and criteria defined in the framework. Certifiers will be accredited to issue seed potato (health & 'true to type') certificates to seed potato growing businesses for crops grown under the National Seed Potato System. Certificates are approvals issued from an accredited certifier to confirm that seed potatoes comply with the national standards (including specific regional or industry based amendments) set out in the Seed Potato Certification Manual.

Based on auditing against rules, the Authority is in charge of denial, revocation, or suspension of accreditation; it examines complaints against and their resolution by certifiers (as part of audits or if justifiably approached directly). The Committee reviews training plans and checks that delivery for and by accredited certifiers has taken place.

[22] Refer to UNECE STANDARD S-1 concerning the marketing and commercial quality control of SEED POTATOES (2006 version currently under review)

The Authority advises HIA as required on matters connected to the governance of the System and seeks advice from technical / industry organisations and individuals as needed to conduct its role. The Authority is reviewed every five years.

The Authority is the custodian of and endorses the System's rules/guidelines, standards and procedures as well as training plans. It provides information to seed and commercial growers about changes to scheme rules, accreditation of certifiers, certification standards, procedures and labelling requirements etc.

In its role as custodian, the Authority **appoints a Certification Standard Technical Review Panel** to review the Guidelines (especially the standard and procedures) biennially or more frequently if required.

The Authority oversees the minituber production QA scheme and its independent accreditation.

The Committee's website provides information about the Committee, the System, individual schemes that operate accordance with the system and certifiers, the accreditation and certification processes, training the certification guidelines and a list of accredited certifiers and minituber producers. This ensures that all seed and commercial growers and overseas buyers of seed potatoes can clearly understand how seed potato certification operates in Australia and how it provides value and reliability.

Interest groups like peak industry bodies and seed growers / commercial grower associations provide feedback and advice to the Authority. The Authority will consult with organisations and stakeholder as required.

The Authority may determine how the national variety collection is maintained.

8.4.6 Accreditation of certifiers

Accreditation is a type of authorisation in which the competency and credibility of an organisation (or person) are established. Accreditation does not refer to the legality of being able to conduct certification. (NB licensing could do this if administered by a governmental entity.)

Accreditation means that organisations that certify third parties against endorsed standards are themselves formally accredited by an accreditation body. The accreditation process ensures that their certification practices are acceptable. Typically this means that they are competent to assess and certify third parties, behave ethically, follow scheme rules i.e. employ endorsed procedures and standards.

The Seed Potato Certification Framework will provide information / reasoning about the eligibility criteria for those who want to become accredited certifiers; it will include a 'Code of Conduct' for certifiers and other rules around accreditation.

An accredited seed potato certifier is an accredited professional or organisation (not for profit or business) that can conduct seed potato inspections (field and tuber) and issue certificates

(and labels) under the Australian seed potato certification system. Generally, independent, impartial and suitably qualified organisations or individuals may become accredited certifiers. It should be considered whether individuals e.g. independent agronomists or other qualified people who visit crops on a regular basis could be certifiers. However, the number of certifiers operating across Australia should be limited to maintain integrity and viability.

To become an accredited certifier an individual or organisation should at a minimum:

- Demonstrate to have the skills, knowledge, qualifications and experience required by the Framework and its guidelines as an individual or within an organisation
- Demonstrate to be a 'fit and proper' person / organisation to be accredited (values and principles / conduct)
- Ensure their staff conducting the certification inspections are trained according to the guidelines/rules and correctly apply the Seed Potato Certification Manual
- Complete regular training and provide regular training to employees
- Provide evidence of professional indemnity insurance
- Renew their certification annually to remain accredited.

Two categories of certifier accreditation may be possible:

1. Accreditation for seed potato certification only
2. Accreditation for seed potato certification and preparations of phytosanitary certificates (documentation for trade including export as per the Interstate Certification Assurance (ICA) Scheme**).

Audits should occur biennially. This may be audits of all or selected certifiers (e.g. a certain proportion).

Accredited Certifiers can become members of a **Certifiers Group**. The group provides feedback and advice to the Authority about challenges and potential for innovation within the System.

Accreditation of minituber production facilities

The Seed Potato Certification Framework will provide guidelines for the independent accreditation of minituber production facilities (propagators). Current QA procedures may be maintained or reviewed depending on feedback from propagators.

Accredited Minituber Producers can become members of the **Propagators Group**. It provides feedback and advice to the Committee about challenges and potential for innovation within the System.

8.4.7 Certification

Certification of seed potatoes is product certification i.e. implementation of standards to determine whether a product meets (minimum) requirements.

A major rule of a robust system is that only accredited certifiers can deliver (seed potato) certification.

Certification guidelines include but may not be limited to the actual standard and its procedures as well as documentation, recording, reporting and labelling requirements for certified crops, and training plans.

Seed potato growers should be able to choose a certifying provider the same way they would choose any other professional:

- Check the accreditation status of the organisation or individual
- Seek word of mouth recommendations from others
- Obtain quotes and or talk to a certifiers to choose one.

Certification Supplement 1: Interstate Certification Assurance (ICA)

Interstate Certification Assurance (ICA) is a system of plant health certification based on quality management principles. ICA provides an alternative to traditional plant health certification involving government inspectors.

The ICA Scheme is a national scheme administered by all states and territories. The scheme enables a business to be accredited by a state or territory plant quarantine authority to issue plant health assurance certificates for its produce.

To be accredited, a business must be able to demonstrate it has effective in-house procedures in place that ensure produce consigned to intra or interstate markets meets specified plant quarantine requirements. The plant quarantine authority regularly audits compliance by the business.

The ICA Scheme seeks to provide a harmonised approach to the audit and accreditation of businesses throughout Australia and the mutual recognition of plant health assurance certificates accompanying consignments of produce moving intrastate or interstate.

The former Domestic Quarantine and Market Access Working Group (DQMAWG) now Subcommittee on Domestic Quarantine & Market Access (SDQMA) sits under the Plant Health Committee (Appendix 2).

The Subcommittee on Domestic Quarantine and Market Access ensures that the development of domestic market access conditions for plants and plant products in Australia are:

- Technically justified to minimise regulatory burdens on industry
- Coordinated and harmonised (aligned and compatible), where possible, across the country and regions, and
- Consistent with Australia's international import and export market access conditions and policies.

The following are the relevant sub-committees of PHC:

- Sub-committee on Domestic Quarantine and Market Access (SDQMA) - Interstate Certification Assurance (ICA)
- Sub-committee on Plant Health Diagnostic Standards (SPHDS)
- Sub-committee on National Plant Health Surveillance (SNPHS).

INTERSTATE CERTIFICATION ASSURANCE (ICA) SCHEME – SCHEDULE OF NATIONAL ICA DOCUMENTS

Ref No. & Title	Pests[1]	Host[2]	State/Territory Accepted[3]	Documents & Status				
				Protocol (Version, Date & State)	HACCP Plan (Version, Date & State)	Operational Procedure		
						State/Territory in effect[4]	Issue & Revision	Issue Date
Memorandum of Understanding on Interstate Certification Assurance	N/A	N/A	All	N/A	N/A	All	Issue: Revision:	06/08/99
Rules for Operation of the Interstate Certification Assurance Scheme	N/A	N/A	All	N/A	N/A	All	Issue: 3 Revision: 4 **Undergoing amendment**	14/02/12 DQMAWG approved 18/04/12
An addendum to the Rules for the Operation of the Interstate Certification Assurance Scheme	N/A	N/A	All	N/A	N/A	All	Issue: 2 Revision: 0	19/12/13
National Audit Program Rules for the Interstate Certification Assurance (ICA) Scheme	N/A	N/A	All	N/A	N/A	All	Issue: 4 Revision: 0	11/10/13

Certification Supplement 2: Plant Health Committee (PHC)

The Plant Health Committee (PHC) develops national plant health policy, capacity and capability in Australia. The principal objective of PHC is to improve plant biosecurity outcomes, manage plant biosecurity risks and facilitate domestic trade within Australia through national leadership, strategic direction and collaboration with stakeholders.

Terms of Reference

PHC provides strategic scientific and policy advice to Australian governments on plant biosecurity, including in relation to the environment and social amenity, through National Biosecurity Committee (NBC), senior officials and ministers, and prioritises and coordinates national plant biosecurity activities.

Membership

PHC members include the Chief Plant Health Managers (or equivalent) in each state and territory and the Australian Chief Plant Protection Officer.

The role of PHC members is to contribute to the development of national plant health policy, capacity and capability in Australia by representing their governments on plant health issues within the scope of PHC's responsibilities and bringing a whole-of-government position to the committee. PHC membership comprises representatives from:

- Australian Government Department of Agriculture (Australian Chief Plant Protection Officer)
- NSW Department of Primary Industries
- Department of Environment and Primary Industries (Victoria)
- Department of Primary Industry and Fisheries (NT)
- Department of Primary Industries, Parks, Water and Environment (Tasmania)
- Department of Primary Industries and Regions (SA)

- Department of Agriculture and Food (WA)
- Queensland Government Department of Agriculture, Fisheries and Forestry
- Territory and Municipal Services Directorate (ACT).

Observers

There are also a number of observers invited by the PHC Chair to participate in committee meetings in an advisory or consultative capacity. Observers come from government agencies, statutory authorities or government-industry co-funded companies; and do not have voting rights.

- Plant Health Australia (PHA)
- The Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Ministry of Agriculture and Forestry—New Zealand (MAF)
- Plant Biosecurity Cooperative Research Centre (PBCRC)
- Australian Plague Locust Commission (APLC).

Chairing

PHC is chaired on a rotational basis and is currently chaired by the Australian Government Department of Agriculture.

Secretariat

Secretariat support for PHC is provided by the Australian Government Department of Agriculture.

Meeting arrangements

Face-to-face meetings of PHC are convened twice a year in June and November. PHC also convenes teleconferences twice a year in March and September, or as required.

Parent committee

PHC is a sub-committee of the National Biosecurity Committee.

Sub-committees

- Sub-committee on Domestic Quarantine and Market Access (SDQMA)
- Sub-committee on Plant Health Diagnostic Standards (SPHDS)
- Sub-committee on National Plant Health Surveillance (SNPHS)
- Sub-committee on National Forest Health (SNFH).

Certification Supplement 3: Biosecurity Plan V2 2013 information

Interstate and interregional movement of plant products – legislation (plant diseases)

State	Administering authority	Legislation
ACT	Environment ACT www.environment.act.gov.au	*Plant Disease Act 2002* *Pest Plants and Animals Act 2005*
NSW	Department of Primary Industries www.dpi.nsw.gov.au	*Plant Diseases Act 1924* *Plant Diseases Regulation 2008*
NT	Department of Primary Industry and Fisheries www.nt.gov.au/d/Primary_Industry	*Plant Health Act 2008* *Plant Health Regulations 2011*
Qld	Biosecurity Queensland, a part of the Department of Agriculture, Fisheries and Forestry, Queensland www.biosecurity.qld.gov.au	*Plant Protection Act 1989* *Plant Protection Regulation 2002*
SA	Primary Industries and Regions SA www.pir.sa.gov.au	*Plant Health Act 2009* *Plant Health Regulations 2009*
Tas	Department of Primary Industries, Parks, Water and Environment www.dpipwe.tas.gov.au	*Plant Quarantine Act 1997*
Vic	Department of Primary Industries www.dpi.vic.gov.au	*Plant Biosecurity Act 2010* *Plant Biosecurity Regulations 2012*
WA	Department of Agriculture and Food www.agric.wa.gov.au	*Plant Diseases Act 1914* *Plant Diseases Regulations 1989* *Biosecurity and Agricultural Management Act 2007*[23]

Adapted from: Industry biosecurity plan for the potato industry, Version 2, November 2013

The focus of the Biosecurity Plan is on high-risk pests:

- PCN
- Bacterial Wilt
- Virus.

The state agriculture departments can provide biosecurity surveillance (Biosecurity Plan V2, 13):

- Planning and auditing surveillance systems
- Coordinating surveillance activities with those of industry and interstate groups

[23] Will replace *Plant Diseases Act 1914* and *Plant Diseases Regulations 1989*. Implementation soon to be underway.

- Diagnostic services
- Field diagnosticians for special field surveillance
- Surveillance on non-commercial sites
- Liaison services with industry members
- Communication, training and extension strategies with industry
- Biosecurity training
- Reporting to interested parties (DAFF, national bodies, trading partners and industry).

Farm Biosecurity

Farm biosecurity reporting procedures and hygiene strategies to reduce threats covered in this Biosecurity Plan are:

- Managing the movements of vehicles and farm equipment
- Movement of people
- Use of warning and information signs
- Visiting overseas farms – what to watch out for when you return
- Quality and hygiene Best Management Practices
- Use high health certified seed potatoes
- Chemical and biological control measures
- Control of vectors
- Destruction of crop residues and
- Farm biosecurity checklist.

Further information on farm biosecurity can also be found at www.farmbiosecurity.com.au.

Selection and preparation of appropriate plant material

Seed potatoes and propagation material should not be distributed without screening for pests. Infected planting material can be the main source of spread for some serious pests. Material from infected plants may appear healthy, so the outward appearance of planting material cannot be regarded as a reliable indicator of pest status. Soil carried on tubers can harbour pathogens or pests, such as fungal spores or nematodes, which highlights the importance of purchasing certified seed potatoes.

Currently all potatoes in Australia should be grown from material provided by certified seed potato producers. Certified seed potatoes are used to provide another level of quarantine protection to the potato industry. The use of certified seed potatoes helps to minimise the chance of spreading pests and diseases.

9 Recommendations for next steps

Recommendations for next steps include the following:

- HIA to drive the appointment of or appoint the Seed Potato Authority
- The Authority to develop or instigate and oversee the formulation of the Seed Certification Framework and its stepwise implementation. This includes the independent accreditation system for certifiers and minituber producers as well as seed potato certification guidelines (standards and procedures) (refer to Section 8 of this document for details and the setup and function of the Australian Seed Authority (ASA, http://aseeds.net.au/)
    - The framework will describe the systems for field grown seed and minituber certification by accredited entities and all processes required to achieve this
- The Authority to appoint a technical review panel to update the 2007 National Standard – Seed potato certification including certification procedures; guidance can be taken from of this document, especially Section 6 and international guidelines, specifically the latest editions of the United Nations Economic Commission for Europe's "UNECE STANDARD S-1 concerning the marketing and commercial quality control of SEED POTATOES"
- The ASA funding model should be investigated for its suitability for a seed potato certification system.

The National Framework should allow for individual certification schemes to operate under its umbrella so that they can meet specific regional or industry requirements, if deemed the best way to have an overall accepted, effective system. However, the Framework has to clearly outline minimum requirements all schemes must adhere to, including labelling, documentation, recording and reporting. This would specifically cover internal biosecurity risks. The Framework has to show alignment with national and international biosecurity rules and agreements.

Specific scheme requirements must be documented as part of the Standard and or procedures.

All entities operating under the Framework, including the Authority need to be reviewed at specified timeframes. This is to ensure that especially standards stay up to date; all entities maintain best possible governance and schemes are reliable and transparent.

Given the strong feedback on the frequent quality loss of seed potatoes due to poor curing, handling, storage and transport, training appears to be required to assist all in the supply chain with appropriate stewardship of certified seed.

References

References are provided throughout the document, including below information on disease tolerances that were compared with the National Standard.

- **Western Australia**:
  Australian Certified Seed Potato Scheme Production Rules Incorporating the National Standard for the Certification of Seed Potatoes. July 2013, Issue no. 6.

- **New Zealand**:
  New Zealand Seed Potato Certification Authority, Seed Potato Certification Scheme Rules, 18th October 2013
  http://www.potatoesnz.co.nz/users/Image/Downloads/PDFs/2013-14%20NZ%20Seed%20Potato%20Certification%20Scheme%20Rules%2018%20October%202013.pdf

- **Canada:**
  Canadian Seed Regulations, Part II, Seed Potatoes
  http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._1400/FullText.html

- **Britain:**
  Explanatory Guide to The Seed Potato Classification Scheme and Approved Stock Scheme (2013).
  http://www.fera.defra.gov.uk/plants/publications/documents/SPCSGuide0313.pdf

- **Idaho:**
  Idaho Crop Improvement Association, Inc. Rules of Certification for Seed potatoes in Idaho
  http://www.idahocrop.com/StandardDocs/2014Potato-R&R.pdf
  United States Standards for Grades of Seed Potatoes (1987, reprinted 1997)
  http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5050320

- **Scotland:**
  Scottish Seed Potatoes, SASA, 8th ed, Jan 2013
  http://www.sasa.gov.uk/sites/default/files/SPCS%20Leaflet%20English%20v8.pdf

- **The Netherlands:**
  The inspection of Dutch seed potatoes; The importance of approval
  http://www.nivaa.nl/files/NIVAP_2005_England_def.pdf

NB: The European Union (EU) has minimum requirements for seed potatoes traded with in the EU.

Appendix 1: Stage 1 Industry Survey

Stakeholder Information

***1. Which stakeholder group(s) do you belong to?**

- ☐ Seed potato grower
- ☐ Seed potato group
- ☐ Grower of mini tubers
- ☐ Australian Seed Potato Council
- ☐ Table potato grower (washed lines)
- ☐ Table potato grower (brushed lines)
- ☐ Table potato grower (both)
- ☐ Processing potato grower
- ☐ Potato processor (french fries)
- ☐ Potato processor (crisps)
- ☐ Potato processor (other)
- ☐ Merchant
- ☐ Seed potato exporter
- ☐ Table potato exporter
- ☐ Processing potato exporter
- ☐ Owner of proprietary lines
- ☐ Certified Seed Scheme business
- ☐ Agronomist
- ☐ Government RD&E provider
- ☐ Regulator / AQUIS
- ☐ Seed inspector
- ☐ Seed storage operator
- ☐ DAFF
- ☐ Other (please specify)

***2. What is your postcode?**

Seed Supply Information

***3. If you are a ware or processing potato grower or a potato seed merchant, from which region or area do you purchase seed?**

- ☐ Armidale Dumaresq
- ☐ Bathurst
- ☐ Blayney
- ☐ Cabonne
- ☐ Crookwell
- ☐ Evans
- ☐ Glen Innes
- ☐ Goulburn
- ☐ Guning
- ☐ Guyra
- ☐ Mulwaree
- ☐ Oberon
- ☐ Orange
- ☐ Severn
- ☐ Walcha
- ☐ Ingecarribee (Parish of Murrimba)
- ☐ Ballarat
- ☐ Kinglake
- ☐ Gippsland
- ☐ Portland
- ☐ Kangaroo Island
- ☐ Otways
- ☐ Albany
- ☐ Tasmania

Other (please specify)

4. Why do you buy seed from the area?

- ☐ It is certified under a good regional scheme
- ☐ It is certified under the current national scheme
- ☐ I know and trust the grower(s)
- ☐ It is not certified but very good quality
- ☐ I never had problems with seed from there
- ☐ It is close to my farm(s)
- ☐ The grower is family
- ☐ I have never tried anybody else

Other (please specify)

5. On average, what is the percentage of certified seed you use each year?

%

6. If you do not use certified seed, what is the reason?

- [ ] Too expensive
- [ ] No enough choice of varieties
- [ ] It does not make a difference to my yield
- [ ] It does not make a difference to my tuber quality
- [ ] I have never thought about it
- [ ] I do not trust the schemes

Other (please specify)

***7. What are the advantages of certified seed for processing and table potato growers?**

- [ ] reliable performance
- [ ] less fungal diseases
- [ ] less bacterial diseases
- [ ] less virus diseases
- [ ] better emergence and crop establishment
- [ ] better profit margins
- [ ] less spraying
- [ ] there are few advantages
- [ ] there are no advantages
- [ ] less seed piece breakdown

Other (please specify)

8. Which scheme applies to the certified seed you buy? Please comment on what is good about that particular scheme

- [ ] VicSpa
- [ ] NSW / Croockwell
- [ ] WA certified rules
- [ ] WA registered rules
- [ ] Tasmania
- [ ] Other
- [ ] Not sure
- [ ] Don't care

Other (please specify)

9. Changes to your seed supply

	yes, always	no, never	sometimes	seldom	many times
I used to buy certified seed from a different supplier	◯	◯	◯	◯	◯
I used to buy non-certified seed from a different supplier	◯	◯	◯	◯	◯
I intend to use a different supplier in the future for certified seed	◯	◯	◯	◯	◯
I intend to use a different supplier in the future for non-certified seed	◯	◯	◯	◯	◯
I shop around for the best seed each year	◯	◯	◯	◯	◯
I change supplier depending on varieties I want	◯	◯	◯	◯	◯
I use PBR varieties, choices are limited	◯	◯	◯	◯	◯
I change supplier depending on quality/health	◯	◯	◯	◯	◯
I change supplier depending on timing	◯	◯	◯	◯	◯
I change supplier depending on price	◯	◯	◯	◯	◯
I change supplier depending on the relationship	◯	◯	◯	◯	◯
I have no say, I get a seed allocation from the processor	◯	◯	◯	◯	◯
I get seed allocated by the merchant	◯	◯	◯	◯	◯
I like to try new suppliers	◯	◯	◯	◯	◯

Other (please specify)

*10. If you are a seed grower or merchant, which states / territories do you supply?

- ☐ VIC
- ☐ NSW
- ☐ ACT
- ☐ Qld
- ☐ WA
- ☐ TAS

Other (please specify)

***11. Would you like to export in the future?**

- ☐ Yes, seed
- ☐ Yes, ware potatoes
- ☐ Yes, processing potatoes
- ☐ No
- ☐ Not sure
- ☐ Other (please specify)

12. If you are already exporting, which are the main countries?

Seed Quality Information

***13. Do you monitor to prevent or quickly respond to issues?**

- ☐ yes, always get seed tested
- ☐ yes, sometimes get seed tested
- ☐ no, never get seed tested
- ☐ no, did not know seed testing can be done
- ☐ I use crop scouting regularly
- ☐ I use crop scouting sometimes
- ☐ my agronomist looks after that
- ☐ I send plants to a lab for identification of issues
- ☐ my spray program looks after issues well enough

Other (please specify)

Seed Quality Information

***13. Do you monitor to prevent or quickly respond to issues?**

- ☐ yes, always get seed tested
- ☐ yes, sometimes get seed tested
- ☐ no, never get seed tested
- ☐ no, did not know seed testing can be done
- ☐ I use crop scouting regularly
- ☐ I use crop scouting sometimes
- ☐ my agronomist looks after that
- ☐ I send plants to a lab for identification of issues
- ☐ my spray program looks after issues well enough

Other (please specify)

***14. Over the years, I have observed the following:**

	Yes, occasionally with non-certified seed	Yes, occasionally with certified seed	Yes, occasionally in a seed crop	Yes, often with non-certified seed	Yes, often with certified seed	Yes, often in a seed crop	no
uneven emergence	☐	☐	☐	☐	☐	☐	☐
seed piece breakdown	☐	☐	☐	☐	☐	☐	☐
transport related issues	☐	☐	☐	☐	☐	☐	☐
storage related issues	☐	☐	☐	☐	☐	☐	☐
abnormal tuber growth	☐	☐	☐	☐	☐	☐	☐
abnormal top growth	☐	☐	☐	☐	☐	☐	☐
deficiencies	☐	☐	☐	☐	☐	☐	☐
insect damage	☐	☐	☐	☐	☐	☐	☐
virus symptoms	☐	☐	☐	☐	☐	☐	☐
nematode symptoms	☐	☐	☐	☐	☐	☐	☐
black heart	☐	☐	☐	☐	☐	☐	☐
black scurf	☐	☐	☐	☐	☐	☐	☐
stem canker	☐	☐	☐	☐	☐	☐	☐
Sclerotinia	☐	☐	☐	☐	☐	☐	☐
late blight	☐	☐	☐	☐	☐	☐	☐
pink rot	☐	☐	☐	☐	☐	☐	☐
tuber wart	☐	☐	☐	☐	☐	☐	☐
powdery scab	☐	☐	☐	☐	☐	☐	☐
common scab	☐	☐	☐	☐	☐	☐	☐
ring rot	☐	☐	☐	☐	☐	☐	☐
blackleg	☐	☐	☐	☐	☐	☐	☐
soft rot	☐	☐	☐	☐	☐	☐	☐
bacterial wilt	☐	☐	☐	☐	☐	☐	☐

Other (please specify)

***15. Which of the above mentioned issues is the hardest to manage? Why?**

Seed Certification

***16. What is your view about seed potato certification?**

	Yes	No	Not sure	No view
Seed certification, if done well, is a basic requirement for healthy, high yielding potato crops	◯	◯	◯	◯
Seed certification, if done well, is a basic requirement for a sustainable potato industry	◯	◯	◯	◯
The current certification standards are clear and consistent across all states	◯	◯	◯	◯
The current certification standards meet my requirements	◯	◯	◯	◯
Most times I am happy with the certified seed I am purchasing	◯	◯	◯	◯
Most times I am happy with the non-certified seed I am purchasing	◯	◯	◯	◯
Certified seed benefits outweigh costs	◯	◯	◯	◯
Certified seed is too expensive for what it delivers	◯	◯	◯	◯
State governments should be in charge of seed certification schemes	◯	◯	◯	◯
Certification requirements for processing and ware potatoes should be different	◯	◯	◯	◯
Certification schemes are using the latest diagnostic technologies	◯	◯	◯	◯
Certification schemes should be reviewed regularly to keep up with new technologies	◯	◯	◯	◯
Certification should only focus on diseases	◯	◯	◯	◯
Certification should include quality indicators (e.g. physiological age, nutrients)	◯	◯	◯	◯
Seed should be accompanied by 'life-cycle' information (growing and storage info)	◯	◯	◯	◯

Other (please specify)

***17. The best seed certification system(s) for the potato industry would be:**

	yes	no	not sure	no view
A QA system (e.g. based on HACCP)	◯	◯	◯	◯
Seed passport system	◯	◯	◯	◯
A uniform certification system based on a revision of the current 'national system'	◯	◯	◯	◯
The schemes we currently have without change	◯	◯	◯	◯
The schemes we currently have with some adjustments	◯	◯	◯	◯
A national system	◯	◯	◯	◯
A state based system	◯	◯	◯	◯
A regional system	◯	◯	◯	◯
A system that is recognised by overseas customers	◯	◯	◯	◯

Other (please specify)

If current certification systems were adjusted, what should change in your view?

18. Do you agree or disagree that a national seed certification scheme should be:

	agree	partly agree	disagree	no view
Customer focussed	◯	◯	◯	◯
Transparent	◯	◯	◯	◯
Reliable	◯	◯	◯	◯
Not favouring a specific production region or state	◯	◯	◯	◯
Use standards or thresholds that have a scientific basis or are based on a documented risk analysis	◯	◯	◯	◯
Include virus indexing that is not only based on visual inspection	◯	◯	◯	◯
Be simple to administer	◯	◯	◯	◯
Provide value for money to all involved	◯	◯	◯	◯

Other (please specify)

***19. In your view, should ownership and management of a seed certification scheme**

	yes	no	not sure	no view
be an industry owned and managed, effective non-for profit organisation	◯	◯	◯	◯
be set up and run as a business	◯	◯	◯	◯
have a board made up of producers, seed customers and perhaps a technical adviser	◯	◯	◯	◯
not change from what we have	◯	◯	◯	◯
be run by state or regional grower groups	◯	◯	◯	◯
be a national industry scheme	◯	◯	◯	◯

Other (please specify)

20. Do you know of an overseas example of a well functioning seed certification scheme? if yes, where is it operating and what is so good about it?

21. Do you have any further comments about seed potato certification in Australia?

Appendix 2: Maximum tolerances for diseases/defects, National Certification Standard and state schemes

	National Certification Standard (2007)		New South Wales	Tasmania	ViCSPA	Western Australia (2013 incorporating national scheme)
1. FIELD INSPECTIONS						
1.1 DISEASE TOLERANCES (% of plants):						
FOREIGN VARIETIES	**0.10%**	Rating 3 (% of plants) in field inspections	Guidelines for New South Wales seed potato certification system not found online and not made available.	**Refer to section 0 below.** Guidelines for Tasmania not found online, but were provided by TIA. Standard Operating Procedures for inspections under the national standard are available online on the TIA website.	Guidelines for Victorian Certified Seed Potato scheme not found online and not made available Other material[1] says that there is zero tolerance for: ▪ PCN ▪ Bacterial wilt ▪ Ring rot	**0□□□%**
Potato Leaf Roll Virus	1%					
Potato Virus Y	1%					
Potato Virus X	1%					
Potato Virus A	1%					
Potato Virus S	1%					
Potato Virus T	1%					
Tobacco Mosaic Virus	1%[X]					
Potato Yellow Dwarf Virus	1%[X]					
Tomato Spotted Wilt Virus	1%					
Purple top Wilt	1%					
Potato spindle tuber viroid	Zero					
TOTAL VIRUS & VIROID DISEASES	**1.00%**					**1.00%**
Fusarium wilt (*Fusarium* sp)	2%					2%
Verticillium wilt (*Verticillium dahliae / albo-atrum*)	2%					2%
Blackleg (*Erwinia carotovora* ssp.)	2%					2%
Vine Rot (*Erwinia* sp.)	2%					2%
Bacterial wilt (*Ralstonia solanacearum*)	Zero					Zero
TOTAL FUNGAL & BACTERIAL DISEASES	**2.00%**					**2.00%**

[1] http://www.vicspa.org.au/f.ashx/Value-of-seed-potato-certification_soilborne-disease.pdf

	National Certification Standard (2007)		New South Wales	Tasmania	ViCSPA	Western Australia (2013 incorporating national scheme)
TOTAL DISEASED PLANTS	**2.00%**					**2.00%**
Potato cyst nematode (PCN) (*Globodera rostochiensis or pallida*)	Zero					Zero
1.2 ZERO TOLERANCE DISEASES (Quarantine Diseases from National Potato Industry Biosecurity Plan) **This list will have to change if the list in the IBP changes.**						
Brown rot (*Ralstonia solanacearum*)	0%					0%
Ring rot (*Clavibacter michiganensis sepedonicus*)	0%					0%
Potato cyst nematode (PCN) (*Globodera rostochiensis or pallida*)	0%					0%
Late blight A2 mating strain (*Phytophthora infestans*)	0%					0%
Potato Spindle Tuber Viroid (*Pospiviroidae*)	0%					0%
Potato Wart (*Synchytrium endobioticum*)	0%					0%
Potato Mop Top Virus (Mop Top Virus)	0%					0%
Smut (*Angiosorus solani*)	0%					0%
PVM (Potato Virus M)	0%					0%
Phoma leaf spot (*Phoma andina*)	0%					0%
Tobacco rattle Virus (Tobacco Rattle Virus)	0%					0%
PVS (Andean strain only) (Potato Virus S)	0%					0%
BCTV (Beet Curly top virus)	0%					0%
PVV (Potato Virus V)	0%					0%

	National Certification Standard (2007)		New South Wales	Tasmania	ViCSPA	Western Australia (2013 incorporating national scheme)
Skin Spot (*Polyscytalum pustulans*)	0%					0%
2. TUBER INSPECTIONS						
2.1 TUBER DISEASE/NEMATODE TOLERANCES (% tuber count):						
		Rating A (% by tuber count) – visual inspection unwashed tubers				
Potato Cyst Nematode (PCN) (*Globodera rostochiensis* or *G. pallida*)	Zero tolerance *(PCN testing is required)*					Zero
Bacterial wilt (*Ralstonia solanacearum*)	Zero tolerance					Zero
Potato spindle tuber viroid	Zero tolerance					Zero
Fusarium Dry rot (*Fusarium sp.)*	2% or 2.0%?					2.0%
Gangrene Dry rot (Phoma exigua var foveata)	2% or 2.0%?					
Black scurf (*Rhizoctonia sp.)*	-*					2.0%
Silver scurf (*Helminthosporium sp.)*	-*					*
Black dot (*Collectorichum sp.)*	-*					*
Common scab (*Streptomyces sp.)*	2% or 2.0% / 4% (Tasmania only)**					2.0%
Powdery scab (*Spongospora subterranea*)	2% or 2.0%?					2.0%
Root knot nematode / Eelworm (*Meloidgyne sp.*)	2% or 2.0%					2.0%^
Soft rots (e.g. *Pythium sp.)*	0.25%					0.25%
Pink rot (*Pythophthora sp.*)	0.25%					0.25%
Late / Irish Blight (*Phytophthora infestans*)	2%					? (but note that A1 and A2 mating strains do not currently occur in WA

	National Certification Standard (2007)		New South Wales	Tasmania	ViCSPA	Western Australia (2013 incorporating national scheme)
						growing regions)
Total tuber diseases	**2 %**					**2%**
2.2 TUBER DEFECTS / INSECT DAMAGE (% tuber count):						
Insect damage	1.5%#					1.5%#
Malformed tubers	2.0%					2.0%^^
Mechanical damage	2.0%					2.0%^^
Stem end discolouration	2.0%					2.0%^^
Miscellaneous (e.g. sunburn)	1.0%					1.0%^^^
Foreign cultivars	0					0
Oversize	1.0%					1.0%*
Undersize	2.0%					2.0%*
Hollow heart						5.0%^^^
Soil						^
Black heart						0
Total tuber defects	**2.0%**					**2.0%**

X Serological testing required
* The tolerance may be negotiated between the seed grower and the seed buyer.
** In Tasmania, the tolerance for domestic seed may be negotiated between the seed grower and the seed buyer.
^ Style A (level of damage) accepted
^^ Style B (level of damage) accepted
^^^ Style C (level of damage) accepted
# An additional 2 per cent of tubers may show minimal feeding damage.

Appendix 3: Comparison of WA rules and the National Standard

Component / disease	WA rules	National Standard	Comments
Number of generations allowed	Rules allow, under exceptional circumstances production of G6 seed (Rule 8, p4)	Maximum of five multiplications i.e. G0 (in the lab) to G5	
Black scurf	At tuber inspection, tolerance of 2% indicated, but can be negotiated between the seed grower and the seed buyer.	No tolerance provided - tolerance may be negotiated between the seed grower and the seed buyer.	**Under the NS, the presence of Black Scurf is not counted in tuber defects group tolerance of 2%.** In WA, Black Scurf is counted in tuber defects.
Silver scurf, black dot, oversize, undersize	Tolerance % can be negotiated between seller and buyer (however 1.0% for oversize & 2.0% for undersize is listed and therefore suggested?). Unless an agreed level if negotiated and specified in a written contract, these are included as tuber defects.	Silver scurf and black dot – no tolerance provided – tolerance may be negotiated between the seed grower and the seed buyer. Presence is not counted as defect unless tolerance is in writing Oversize tolerance 1.0%. Undersize tolerance 2.0% (both included in group with 2.0% group tolerance)	There is variation between WA and National Standard. There are different tolerances or 'suggested?' tolerances. Tolerance can be negotiated for some. Some are counted towards group disease / defect tolerance while others are not.
Virus testing	Initial stocks are tested for a range of diseases including a list of viruses (as per the National Standard see next column in this table). In WA virus testing is required for all G3 seed for the following viruses: tomato spotted wilt virus, potato leaf roll virus, potato virus S, potato virus X, and potato virus Y. Where virus is detected at the first inspection a second set of samples must be tested at the growers expense to verify if rouging has been successful. (Rule 31).	Testing is only required for initial (starting material) stocks for a range of diseases including the following viruses: Potato leafroll virus (PLRV), potato virus A (PVA), potato virus M (PVM), potato virus S (PVS), potato virus x (PVX), potato virus Y (PVY), tomato spotted wilt virus (TSW), potato spindle tuber viroid (PSTV), and Calico, caused by Alfalfa Mosaic Virus.	More testing is required in WA compared to NS, e.g. all G3 seed is tested.
Potato Virus Y	All rating 1 and rating 2 crops must be 0% for PVY at the 1st and 2nd crop inspections. (see Rule 33, and appendix of disease tolerances)	Rating 1 crops, tolerance of 0.01% at final inspection. Rating 2 crops, tolerance of 0.1% at final inspection.	WA rules are more stringent for PVY.

Component / disease	WA rules	National Standard	Comments
Eelworm (Meloidogyne spp.)	Tuber defects, style A is acceptable for eelworm. Therefore only style B or worse is counted as diseased (Rule 37).	Styles are not referred to for tuber inspection tolerances. However, styles are referred to for when selling seed to another seed grower.	This has been included in the WA rules to clarify what level of disease to count as diseased.
Late / Irish blight	No tolerance provided, but WA Rules state that WA seed growing districts of free of "Late blight (A1 & A2 mating strains)".	Tolerance of 2% for "Late/Irish Blight, Phytophthora infestans" (see appendix 3 p.26 of standard). Zero tolerance for 'A2 mating strain' (Quarantine diseases from National Potato Industry Biosecurity Plan)	Information within the NS is not consistent: Table 3 (tuber disease tolerances) – Late Blight is not mentioned. Appendix 3 (diseases and tolerances to be included in tuber inspections) - 2% tolerance
Tuber defects / insect damage	WA rules include information on the Style (level of damage) accepted.	The National Standard does not specify styles that are acceptable for tuber defects or insect damage. However, the NS does provide images for examples of levels of tuber-borne diseases (Styles). The NS states that styles should be used: ▪ For negotiating tolerances for black scurf, silver scurf and black dot. ▪ As a guide for tubers to be 'practically free of soil' i.e. Style A. ▪ When selling seed to another seed grower.	WA has included information on Styles. It is not clear if other states have developed any information on Style accepted. What does this mean in practice for assessing tubers in each state and consistency with the National Standard?
Hollow heart (under Tuber defects / insect damage)	Tolerance of 5.0% but Style C (level of damage) accepted.	No tolerance provided.	Additional tolerance included in the WA rules
Black heart (under Tuber defects / insect damage)	Tolerance of 0%	No tolerance provided.	Additional tolerance included in the WA rules.
Significant crop failure	Growers are required to provide evidence of destination of potatoes from substantial areas of crop that has been rejected from certification.	Not covered by National Standard.	WA included this rule to address the problem of 'blending' seed from different crops.

Appendix 4: Comparing the Tasmanian Standard to the National Standard

<table>
<tr><th colspan="2">Disease</th><th>Tasmanian Standard</th><th>National Standard</th><th>Comments</th></tr>
<tr><td colspan="2">Rotation</td><td>Seed crops must be panted on land that has not been planted with potatoes for at least 5 years, including volunteers.</td><td>Land on which seed generations one to three (G1 – G3) are produced must not have grown potatoes for a minimum of five years. Land on which subsequent generations are produced (ie. G4 and G5) must not have grown potatoes for a minimum of three years.</td><td>Tasmanian Standard is more stringent for rotation – for G4 & G5.</td></tr>
<tr><td colspan="2">Field conditions</td><td>Additional conditions (refer to Tasmanian Standard) e.g. "growers must co-operate with any soil testing program which seeks to ensure Tasmania's ongoing freedom from Potato Cyst Nematode".</td><td></td><td>Additional to the National Standard.
The Tasmanian Standard does not specify if a PCN program is current or what it involves.</td></tr>
<tr><td colspan="2">Crop Isolation</td><td>All seed production must be at least 50 metres from ground keepers.</td><td>Generally 20 metres (see rules 14 and 15).</td><td>Tasmanian Standard is more stringent for crop isolation.</td></tr>
<tr><td rowspan="3">Field Inspections</td><td>Rouging</td><td>Additional rules for rouging including prior consultation with TIA Certification Officer prior to rouging.</td><td></td><td>Requirements additional to the National Standard.</td></tr>
<tr><td>Potato Leaf Roll Virus (PLRV)</td><td>2nd and final field inspection, tolerances for visual inspection:
G1 0%
G2 0.01%
G3 0.1%
G4 0.25%
G5 0.25%</td><td>Final inspection rating:<table><tr><th>R3</th><th>R2</th><th>R1</th></tr><tr><td>1%</td><td>0.1%</td><td>0.01%</td></tr></table>"If viruses are noted in the field the results can be confirmed by serological testing."</td><td>The Tasmanian Standard does not state how it relates to seed Ratings R1, R2 and R3 in the National Standard (see Rule 22 and Appendix 3 Nat. Standard). Presumably the tolerances in the Tas Standard are applied first and then the ratings are applied as per the Nat Standard.</td></tr>
<tr><td>Potato Virus X (PVX)</td><td>"PVX detected at levels greater than 1% infection by a visual examination (plus ELISA testing) or though a full serological test after the second and final field inspection will result in the crop being rejected."</td><td>Final inspection rating:<table><tr><th>R3</th><th>R2</th><th>R1</th></tr><tr><td>1%</td><td>0%</td><td>0%</td></tr></table></td><td>The Tasmanian Standard does not state how it relates to seed Ratings R1, R2 and R3.
The Tasmanian Standard does not state how the tolerances for individual viruses (Appendix 3, NS) are used</td></tr>
</table>

<table>
<tr><th colspan="2">Disease</th><th>Tasmanian Standard</th><th>National Standard</th><th>Comments</th></tr>
<tr><td></td><td>Potato Virus Y (PVY)</td><td>Zero tolerance.
"A zero tolerance will apply to PVY. If any level of PVY is detected by visual examination (plus ELISA testing) or through a full serological test after the second and final field inspection then all material of that variety and generation planted in that plot must be destroyed or processed."</td><td>Final inspection rating:<table><tr><th>R3</th><th>R2</th><th>R1</th></tr><tr><td>1%</td><td>0.1%</td><td>0.01%</td></tr></table></td><td>Tasmania has a more stringent Standard for PVY.</td></tr>
<tr><td></td><td>Potato Virus S (PVS)</td><td>"No crop will be rejected due to the detection of PVS"</td><td>Final inspection rating:<table><tr><th>R3</th><th>R2</th><th>R1</th></tr><tr><td>1%</td><td>0%</td><td>0%</td></tr></table></td><td>The Tasmanian Standard does not state how it applies the National Standard for PVS i.e. does the 1% tolerance for R3 still apply? and if PVS is detected but <1%, is it precluded from rating 1 & 2?</td></tr>
<tr><td></td><td>Virus testing</td><td>The Tasmanian Standard does not specific what virus testing is necessarily required, but it does refer to "visual examination (plus ELISA testing).." for PVX and PVY. And it does say "An independent laboratory test will be made available, at cost to the grower in the event of a dispute of virus diagnosis in the field."
However, the Tasmanian Standard Operating Procedures say that "All G2 crops are virus sampled for viruses set by the industry each season" (SOP, p15)</td><td>"If viruses are noted in the field the results can be confirmed by serological testing." (Appendix 3)</td><td>It is not easy to determine from either the Tasmanian or National Standard, what virus testing is required by the rules.</td></tr>
</table>

Disease		Tasmanian Standard	National Standard	Comments
Tuber inspections	**Common Scab**	Tolerance level can be negotiated, otherwise tubers assessed at **2%**. [But Tasmanian Standard Operating Procedures say **4%** for common scab]	2.0% and "In Tasmania, the tolerance for **domestic seed** may be negotiated between the seed grower and the seed buyer." (rule 27) 2% / 4% (Tasmania Only) (Appendix 3)	Information in two sections of the National Standard (Rule 27 and Appendix 3) is inconsistent. One section says that in Tasmania tolerance can be negotiated, the other says 4% for Tasmania. "Domestic seed" is not defined in the National Standard. The Standards do not state how the Group tolerance of 2% (rule 28, Nat. Std.) is applied / adjusted in Tasmanian when common scab is greater than 2%.
Labels		"Seed that has passed two field inspections and is wither not submitted for tuber inspection or is rejected at tuber inspection can be labelled with a TIA "Provisional" label"	Refer to rules 33 to 39.	In Tasmania, seed rejected at tuber inspection can use a "Provisional" label. If the crop has been rejected at tuber inspection, does the buyer receive information as to why? Do growers know to ask about this?

Appendix 5: Comparing the National Standard to International Standards

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Rogues and off-types					**0.1%**	**0.5% (of which deviation from variety must not exceed 0.2%)**					
Foreign varieties / Variety purity / true to type	**0.10%**	**0.0%**	**0.025%**	**0.5%**		**0.2**	**0.20%**	**0.05%**	**0.10%**	**0.01%**	**0.05%**
Virus / viroids:											
Well defined Mosaic							1.00%				
Severe mosaic and/or leafroll virus								0.1%	0.4%	0.25%	2%
Total mosaic and/or leafroll virus								0.5%	0.8%		
Severe virus					0.4%	2.0%					
Total severe virus					0.4%	2.0%					
Mild virus					0.8%	5.0%					
Mild mosaic										2%	10%
Potato Spindle Tuber Viroid	0%			0%	See tuber inspection						
Potato Mop Top	0%										

[2] Refer to guidelines for group and pyramid tolerances
[3] Tuber tolerances shown are for blue tag which is equivalent to U.S. No. 1 seed potato grade – with some exceptions
[4] Tuber inspection tolerances are shown for Basic seed potatoes produced in Scotland for export outside the EU (and to the Canary Islands) unless the importing country's requirements are stricter.
[5] Tuber tolerances are **by weight**.
[6] Tuber tolerances shown are for marketing within the EU. Different tolerances apply to non-EU

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
virus											
Potato Virus M	0%										
Tobacco Rattle Virus	0%						Nil ("Corky Ring Spot")				
Potato Virus S	0% (Andean strain only)										
Beet curly top virus	0%										
Potato Virus V	0%										
Potato Leaf Roll Virus	1%				0.4%	2.0%	0.20%	See above joint with 'mosaic'			
Potato Virus Y	1%										
Potato Virus X	1%										
Potato Virus A	1%										
Potato Virus S	1%										
Potato Virus T	1%										
Tobacco Mosaic Virus	1%[X]										
Potato Yellow Dwarf Virus	1%[X]										
Tomato Spotted Wilt Virus	1%										
Purple top Wilt	1%										
TOTAL VIRUS DISEASES / Total viruses / Total mosaic	**1.00%**	**0.1%**	**0.2%**	**2%**	**0.8%**	**5.0%**	**1.00%**	**See above "total mosaic and/or leafroll"**		**2%**	**10%**
Bacterial and fungal:											

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Pink rot		'Pink rot' is mentioned in text at 7.1 (p13) of rules, but tolerance not provided.									
Brown Rot (*Ralstonia solanacearum*)	Zero			See below?? Combined with blackleg	See tuber inspection						
Ring rot (*Clavibacter michiganensis sepedonicus*)	0%			0%	See tuber inspection		Nil				
Late blight (*Phytophthora infestans*)	0% (A2 mating strain)										
Potato Wart (*Synchytrium endobioticum*)	0%				See tuber inspection						
Smut (*Angiosorus solani*)	0%										
Phoma leaf spot (*Phoma andina*)	0%										
Skin Spot (*Polyscytalum pustulans*)	0%										
Fusarium wilt (*Fusarium* sp)	2%	'Fusarium Wilt' is mentioned in text at 7.1 (p13) of rules, but % tolerance not provided.		Included in 'total blackleg & wilts' below?							
Verticillium wilt (*Verticillium dahliae / albo-atrum*)	2%										

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Blackleg (*Erwinia carotovora* ssp.)	2%				1.0%	2.0%	-^	See below, other organisms causing 'Blackleg'.		0.03%	0.1%
Blackleg (Pectobacterium spp.) Blackleg (Dickeya spp.)								0.5 0.0	1.0 0.0		
Vine Rot (*Erwinia* sp.)	2%										
Total of blackleg and wilts (not specified)		5.0%	0.5%	2%							
TOTAL FUNGAL & BACTERIAL DISEASES	**2.00%**										
Nematodes:											
Potato Cyst Nematode (Globodera rostochiensis or pallida)	Zero	*Must be compliant with Export Compliance Programme for the Provision for Potato Cyst Nematode (PCN) and Potato Wart Additional Declarations' [Rule 16]*			See tuber inspection			Nil			
Root Knot Nematode							Nil				
Other:											
Bolters		1.0%	0.5%								

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
TOTAL DISEASED PLANTS (Virus, bacterial & fungal)	**2.00%**										
TUBER INSPECTIONS[7]											
Potato Cyst Nematode (PCN) (Globodera rostochiensis or G. pallida)	Zero										
Fusarium Dry rot (*Fusarium sp.)*	2% or 2.0%?	1% "dry rots"		See below	1.0%		2.00% "**serious** damage by dry or moist type Fusarium Tuber rot"	See below (combined with other rots)			
Gangrene Dry rot (Phoma exigua var foveata)	2% or 2.0%?			See below	1.0%			See below (combined with other rots)			
Combined: Gengrene (Phoma foveata), Dry rot (Fusarium), Wet rot (Botrytis cinerea)								0.5			
Wet rot										Sporadic (1 tuber /	

[7] Canadian regulations: tuber tolerances are at shipping point – it is not clear without further investigation how the tuber certification system works inside of Canada

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
										250kg)	
Black scurf (*Rhizoctonia sp.)*	-*	5% (5% of indiv tuber surface on 5% of tubers sampled)		See below (combined with scab)	3.0%			3.0% by weight 12.5% surface area cover (25% for class A)		25% light?	
Silver scurf (*Helminthosporium sp.)*	-*										
Black dot (*Collectorichum sp.)*	-*										
Common scab (*Streptomyces sp.)*	2% or 2.0% / 4% (Tasmania only)**	If more than 2 in 500 tubers sampled, show any sign of any scab, scab is tested for type and recorded on label.		See below (combined with Rhizoctonia)	4.0%			4.0% (5.0% for class A) 25.0% surface area cover (33% for class A)		Scab scale 2.5 (at most 1/8 of total surface)	
Powdery scab (*Spongospora subterranea*)	2% or 2.0%?				3.0%			3.0% 12.5% surface area cover			
Combined Rhizoctonia and Scab				Light 10.0% Moderate 5.0%							
Root knot nematode / Eelworm (*Meloidgyne sp.*)	2% or 2.0%						Nil				

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Soft rots (e.g. *Pythium sp.)*	0.25%	0.1% "wet rot"		0.1% "soft rot or wet breakdown"	1.0% (including Watery Wound Rot)						
Pink rot (*Pythophthora sp.*)	0.25%				1.0% (Pink Rot and Pit Rot)						
Late / Irish Blight (*Phytophthora infestans*)	2%			See below	1.0%		1.00%	0.5% "rots including blight"		<35mm: 1 tuber / 50 kg >35mm 1 tuber / 100kg	
Skin Spot *(Polyscytalum pustulans)*					0.5% except for A and CC classes; 2.0% for A and CC classes only			0.5% (2.0% for class 2 only) by weight 12.5% surface area cover			
Dry rot, including late blight				1.0%							
Dry rot										1-4 tubers / 50 kg	
Blackleg					1.0%			See below.			
Blackleg bacterial soft rot (Pectobacterium spp.)								0.5%			
Blackleg (Dickeya spp.)								0.0%			
Bacterial Ring rot					nil		0.00	Nil			
Wart disease					nil			Nil			

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Brown rot	Zero "Bacterial wilt *(Ralstonia solanacearum)"*				nil			Nil			
Potato Spindle Tuber Viroid	Zero				nil			Nil			
Virus (post harvest inspection)										Class A: 5 in 100 Class C: 10 in 100	
Group tolerance for rots								**0.5%**			
Group tolerance for surface diseases (skin spot, black scurf, common scab, powdery scab)								**4.0%**			
Total tuber diseases	**2 %**										
Potato tuber moth		4%					(US Standard: Combined with nematode (below))	Nil			
Potato Cyst Nematode	Zero				Nil			Nil			

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Potato Tuber Eelworm					Nil			Nil			
Colorado beetle					Nil			Nil			
TUBER DEFECTS / INSECT DAMAGE (% tuber count):											
Combined: Nematode or Tuber Moth injury							US standard 0.00%				
Frozen, soft rot or wet breakdown							0.50%				
Superficial necrosis caused by strains of potato virus Y					0.1%			0.1%			
External blemishes or tubers other than diseased tubers whose shape is atypical for the variety					2.0%			2.0%			
External disorders									4-12 tubers / 50 kg		
Frost damaged tubers					1.0%						
Damaged (not infected)		4%									
Insect damage	1.5%[#]										

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Malformed / misshapen tubers	2.0%	4%									
Mechanical damage	2.0%										
Malformed and damage				2.0%							
Stem end discolouration	2.0%			4.0%							
Stem end rot		2%									
Miscellaneous (e.g. sunburn)	1.0%										
Foreign cultivars / varietal mixture	0						0.25%				
Oversize	1.0%										
Undersize	2.0%										
Hollow heart							10%				
Soil					1.0%		10%	1%	1% of total weight		
Vascular ring discolouration							5%				
Black heart											
Group tolerance for '<u>other defects and damage</u>' (PVY necrosis, external blemishes)								2.0%			

Component	National Certification Standard (2007) Australia	New Zealand[2]		Canadian	Britain [z]		Idaho [3]	Scotland[4 5 6]		The Netherlands	
		Group	G6 (Pyramid)		A	CC (unlimited generations)		Elite (E1-3)	Class A	Class A	Class C
Collective Group tolerance for rots, surface diseases and other defects and damage.								4.0%			
Total external defects							6%				
Total internal defects							5% *Not clear if this is what the US standards really mean. See excerpt in Appendix.*				
Total tuber defects	**2.0%**										
Combined maximum defects (diseases + defects)		**5%** (*but unclear if this limit includes scab, Rhizoctonia , misshapen*)			**4.0%** (*NB refer to regulations for other group tolerances*)						

Appendix 6: International Standards for Phytosanitary Measures (ISPM)

Standards relevant to PCN freedom are highlighted blue

Standard N°	Title / topic
ISPM 1	Phytosanitary principles for the protection of plants and the application of phytosanitary measures in international trade
ISPM 2	Framework for Pest Risk Analysis
ISPM 3	Code of conduct for the import and release of exotic biological control agents
ISPM 4	**Requirements for the establishment of pest-free areas**
ISPM 5	Glossary of phytosanitary terms (2009 version)
ISPM 6	**Guidelines for surveillance**
ISPM 7	Export certification system
ISPM 8	**Determination of pest status in an area**
ISPM 9	Guidelines for pest eradication programmes
ISPM 10	**Requirements for the establishment of pest free places of production and pest free production sites**
ISPM 11	Pest risk analysis for quarantine pests including analysis for environmental risks and living modified organisms (2004)
ISPM 12	Guidelines for phytosanitary certificates
ISPM 13	Guidelines for the notification of non-compliance and emergency action
ISPM 14	The use of integrated measures in a systems approach for pest risk management
ISPM 15	Guidelines for regulating wood packaging in international trade (2009)
ISPM 16	Regulated non-quarantine pests: concept and application
ISPM 17	Pest reporting
ISPM 18	Guidelines for the use of irradiation as a phytosanitary measures
ISPM 19	Guidelines on lists of regulated pests
ISPM 20	Guidelines for a phytosanitary import regulatory system
ISPM 21	Pest Risk Analysis for regulated non-quarantine pests
ISPM 22	Requirements for the establishment of areas of low pest prevalence
ISPM 23	Guidelines for inspection

Standard N°	**Title / topic**
ISPM 24	Guidelines for the determination and recognition of equivalence of phytosanitary measures
ISPM 25	Consignments in transit
ISPM 26	Establishment of pest free areas for fruit flies (Tephritidae)
ISPM 27	Diagnostic protocols for regulated pests
ISPM 28	Phytosanitary treatments for regulated pests
ISPM 29	Recognition of pest free areas and areas of low pest prevalence
ISPM 30	Establishment of areas of low pest prevalence for fruit flies (*Tephritidae*)
ISPM 31	Methodologies for sampling of consignments
ISPM 32	Categorization of commodities according to their pest risk (2009)
ISPM 33	Pest free potato (*Solanum* spp.) micropropagative material and minitubers for international trade (2010)
ISPM 34	Design and operation of post-entry quarantine stations for plants (2010)

Appendix 7: Excerpt from The Seed Potatoes (England) Regulations 2006[1]

PART III

Basic seed potatoes and certified seed potatoes produced in England

Column 1 *Specified diseases or pests, damage and defects*	*Column 2* *Individual tolerances*	*Column 3* *Group tolerances*	*Column 4* *Collective group tolerances*
GROUP I Wart Disease (*Synchytrium endobioticum* (Schlib.) Perc.)	Nil	-	-
Potato Tuber Eelworm (*Ditylenchus destructor* Thorne)	Nil	-	-
Potato Cyst Nematode (*Globodera* species infesting potatoes)	Nil	-	-
Ring Rot (*Clavibacter michiganensis* (Smith) Davis et al. spp. *sepedonicus* (Spieck. & Kotth.) Davis et al.)	Nil	-	-
Brown Rot (*Ralstonia solanacearum* (Smith) Yabuuchi et al)	Nil	-	-
Potato Spindle Tuber Viroid	Nil	-	-
Colorado Beetle (*Lepinotarsa decemlineata* (Say))	Nil	-	-
GROUP II Blight (*Phytophthora infestans* (Mont.) de Bary)	1.0%	)	)
Blackleg (*Erwinia carotovora* (Jones) Bergey et al.spp) *atroseptica* (Hellmers & Dowson) Dye or *Erwinia chrysanthemi* Burkholder et al. or both	1.0%	)	)
Soft Rots including Watery Wound Rot (*Pythium ultimum Trow*)	1.0%	) 1.0%	)
Pink Rot (*Phytophthora erythroseptica Pethybridge*) and Pit Rot	1.0%	)	)
Dry Rot (*Fusarium* species)	1.0%	)	)
Gangrene (*Phoma* species)	1.0%	)	)
Frost damaged tubers	1.0%	)	)
Provided that in respect of seed potatoes of a Community Grade the individual tolerances listed in column 2 and the group tolerances listed in column 3 shall not exceed 0.5%.			
GROUP III Skin spot (*Polyscytalum pustulans* (Owen & Wakefield) M. B. Ellis)	0.5% except for A and CC classes;	)	)

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[1] http://www.legislation.gov.uk/uksi/2006/1161/pdfs/uksi_20061161_en.pdf

Column 1 *Specified diseases or pests, damage and defects*	*Column 2* *Individual tolerances*	*Column 3* *Group tolerances*	*Column 4* *Collective group tolerances*
	2.0% for A and CC classes only		
Powdery scab (*Spongospora* subterranea (Wallr.) Legerh.) Provided that seed potatoes which have at least two eyes at the rose end that are wholly unaffected and less than one-eighth of whose surface area has been affected shall be deemed to be unaffected by the disease (except where powdery scab takes its cankerous form).	3.0%	) 4.0%	) 4.0%
GROUP IV Black Scurf (*Rhizoctonia solani* Kuhn) Provided that seed potatoes which have at least two eyes at the rose end that are wholly unaffected and less than one-quarter of whose surface area has been affected in respect of class A and class CC and one-eighth unaffected in respect of all other classes shall be deemed to be unaffected by the disease.	3.0%	)	)
Common Scab (*Streptomyces* species) Provided that seed potatoes which have at least two eyes at the rose end that are wholly unaffected and less than one-quarter of whose surface area has been affected shall be deemed to be unaffected by the disease.	4.0%	)	)
GROUP V External blemishes or tubers other than diseased tubers whose shape is atypical for the variety	2.0%	2.0%	)
Superficial necrosis caused by strains of potato virus Y	0.1%		
GROUP VI Dirt or other extraneous matter	1.0%	-	-

Appendix 8: Excerpt from Canadian seed regulations

TABLE

CERTIFIED

	Column 1	Column 2	Column 3
Item	Disease or Varietal Mixture	Percentage on First or any Subsequent Inspection	Percentage on Final Inspection
1.	PSTV	0	0
2.	Bacterial ring rot	0	0
3.	Total of all viruses	3	2
4.	Total of blackleg and wilts	3	2
5.	Varietal mixtures	1	0.5

SOR/91-526, s. 1; SOR/95-179, s. 8; SOR/2002-198, s. 3.

TABLE

TUBERS

	Column I	Column II	Column III
Item	Disease or Defect	Percentage by Count at Shipping Point	Percentage by Count at Destination
1.	Soft rot or wet breakdown	0.1	0.5
2.	Dry rot, including late blight	1.0	1.0
3.	Scab and Rhizoctonia combined		
	(*a*) light	10.0	10.0
	(*b*) moderate	5.0	5.0
4.	Stem-end discolouration due to top-killing, frost, heat or drought, with penetration from 6 to 13 mm	4.0	4.0
5.	Malformed and damage	2.0	3.0

(3) For the purposes of the table to subsection (2),

"light Rhizoctonia"

"light Rhizoctonia" means that 1 to 5 per cent of the tuber surface is covered with Rhizoctonia sclerotia; (*rhizoctonie légère*)

"light scab"

"light scab" means that 1 to 5 per cent of the tuber surface is covered with common scab lesions; (*gale légère*)

"moderate Rhizoctonia"

"moderate Rhizoctonia" means that 5 to 10 per cent of the tuber surface is covered with Rhizoctonia sclerotia; (*rhizoctonie modérée*)

"moderate scab"

"moderate scab" means that 5 to 10 per cent of the tuber surface is covered with common scab lesions. (*gale modérée*)

Appendix 9: Excerpt from New Zealand seed potato certification scheme rules

Group Programme:

Tolerances Permitted	Group (%)
Maximum Virus. (PV X, Y, PLRV etc)	0.1
Maximum Rogues (off types)	0.0
Maximum Bolters	1.0
Max. Blackleg & Wilt. (E.Carotovora & Verticillium Wilt)	5.0

Pyramid Programme:

Tolerances Permitted	G1	G2	G3 (Pre-Basic, SE)	G4 (Basic, E)	G5 (1st Gen, Open A)	G6 (2nd Gen, Open B)
Maximum Virus PV X, Y, PLRV etc	0	0.05 (1 in 2000)	0.05 (1 in 2000)	0.05 (1 in 2000)	0.1 (1 in 1000)	0.2 (1 in 500)
Maximum Rogues (off types)	0	0	0	0	0	0.025 (1 in 4000)
Maximum Bolters	0	0.1 (1 in 1000)	0.1 (1 in 1000)	0.1 (1 in 1000)	0.2 (1 in 500)	0.5 (1 in 200)

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Maximum Blackleg E. Carotovora Maximum Wilt Verticillium Wilt	0	0.1 (1 in 1000)	0.1 (1 in 1000)	0.1 (1 in 1000)	0.1 (1 in 1000)	0.5 (1 in 200)

Should an Inspector find a combination of virus and rogue plants present in excess of that shown in the table below on the first inspection, the field will be rejected from certification, but the decision to reject the field is subject to an appeal by the grower.

7.2 Tuber Standards

Approved organisations must reference these tolerances in their procedures describing how inspections are undertaken.

For every 100 tuber sample inspected	Maximum %
Potato Tuber Moth	4
Dry Fusarium/Gangrene	1
Damaged (not infected)	4
Stem end rot	2
Wet rot	0.1
Combined maximum defects	5

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Appendix 10: Excerpt from Idaho Crop Improvement Association, inc. Rules of Certification for Seed potatoes in Idaho

VI. Field Inspection Requirements

A. Two inspections shall be made for each field entered.

B. Field Inspection tolerances for 1st and 2nd Inspections

Table 1 - Percentages allowed for 1st inspection[1] NOTE: Footnotes continue on Seed Potatoes-14

Factor[2]	Generation					
	Nuclear	Gen 1	Gen 2	Gen 3	Gen 4	Gen 5/6
Varietal mixture	0.00	0.00	0.02	0.10	0.25	0.50
Well defined Mosaic	0.00	0.00	0.5	1.00	1.50	2.00
Potato Leafroll	0.00	0.00	0.03	0.05	0.10	0.20
Blackleg[3]	0.00	0.10	0.50	1.00	2.00	..[4]
PVX	0.00	0.50	2.00			
Total Virus[5]						2.00

Table 2 - Percentages allowed for 2nd inspection[1]

Factor[2]	Generation					
	Nuclear	Gen 1	Gen 2	Gen 3	Gen 4	Gen 5/6
Varietal mixture	0.00	0.00	0.01	0.05	0.10	0.20
Well defined Mosaic	0.00	0.00	0.25	0.50	0.75	1.00
Potato Leafroll	0.00	0.00	0.02	0.03	0.08	0.20
Blackleg[3]	0.00	0.10	0.50	1.00	2.00	..[4]
Total Virus[5]						1.00

[1]Field inspections of Nuclear and Generation 1 seed lots are advisory and all factors are required to be rogued when found in order to maintain the tolerance of 0.00%.

[2]Some diseases may be present in a seed potato lot and not exhibit symptom expression in plants or tubers at the time of a regular inspection.

4/13 Seed Potatoes-14

[3]Determination of blackleg disease is based on a visual plant symptom of an inky black stem originating from the seed tuber. Visible blackleg has no tolerance in Generations 5 and 6 and therefore is not a disqualification factor.

[4]Visible blackleg will not be a disqualification factor in G5 or G6.

[5]Total is the combined percentage of potato leafroll, calico, well defined mosaic and all other viral, viroid and mycoplasma-like disease (haywire, witches' broom, aster yellows, etc). This does not include Potato Virus X (PVX).

XII Grade Requirements

A. Idaho Certified Blue Tag Seed Potatoes

The blue tag shall be equivalent to U.S. No. 1 seed potato grade with the following exceptions. There is a 1% tolerance for late blight.

1. Scab - shall not cover more than one-fifth of the surface area.
2. Adhering dirt - a maximum of 50% of the tuber surface may be covered with caked dirt.
3. Loose dirt and/or foreign material - included in total external tolerance.
4. Clipping or trimming not allowed.
5. Freshly broken off second growth - shall not be damaged.
6. Wireworm and/or grub - damaged by waste.
7. Tolerances: For total defects 10%. Three percent (3%) for potatoes which are affected by freezing injury. One percent (1%) for potatoes which are affected by soft rot, wet breakdown or are frozen. The limitations for external and internal defects shall apply as written in the U.S. No. 1 seed potato grade.
9. An additional 10% may be damaged, but not seriously, by shape.

12/10 Seed Potatoes-20

Appendix 11: United States Standards for Grades of Seed Potatoes

§51.3002 Tolerances.

In order to allow for variations incident to proper grading and handling in the foregoing grade, the following tolerances, by weight, are provided as specified.

(a) For defects:

1

(1) 10 percent for potatoes in any lot which are seriously damaged by hollow heart;
(2) 10 percent for potatoes in any lot which are damaged by soil;
(3) 5 percent for potatoes in any lot which are seriously damaged by vascular ring discoloration;
(4) 11 percent for potatoes which fail to meet the remaining requirements of the grade including therein not more than 6 percent for external defects and not more than 5 percent for internal defects: Provided, that included in these tolerances not more than the following percentages shall be allowed for the defects listed:

	Percent
Bacterial Ring Rot	0.00
Serious damage by dry or moist type Fusarium Tuber Rot	2.00
Late Blight Tuber Rot	1.00
Nematode or Tuber Moth injury	0.00
Varietal mixture	0.25
Frozen, soft rot or wet breakdown	0.50

Provided, that en route or at destination, an additional 0.50 percent, or a total of 1 percent, shall be allowed for potatoes which are frozen or affected by soft rot or wet breakdown.

(b) For off-size:

(1) For undersize: 5 percent for potatoes in any lot which fail to meet the required or specified minimum size.
(2) For oversize: 10 percent for potatoes in any lot which fail to meet the required or specified maximum size.

Appendix 12: Scottish Seed Potatoes

TUBER INSPECTION TOLERANCES - EU

The Scottish Government

The following minimum tolerances are used for Basic seed potatoes produced in Scotland for marketing within the EU.

Disease, pest, damage or defect	Individual tolerance [1]	Individual tolerance for surface area cover	Group tolerance [1]	Collective tolerance groups II, III & IV[1]
Quarantine organisms (Group I)			NIL	
Wart disease (*Synchytrium endobioticum*)	NIL	-		
Potato tuber eelworm (*Meloidogyne chitwoodi, M. fallax*)	NIL	-		
Potato cyst nematodes (*Globodera rostochiensis, G. pallida*)	NIL	-		
Ring rot (*Clavibacter michiganensis* ssp. *sepedonicus*)	NIL	-		
Brown rot (*Ralstonia solanacearum*)	NIL	-		
Potato tuber moth (*Phthorimaea operculella*)	NIL	-		
Potato spindle tuber viroid	NIL	-		
Colorado beetle (*Leptinotarsa decemlineata*)	NIL	-		
Rots (Group II)			0.5%	
Rots including Blight (*Phytophtora infestans*)	0.5%	-		
Blackleg/bacterial soft rot (*Pectobacterium* spp.)	0.5%	-		
Blackleg (*Dickeya* spp.)	0.0%			
Gangrene (*Phoma foveata*), Dry rot (*Fusarium*), Wet rot (*Botrytis cinerea*)	0.5%	-		
Surface diseases (Group III)			4.0%	
Skin spot (*Polyscytalum pustulans*)	0.5% (2.0%[2])	12.5%		
Black scurf (*Rhizoctonia solani*)	3.0%	12.5% (25%[2])		
Common scab (*Streptomyces scabies*)	4.0% (5.0%[2])	25.0% (33%[2])		
Powdery scab (*Spongospora subterranea*)	3.0%	12.5%		
Other defects and damage (Group IV)			2.0%	
Externally blemished or atypically shaped tubers[3]	2.0%	-		
Superficial necrosis by PVY	0.1%	-		
Total (Groups II, III and IV)				4.0%
Soil			1.0%	
Dirt or other extraneous matter	1.0%	-		

[1] Tolerances are by weight; [2] Applies to Class A only; [3] Includes tubers wrinkled or dehydrated due to silver scurf (*Helminthosporium solani*).

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TUBER INSPECTION TOLERANCES – NON-EU

The Scottish Government

The following minimum tolerances are used for Basic seed potatoes produced in Scotland for export outside the EU (and to the Canary Islands) unless the importing country's requirements are **stricter**.

Disease, pest, damage or defect	Individual tolerance [1]	Individual tolerance for surface area cover	Group tolerance [1]	Collective tolerance groups II, III & IV[1]
Quarantine organisms (Group I)			NIL	
Wart disease (*Synchytrium endobioticum*)	NIL	-		
Potato tuber eelworm (*Meloidogyne chitwoodi, M. fallax*)	NIL	-		
Potato cyst nematodes (*Globodera rostochiensis, G. pallida*)	NIL	-		
Ring rot (*Clavibacter michiganensis* ssp. *sepedonicus*)	NIL	-		
Brown rot (*Ralstonia solanacearum*)	NIL	-		
Potato tuber moth (*Phthorimaea operculella*)	NIL	-		
Potato spindle tuber viroid	NIL	-		
Colorado beetle (*Leptinotarsa decemlineata*)	NIL	-		
Rots (Group II)			0.2%	
Rots including Blight (*Phytophtora infestans*)	0.2%	-		
Blackleg/bacterial soft rot (*Pectobacterium* spp.)	0.2%	-		
Blackleg (*Dickeya* spp.)	0.0%			
Gangrene (*Phoma foveata*), Dry rot (*Fusarium*), Wet rot (*Botrytis cinerea*)	0.2%	-		
Surface diseases (Group III)			1.5%	
Skin spot (*Polyscytalum pustulans*)	0.5%	12.5%		
Black scurf (*Rhizoctonia solani*)	1.5%	12.5%		
Common scab (*Streptomyces scabies*)	1.5%	12.5%		
Powdery scab (*Spongospora subterranea*)	1.5%	12.5%		
Other defects and damage (Group IV)			3.0%	
Externally blemished or atypically shaped tubers[2]	1.0%	-		
Superficial necrosis by PVY	0.1%	-		
External necrosis by other viruses	2.0%	-		
Total (Groups II, III and IV)				4.7%
Soil			0.5%	
Dirt or other extraneous matter	0.5%	-		

[1] Tolerances are by weight; [2] Includes tubers wrinkeled or dehydrated due to silver scurf (*Helminthosporium solani*).

Appendix 13: The inspection of Dutch seed potatoes

Table 4: The tolerances employed in field inspections, post-harvest inspections and lot inspections in the Netherlands in relation to the EU tolerances.

Aspect covered in the inspections	The Netherlands (NAK)				European Union (EU)	
	Class	Tolerance			Class	Tolerance
Field inspections						
Varietal purity	S,SE,E A C	0% 0.01% 0.05%			basic certified	0.25*% 0.5*%
Erwinia spp.	S,SE,E A C	0% 0.03% 0.1%			basic certified	2% 4%
Virus		severe mosaic/ leafroll	mild mosaic	total mosaic		total
	S SE E	0.025% 0.05% 0.1%	0.025% 0.05% 0.1%	0.025% 0.05% 0.1%	basic	4%*
	A C	0.25% 2%	2% 10%	2% 10%	certified	10%*
Post-harvest inspections						
Virus	S SE E	0 in 200 1 in 200 2 in 200			basic	4%*
	A C	5 in 100 10 in 100			certified	10%*
Lot inspections	Standards employed by the NAK within the EU	Standards employed by the Plant Protection Service outside the EU			EU-standards	
Wet rot	sporadic (1 tuber/ 250 kg)	0%			1% of total weight	
Late blight	<35mm: 1 tuber/50 kg >35mm: 1 tuber/100 kg	0.5% of total weight			1% of total weight	
Dry rot**	1-4 tubers/50 kg	0.5% of total weight			1% of total weight	
Common scab	scab scale 2.5 (at most 1/8 of total surface)	scab scales as required			max 5% of tubers showing lesions covering more than 1/3 of total surface	
Rhizoctonia canker Classes S/SE Classes E tot C	 10% light 25% light	 10% light 25% light			 not relevant not relevant	
External disorders	4-12 tubers/50 kg	1% of total weight			3% of total weight	
Soil, etc.	1% of total weight	1% of total weight			2% of total weight	

Notes:
** EU standard for immediate further cultivation*
N.B.: not all parts (especially the EU tolerances) may be simply added up. For example, the EU tolerance for dry and wet rot together is at most 1%
*** before 1 February: sporadic*

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Appendix 14: Stage 2 Industry Survey

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Stakeholder Information

***1. Which stakeholder group(s) do you belong to?**

- ☐ Seed potato grower
- ☐ Seed potato group
- ☐ Grower of mini tubers
- ☐ Australian Seed Potato Council
- ☐ Table potato grower (washed lines)
- ☐ Table potato grower (brushed lines)
- ☐ Table potato grower (both)
- ☐ Processing potato grower (french fries)
- ☐ Processing potato grower (crisps)
- ☐ Processing potato grower (other)
- ☐ Potato processor (french fries)
- ☐ Potato processor (crisps)
- ☐ Potato processor (other)
- ☐ Merchant
- ☐ Seed potato exporter
- ☐ Table potato exporter
- ☐ Processing potato exporter
- ☐ Owner of proprietary lines
- ☐ Certified Seed Scheme organisation
- ☐ Agronomist
- ☐ Government RD&E provider
- ☐ Regulator / AQUIS
- ☐ Seed inspector
- ☐ Seed storage operator
- ☐ DAFF
- ☐ Other (please specify)

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***2. How important is a uniform, transparent national seed certification approach for you?**

- ◯ very important
- ◯ somewhat important
- ◯ not important
- ◯ not required

Other (please specify)

3. What is your vision for the seed industry? What would a successful industry look like?

***4. What is your postcode?**

Seed Supply Chain

We would like to understand relationships between seed growers and buyers

5. Can you rank seed producing states by volume?

- South Australia
- Western Australia
- Queensland
- NSW
- Victoria
- Tasmania

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6. Can you rank states by seed potato volume bought for table potato production?

	Tasmania
	Victoria
	Western Australia
	South Australia
	NSW
	Queensland

7. Can you rank states by seed potato volume bought for processing potato production?

	NSW
	Victoria
	South Australia
	Western Australia
	Queensland
	Tasmania

8. If growers do not use certified seed, what do you think is the reason?

- ☐ Too expensive
- ☐ No enough choice of varieties
- ☐ It does not make a difference to yield
- ☐ It does not make a difference to quality
- ☐ No trust in the schemes
- ☐ Other (please specify)

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9. In an ideal world, what do you think would be advantages of certified seed for processing and table potato growers?

- ☐ reliable performance
- ☐ less fungal diseases
- ☐ less bacterial diseases
- ☐ less virus diseases
- ☐ better emergence and crop establishment
- ☐ better profit margins
- ☐ less spraying
- ☐ there are few advantages
- ☐ there are no advantages
- ☐ less seed piece breakdown
- ☐ higher marketable yield
- ☐ Other (please specify)

10. Please ranks certification schemes by performance.

▾	WA registered rules	☐ N/A
▾	Other	☐ N/A
▾	Don't care	☐ N/A
▾	WA certified rules	☐ N/A
▾	Not sure	☐ N/A
▾	Tasmania	☐ N/A
▾	NSW / Croockwell	☐ N/A
▾	VicSpa	☐ N/A

***11. If you are a seed grower or merchant, which states / territories do you supply?**

- ☐ VIC
- ☐ NSW
- ☐ ACT
- ☐ Qld
- ☐ WA
- ☐ TAS
- ☐ Not applicable

Other (please specify)

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***12. If you area a seed buyer, which states do you buy from?**

- ☐ Tasmania
- ☐ Western Australia
- ☐ South Tasmania
- ☐ Victoria
- ☐ NSW
- ☐ Queensland
- ☐ Not applicable
- ☐ Other (please specify)

***13. Would you like to export in the future?**

- ☐ Yes, seed
- ☐ Yes, ware potatoes
- ☐ Yes, processing potatoes
- ☐ No
- ☐ Not sure
- ☐ Other (please specify)

14. If you are already exporting, which are the main countries?

Seed Quality Information

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***15. Over the years, I have observed the following:**

	Yes, occasionally with non-certified seed	Yes, occasionally with certified seed	Yes, occasionally in a seed crop	Yes, often with non-certified seed	Yes, often with certified seed	Yes, often in a seed crop	no
uneven emergence	☐	☐	☐	☐	☐	☐	☐
seed piece breakdown	☐	☐	☐	☐	☐	☐	☐
transport related issues	☐	☐	☐	☐	☐	☐	☐
storage related issues	☐	☐	☐	☐	☐	☐	☐
abnormal tuber growth	☐	☐	☐	☐	☐	☐	☐
abnormal top growth	☐	☐	☐	☐	☐	☐	☐
deficiencies	☐	☐	☐	☐	☐	☐	☐
insect damage	☐	☐	☐	☐	☐	☐	☐
virus symptoms	☐	☐	☐	☐	☐	☐	☐
nematode symptoms	☐	☐	☐	☐	☐	☐	☐
black heart	☐	☐	☐	☐	☐	☐	☐
black scurf	☐	☐	☐	☐	☐	☐	☐
stem canker	☐	☐	☐	☐	☐	☐	☐
Sclerotinia	☐	☐	☐	☐	☐	☐	☐
late blight	☐	☐	☐	☐	☐	☐	☐
pink rot	☐	☐	☐	☐	☐	☐	☐
tuber wart	☐	☐	☐	☐	☐	☐	☐
powdery scab	☐	☐	☐	☐	☐	☐	☐
common scab	☐	☐	☐	☐	☐	☐	☐
ring rot	☐	☐	☐	☐	☐	☐	☐
blackleg	☐	☐	☐	☐	☐	☐	☐
soft rot	☐	☐	☐	☐	☐	☐	☐
bacterial wilt	☐	☐	☐	☐	☐	☐	☐

Other (please specify)

***16. Which of the above mentioned issues is the hardest to manage? Why?**

Seed Certification

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***17. What is your view about seed potato certification?**

	Yes	No	Not sure	No view
Seed certification, if done well, is a basic requirement for healthy, high yielding potato crops	◯	◯	◯	◯
Seed certification, if done well, is a basic requirement for a sustainable potato industry	◯	◯	◯	◯
The current certification standards are clear and consistent across all states	◯	◯	◯	◯
The current certification standards meet my requirements	◯	◯	◯	◯
Most times I am happy with the certified seed I am purchasing	◯	◯	◯	◯
Most times I am happy with the non-certified seed I am purchasing	◯	◯	◯	◯
Certified seed benefits outweigh costs	◯	◯	◯	◯
Certified seed is too expensive for what it delivers	◯	◯	◯	◯
State governments should be in charge of seed certification schemes	◯	◯	◯	◯
Certification requirements for processing and ware potatoes should be different	◯	◯	◯	◯
Certification schemes are using the latest diagnostic technologies	◯	◯	◯	◯
Certification schemes should be reviewed regularly to keep up with new technologies	◯	◯	◯	◯
Certification should only focus on diseases	◯	◯	◯	◯
Certification should include quality indicators (e.g. physiological age, nutrients)	◯	◯	◯	◯
Seed should be accompanied by 'life-cycle' information (growing and storage info)	◯	◯	◯	◯

Other (please specify)

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***18. The best seed certification system(s) for the potato industry would be:**

	yes	no	not sure	no view
A QA system	◯	◯	◯	◯
A system that is 3rd party audited	◯	◯	◯	◯
A uniform certification system based on a revision of the current 'national system'	◯	◯	◯	◯
The schemes we currently have without change	◯	◯	◯	◯
The schemes we currently have with some adjustments	◯	◯	◯	◯
A new national system	◯	◯	◯	◯
A state based system	◯	◯	◯	◯
A regional system (growing regions)	◯	◯	◯	◯
A system that is recognised by overseas customers	◯	◯	◯	◯

Other (please specify)

19. If you could adjust current certification systems, what would you change?

20. Do you agree or disagree that a national seed certification scheme should be:

	agree	partly agree	disagree	no view
Customer focussed	◯	◯	◯	◯
Transparent	◯	◯	◯	◯
Reliable	◯	◯	◯	◯
Not favouring a specific production region or state	◯	◯	◯	◯
Use standards or thresholds that have a scientific basis or are based on a documented risk analysis	◯	◯	◯	◯
Include virus indexing that is not only based on visual inspection	◯	◯	◯	◯
Be simple to administer	◯	◯	◯	◯
Provide value for money to all involved	◯	◯	◯	◯

Other (please specify)

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***21. In your view, should ownership and management of a seed certification scheme**

	yes	no	not sure	no view
be an industry owned and managed, effective non-for profit organisation	◯	◯	◯	◯
be set up and run as a business	◯	◯	◯	◯
have a board made up of producers, seed customers and perhaps a technical adviser	◯	◯	◯	◯
not change from what we have	◯	◯	◯	◯
be run by state or regional grower groups	◯	◯	◯	◯
be a national industry scheme	◯	◯	◯	◯

Other (please specify)

22. Do you know of an overseas example of a well functioning seed certification scheme? if yes, where is it operating and what is so good about it?

23. Do you have any further comments about seed potato certification in Australia?

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Survey Responses - Vision

NB.: all raw survey response data has been supplied to HIA

- Uniform and transparent with a culture of continuous improvement and framework's (feedback, understanding, best practice, people development) in place to drive understanding and value creation.
- A seed industry that is well connected with the commercial potato growers.
- Seed growers that understand physiological maturity, dormancy, and impacts of crop agronomy, harvest, storage and handling on seed quality including maturity.
- Sufficient diversity in the seed potato production system to manage risk if disease or other environmental issues affect some growing areas.
- Good understanding by commercial growers of seed potato production, storage and handling - they can effectively manage seed once it has left care of seed grower.
- Open communication between commercial and seed potato growers so that the seed is optimised for commercial requirements.
- An industry that has good, accountable and accredited seed going into the grower market. Got to have a clean system, all working to the same rules.
- A standardised industry suitable to represent all states and territories of Australia not states independently as is.
- This would ensure ANY seed from Australia has been grown, inspected and certified the same no matter where it has been grown.
- One where certified seed from any source in the country would be accepted across all States.
- To produce & supply disease free potato seed at all times. All potato seed producers to be under one familiar regime.
- Have standards aligned across all states. Have more ware growers using certified seed.
- With in the certification system allow for more differentiation of quality and different standards priced accordingly.
- The seed industry is, in my opinion, based on a high quality product that can provide a yield, quality and disease free advantage to the growers who purchase this seed and grow it on. In that fact we need to have an industry where all states are brought under the one umbrella so standards, practices and seed potatoes are all consistent in their quality and specifications. This will enable any client to buy seed from all over Australia safe in the knowledge that it is of the highest quality and meet the same standard as every other seed source in the nation.
- World's best practice with good returns for the investment that growers put into producing a crop across the industry.
- Quality seed should be at a set price and poorer quality discounted. It's not equal for growers and buyers if the same price is set across the board per each variety when quality varies hugely.
- All commercial growers use certified seed.
- One that can provide quality seed of the standard I expect.

- Good quality seed.
- It would be good if all potato crops had to be registered and certified seed had to be bought to grow these crops. Virus would reduce significantly, yield would improve and therefore every ones bottom line will improve.
- There needs to be a national approach as we entering into the export market the client is comparing our different regulations and is causing some problems, especially when early generation seed is moved between states.
- Our basic system is a world leader with short generations but the standards within these generations is not good enough.
- There needs to be a better inspection and licencing system in place.
- Relatively local production to supply the adjacent growers so avoiding long transport of tubers. This would depend on the health status of the local commercial potatoes. If the majority were planted with certified seed then it should be ok. Growers could have on-farm storage to ensure they produce the appropriately sprouted seed.
- Viable for both growers and customers. Regulated by a federal body to remove interstate rivalry, restrictions and blockages.
- Quality seed potatoes with minimum diseases introduced by the growers of the seed potatoes.
- I think you've got to have a national, independent peak body that inspects all seed consistently. At the moment there are many different schemes across the country.
- Disease free industry that provides good quality and that's always trying new things and new varieties.
- EVERY ONE WORKING TOGETHER FOR A BETTER FUTURE FOR ALL FARMERS.
- Work together, recognition of its value.
- One that is working together in conjunction with commercial growers. But utmost quality needs to be maintained or even improved.
- A successful industry would be that all seed growers would adhere to the rules and guidelines.
- High quality seed grown by a group of excellent seed growers.
- Biosecurity to maintain the growing environment.
- Developing high yielding disease resistant cultivars.
- Increasing local processing demand requirements and the increase of export markets.
- To have available quality certified seed as directed by the National Standards and QA assurance programmes. To enable new and younger growers to enter into a certification industry with confidence and encouragement.
- A scheme that provides the best quality seed at an affordable price.
- A scheme that embraces new technologies, if they would improve the scheme.
- I believe that the potato industry as a whole needs a unified certification. Mainly for the control of diseases and the threat of new ones. However I think the national standard needs to be relevant to the different bodies i.e., processing, table, crisping, and others I

don't believe a blanket approach to some rules is relevant to all the different bodies for instance as some issues for table varieties have no bearing on processing potatoes just one example. I believe that the seed industry can be multifaceted in its approach to all relevant body's whilst still keeping certification guidelines and costs to a minimum.

- Quality product, improved varieties, high demand, profitable industry.
- An industry with National Standards that can market itself internationally as one brand rather than State-by-State.
- An industry where seed quality measures are used right along the pathway from seed production, through storage, cutting and planting. Education would be required to allow consumers of seed potatoes to understand the quality measures and their impact on seed performance.
- A scheme that is very reliable and their standards are kept up and are consistent across the country.
- All states should have the same certification scheme.
- All the states would have the same certification parameters.
- Be able to get seed tested anywhere, not just where VicSpa say it needs to be tested. There'd be accountability through to VicSpa.
- Not a uniform system across the nation. Different states have different pests and diseases where they need to be vigilant. Tasmania shouldn't concentrate resources on PCN testing on a broad scale; it would be better to put effort into powdery scab, for example.
- The vision would be to have a good, clean seed growing regions across Australia with good legislation and good testing. Not everybody abides by the rules, but a straightforward system that suits most people should achieve greater compliance.
- My vision for the seed industry is to develop an industry that can support an international seed potato trade processing and fresh market scheme bringing more production to our state and assisting our farmers in maintaining a relatively clean seed line free from pathogens, virus and
- Clean seed, tested with enough vigour (frequency and technology appropriate), handled appropriately and transported with due care and official registration - to ensure no spread of pathogens, potential production capacity at highest level; regulatory support for seed production regions that ensure fully traceable movement of plant material; PBR that includes demand for DNA fingerprints in description; on-farm hygiene embedded in practices, planning and thinking; and a fair price paid for quality potatoes.
- To be able to purchase disease free strong healthy seed to the size range i require at reasonable price.
- To maintain a viable certified seed supply to all markets supported by nationally endorsed standards.
- Seed has to be true to type - what you buy is what you acquire, so you don't get contamination. If it's G3 or G4 it's true to that generation. As far as disease is concerned, it needs over-hauling. Need to use predictor PT (soil DNA testing) to know disease levels of the soil and everyone should be able to access that. Comes down to seed cost, if seed doesn't meet standard than that compromises cost.

- The biggest thing is having an industry voice rather than being dictated to. Needs to be an independent body that has a say, not just the big guys.
- I would like to see seed sold by a count system where you pay for the number of seed tubers rather than the number of kg/tonnes. Ideally seed sizes should be between (35mm-50mm) (50mm - 55mm) (55mm-60mm). I think a standard bag weight should be introduced e.g. 1200kg so transport operators know what the weight of the load will be etc. avoiding over loading. Some seed growers use bigger bags so they get more kg's per bag and then it is hard to load these bigger bags into Fridge vans due to bigger dimensions causing more costs to customers. I think there needs to be tighter control over certification / better checking etc., there is a lot more Scab in seed today than in previous years. Seed with Scab is being sent to Qld over the % allowed and then when rejected offered at a discount rate.
- Profitable.
- Profitable and thriving industry providing disease and virus free seed to Potato growers.
- The industry needs to be a diversity of growers striving for seed quality, and commanding a premium for 'the best'.
- National freedom of PCN and BW - mandatory national PCN testing of Seed / Propagation potatoes.
- Something that would get rid of all virus and potentially the vision would be to have exports from Tasmania of processing and/or ware potatoes, similar to what WA is doing.
- An industry that supplies virus free seed that has vigour because it has been grown, handled and stored in optimum conditions to realise its full potential.
- Sustainable seed growers supplying a high quality seed product.
- Maintain status quo.
- No change from the current VicSpa scheme.
- From my point of view the certified seed industry in Tasmania satisfies the needs of industry.
- Certified seed industry should be equal to that of W.A.
- Very much the same as it is now.
- The current seed industry is successful providing virus free stock.
- I haven't got any issues with the way it is now. Certification bodies have a process to follow and they aren't policed. To police the industry isn't viable and has the potential to make everything go underground. If anything a process to weed out the few growers who can give the industry a bad name. Maybe some justified complaints and the grower needs to re-apply to be a member of the certification body.
- The seed industry needs to continue to produce seed to the specification of the scheme. If purchasers of certified seed are confident that all seed purchased is within the specs outlined then they will continue to purchase that seed.
- The basic framework of VICSPA is sound and has proven over the years to serve the needs of the industry. However over the last few years has lost direction perhaps a personal problem rather than the structure of the scheme.

- Where everyone makes money. Pretty happy with how it's going. Everyone on the same page wouldn't hurt. Not really sure of other schemes, but think VicSpa is doing good things.
- Seed growers working in unison with their customers to provide adequate quantities of certified seed of the right physiological age for the customers' requirements. There should be a feedback system from commercial growers to seed growers.