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CEBRA Report Cover Page

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Title, ID, & Output #	Testing Incentive-based drivers for importer compliance, CEBRA Project 1608C, Deliverable 3 – Final Report			
Project Type				
DAWR Project Sponsor	Lois Ransom	DAWR Project Leader/s	Jacqui Vandebroek (at inception Felicity Woodhams, subsequently Bo Wang)	
CEBRA Project Leader	Susie Hester	NZ MPI Collaborator	N/A (at inception Stephen Butcher)	
Project Objectives	To evaluate the implementation of compliance-based biosecurity protocols, drawing on insights from CEBRA Projects 1304C and 1404C. A rigorous and scientific approach to evaluation was used to inform the department about developing tailored approaches for a wider roll-out of these types of mechanisms. Such an approach would also provide the department with a framework for future program evaluation work.			
Outputs	This report provides an analysis of the field trials that took place on the peat and selected vegetable seeds for sowing import pathways. It describes: 1. field trial design and implementation, including implementation issues that arose during the trial and affected outcomes; 2. the qualitative analysis of two rounds of interviews with customs brokers and importers on both pathways, assessing implementation, behaviour change potential and compliance costs associated with inspection activities; 3. insights from interviews with DAWR biosecurity operations staff, which focused largely on information and communication issues; and 4. the quantitative analysis of departmental administrative data, focused around evidence of behaviour change by stakeholders.			
CEBRA Workplan Budget	Year 2015-16	Year 2016-17	Year 2017-18	
	50,000	40,000	50,000	
Project Changes	Nil			
Research Outcomes	The field trial yielded insights around potential improvements to communication and information technology systems, some of which the department has begun to address. While there was little evidence of behaviour change and compliance-cost savings were relatively small, the approaches used in this project provide a framework for future evaluation on the effect of new biosecurity protocols on stakeholder behaviour and costs.			
Recommendations	That the department: 1. develops pathway-specific understanding of factors that influence stakeholder behaviour; 2. provides clearer guidance around what Australia’s ALOP means for designing assurance frameworks; 3. reconfigures information management and operational systems to improve data capture and flexibility in rule design; 4. improves internal information flows and clarifies decision-making authority for frontline staff; 5. more actively solicits stakeholder perspectives to improve external communication processes, including using structured feedback reports; and 6. develops systems to record and incorporate stakeholder feedback more systematically.			
Related Documents	CEBRA 1304C Final Report (Rossiter et al. 2016); CEBRA 1404C Final Report (Rossiter et al. 2018a)			
Report Complete	Yes			

CEBRA Project 1608C: Testing incentive-based drivers for importer compliance

Final Report

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Agriculture Import Management System (AIMS): The primary software used by the Department of Agriculture and Water Resources (the department) to manage biosecurity and food safety risks associated with imported cargo, track and recorded imported consignments and assign fees and collect revenue on imported cargo. Entries of potential biosecurity concern are referred to AIMS from the Integrated Cargo System (ICS).

Approach rate: An estimate of the likelihood of entry of pests and diseases determined through inspection results.

Appropriate Level of Protection (ALOP): Under the *Sanitary and Phytosanitary Measures Agreement*, World Trade Organization members are entitled to maintain a level of protection they consider appropriate to protect life or health within their territory. Australia's ALOP, as defined in the *Biosecurity Act 2015*, is expressed as providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero.

Approved arrangements (AA): Voluntary arrangements, defined in Chapter 7 of the *Biosecurity Act 2015*, that allow persons to carry out activities to manage the biosecurity risks associated with specified goods, premises or other things. An AA can cover all biosecurity activities involving the physical handling of goods, such as storage, inspections and post-entry quarantine requirements, at one or more approved sites. It may also cover biosecurity activities that do not involve the physical handling of goods, such as documentary assessment for goods subject to biosecurity control by accredited persons or performing health-related measures to control or kill insect vectors of human diseases on aircraft. Physical and non-physical biosecurity activities can be grouped together under the same AA.

AQIS Commodity Code (ACC): A four-character alphanumeric code that can be entered into the Integrated Cargo System by brokers to identify a commodity to a more specific level than a tariff code.

Automatic Entry Processing (AEP): An Approved Arrangement under which accredited customs brokers or self-reporting importers perform documentation assessments for non-commodity documentation and, for selected commodities, commodity documentation on behalf of the department. Brokers using AEP enter an additional 'AEP code' when lodging a full import declaration into the Integrated Cargo System, which, when the entry is referred to AIMS, triggers the automatic application of the subsequent direction by the Q-ruler. Under these arrangements, brokers undertake training and assessment, to gain 'accreditation' to assess documentation and process and lodge entries (Import Declarations) using AEP under the *Non-commodity for Containerised Cargo Clearance Scheme* and the *AEP for Commodities Scheme (AEPCOMM)*.

Bill of lading: Commercial import documents that provide detail of cargo or goods that include invoices and packing lists.

Biosecurity Import Conditions (BICON): An online database that houses the Australian Government's biosecurity import conditions database for more than 20 000 plants, animals, minerals and biological products. It is used by importers, customs brokers and overseas suppliers to determine biosecurity conditions associated with importing goods into Australia. For example, this could include whether the

good requires an import permit to be granted by the department. Users of this database can also subscribe to case notifications ('BICON alerts') when specific information in BICON changes. BICON also has an internal view for operational staff that contains information about how to process goods in accordance with the import conditions.

Biosecurity risk material: Material that has the potential to introduce a pest or disease into Australia. This could include, but is not limited to: live insects; weed seeds; soil; animal material; plant material such as straw, twigs, leaves, roots and bark; food refuse; and other debris.

Cargo Online Lodgement System (COLS): An electronic system that enables clients to lodge documentation associated with full import declarations and Self-Assessed Clearance upgrades into the departments import management system for imports of biosecurity and imported food concern.

Clearance number: A key parameter of the CSP-1 and CSP-3 algorithms. It represents the number of consecutive clean lines that must be reached before a target's goods can be switched to a compliance-based rate of inspection in monitoring mode.

Compliance-Based Inspection Scheme (CBIS): An intervention scheme offered by the Department of Agriculture and Water Resources for selected plant-products which automates the application of directions under the CSP-1 or CSP-3 rules applied to biosecurity inspections.

Consignment: An import of goods lodged in a single Import Declaration. In general, a consignment consists of all the goods for a single consignee that arrives on the same voyage of a vessel; a single consignment can consist of many container loads of goods each associated with a number of lines.

Continuous sampling plan (CSP): A technical rule for determining whether or not to inspect a consignment, based on the recent inspection history of the pathway (Dodge and Torrey, 1951). The pathway manager sets the target dimension on which the rule is applied (usually by importer) and specific rule parameters, such as the clearance number and monitoring fraction.

Dashboard: A pre-configured data enquiry on the Hyperion database (see below). The CBIS (Hyperion) dashboard referred to in this trial is configured using the CSP-1 rule, drawing on defined parameters and AIMS data to instruct departmental assessment staff whether or not an inspection is required on an eligible line.

Documentation failure: A documentation failure occurs when there is a non-compliance detected by an assessment officer because of inadequate or missing documentation that should accompany the physical commodities according to the relevant import conditions. This could include things such as missing declarations or a situation where there is a discrepancy between key components that identify the commodity, such as seed lot numbers, between different documents supplied as part of the assessment process.

Economics experiment: An economics experiment can refer to several related research methods used to collect data for scientific purposes to understand the factors that influence people's decisions in economically relevant situations, either as individuals or in a group setting. A key commonality of these approaches is that the researcher maintains some control over the environment of interest and/or the

allocation of participants to treatments (see below). A *conventional laboratory experiment* is conducted in a computer laboratory with university students, while a *field experiment* is characterised by augmenting the laboratory experiment with elements from the natural context for studying interactions with rules and institutions.

(Experimental) treatment: A treatment in an economics experiment represents a specific combination of the collection of characteristics analysed in the experiment. In the biosecurity context, examples of treatments might include: the type of inspection rule; key parameters of the rule; the level of information provided to participants about the rule; the nature of feedback given to participants; the costs incurred in being inspected or treated; or whether the participant has a choice over the rule they follow. The results from different treatments can be compared only where one of these characteristics is varied at a time, with all others held constant.

Hyperion: A reporting system maintained by the Department of Agriculture and Water Resources which draws data from AIMS and other departmental systems.

Incident database: An internal department system that is used to record additional information on AIMS entries where an inspection failure has occurred. This can include the results of further testing by the department's plant pathologists and entomologists seeking to identify plant diseases and insects.

Industry Advice Notice (IAN): An email notification issued by the department, to industry members who have chosen to subscribe to receive them. IANs are also available on the department's website (<http://www.agriculture.gov.au/import/industry-advice>).

Inspection: An examination of goods or systems for the biosecurity of animal, plant, food and human health to verify that they conform to requirements (Beale et al. 2008).

Inspection failure: In general, an inspection failure occurs when there is a non-compliance detected at inspection. The possible types of non-compliance include the incorrect declaration of goods, packaging failures and evidence suggesting the possible presence of biosecurity risk material in consignments.

Inspection game: A mathematical model of a situation where an *inspector* verifies that another party (the *inspectee*) adheres to certain legal requirements (Avenhaus et al., 2002).

Integrated Cargo System (ICS): An electronic reporting and lodgement system for the legitimate movement of goods across Australia's borders maintained by the Australian Government Department of Home Affairs. The system features sophisticated risk-management technology to help officers target high-risk cargo and introduces new compliance assurance models with an emphasis on ensuring accurate risk assessment and the swift movement of low-risk freight (http://www.homeaffairs.gov.au/Cargosupport/Documents/cs_terms_acronyms_ics.pdf).

International Seed Testing Association (ISTA): An association of seed testing laboratories, personal members and technical committee members who pursue the objectives laid out in the ISTA Constitution, primarily to develop, adopt and publish standard procedures for sampling and testing seeds, and to promote uniform application of these procedures for evaluation of seeds moving in international trade.

ISTA Orange International Seed Lot Certificate: issued by an ISTA-accredited laboratory and shows a seed lot, sampling and testing are carried out according to ISTA rules.

Intervention: Legally enforceable obligations (through legislation or regulations) imposed by government on business and/or the community, together with government import processes that support the obligations. In the biosecurity context, this includes requirements related to:

- prescribing specific actions or requirements that must be completed before goods can be brought into the Australian territory;
- giving notice of goods to be unloaded in Australian territory;
- providing information, including documents, about the goods if requested by biosecurity officers;
- allowing for the goods to be physically inspected;
- allowing for samples of the goods to be taken; and
- prescribing treatments to reduce the biosecurity risk associated with goods or conveyances.

Markov chain: In probability theory, a Markov chain is a model describing a sequence of possible events in which the probability of each event depends only on the state attained in the previous event. This means that, conditional on the present state of the system, its future and past states are independent.

Monitoring fraction: A parameter in the CSP-1 and CSP-3 rules used to determine the frequency of inspection once an importer has demonstrated sufficient compliance with biosecurity requirements in the monitoring mode of the CSP algorithm. This parameter governs the compliance-based rate of inspection (*MF*) to be applied that enables inspection of less than 100% of consignments imported.

Naktuinbouw Authorized Laboratory (NAL) Quality certificate: issued by an approved laboratory in the Netherlands under the NAL, an organisation founded in 1994 to facilitate international seed trade for the horticultural seed industry. Specifically, it is a system for authorisation of laboratories from seed companies that are conducting tests on seeds and parts of plants.

Pathway failure: Any kind of non-compliance associated with a consignment on a pathway, including failures that do not necessarily represent a direct biosecurity risk. Inadequate documentation for a consignment is considered a pathway failure, as is contamination by a pest or disease.

Quarantine failure: A non-compliance associated with a consignment that poses a direct biosecurity risk. For example, contamination by an actionable pest or disease is a quarantine failure.

Quarantine ruler (Q-ruler): Rule-based software functionality within AIMS that automatically assigns directions, such as inspection or documentation assessment directions, according to set criteria. The Q-ruler is used to apply both AEP and CBIS directions.

Seed Analysis Certificate: A certificate issued by an ISTA-accredited seed testing laboratory.

Tailgate inspection: A type of inspection performed to visually identify and address a range of biosecurity risks associated with containerised cargo. Typically, this may

involve inspecting external container surfaces, internal container surfaces and/or goods through opened container doors. For example, if BICON conditions require a tailgate inspection of a commodity then the external surface of the container might not be examined; if it is a 'rural tailgate' then the commodity will not be inspected. If the visual assessment identifies the presence of infestation/s or contamination, or if the tailgate inspection does not resolve commodity, packing or documentation issues, the container may require further intervention.

Tight census: A parameter in the CSP-3 algorithm which governs the number of consignments inspected at a rate of 100% following an inspection failure when the importer is in monitoring mode. For the CBIS system, this is set to four across all eligible pathways, consistent with the initial recommendation of Dodge and Torrey (1951).

Treatment: Refers to actions, such as fumigation, cleaning or irradiation, required either by import conditions or as a remedial measure to mitigate biosecurity risks identified at inspection. Treatments reduce biosecurity risks and enable goods or conveyances to meet Australia's appropriate level of protection (ALOP).

Treatment cost: The costs incurred by an importer resulting from treatments required by the biosecurity regulator to address the presence of biosecurity risk material in a consignment and allow the consignment to enter Australia.

Unpack inspect: An inspection of goods for biosecurity concerns where the consignment is unpacked prior to undertaking the inspection.

1 Executive Summary

This report represents the final instalment in a sequence of three projects focused on supporting reforms to the design and implementation of the Australian Government Department of Agriculture and Water Resources' (the department's) regulatory framework for biosecurity assurance. Specifically, this project sought to evaluate field trials on two plant-product pathways, namely selected vegetable seeds for sowing and pure peat, conducted between August 2016 and December 2017. The inspection protocols and implementation and communication strategies adopted in the trial drew on the analysis and key findings of the two preceding phases, namely *CEBRA Project 1304C: Incentives for Importer Choices* (Rossiter et al., 2016) and *CEBRA Project 1404C: Testing Compliance-Based Inspection Protocols* (Rossiter et al., 2018a).

1.1 Trial design and implementation

The trials were a “proof of concept” to demonstrate the potential to adopt compliance-based interventions more widely across the department and the importance of considering stakeholder incentives for compliance as part of intervention design. They were not conceived as randomised control trials, since Australian biosecurity legislation only allowed the application of interventions for which some stakeholders would be eligible, and others not eligible, based on scientific considerations related to biosecurity risk. Instead, all stakeholders importing goods deemed eligible could access the modified inspection protocols for the duration of the trial period. As discussed in Chapter 2, this design of the trial enabled the project team to compare observed behaviours during the trial period with those for a period immediately before the trial commenced.

The two major aspects introduced as part of these trials were:

- adopting a modified version of rules underpinning the department's Compliance-Based Inspection Scheme (CBIS), which was applied to both trial pathways; and
- providing importers of selected vegetable seeds with periodic tailored feedback reports, detailing their recent biosecurity compliance history.

These two measures were supported by a range of smaller changes, such as in the way information about the inspection rules was presented in department communication to stakeholders. The project also investigated other novel aspects for biosecurity policy and operations in Australia, including:

- the use of commodity codes to allow inspection protocols to be tailored at a level below the tariff code;
- the application of new analytical methods to describe trade-offs associated with different rule parameter choices in a more straight-forward manner;
- the focus on the importance of potential behaviour change of stakeholders in response to new protocols; and
- the use of a mixed-methods evaluation approach to assess policy changes.

Chapters 3 and 4 of this report provide more detail about the design of the two trials and their implementation, respectively.

1.2 Field trial outcomes

As part of evaluating the trial, two aspects of most interest for the trial were assessing:

- the behavioural responses, if any, by importers and others in the supply chain to the trialled protocols, documented in Chapter 6; and
- the compliance-cost savings received by importers through the trial, discussed in Chapter 7.

Awareness of potential behavioural responses, either positive or negative from the standpoint of Australia's biosecurity requirements, can help understand the circumstances in which compliance-based interventions support biosecurity objectives or where their design needs to explicitly address possible perverse incentives. Interest in understanding compliance costs reflected the need to better understand importers' incentives for compliance and how similar protocols may contribute to the department meeting the Australian Government's stated policy position of reducing the regulatory burden faced by businesses.

On a range of measures, little evidence was found that suggested stakeholders changed their behaviour during the trial relative to the pre-trial period. This was not surprising for the two trial pathways, given discussions with stakeholders in CEBRA Project 1304C pointed to there being a range of control measures and mitigation approaches throughout the supply chain to manage biosecurity risks. It may have already reflected the relatively short duration and temporary nature of the trial, as importers or others in the supply chain may not have had the opportunity to make changes to production processes or supplier networks.

Evidence collected from stakeholders also suggested that importers saving inspection resulted in sizeable per-consignment compliance-cost savings. Most of these cost savings stemmed from indirect channels related to savings in transshipment, time in storage and administrative overheads relating to the inspection process rather than the fees charged by the department.

As outlined in Chapter 5, there was support from stakeholders for the trial of new inspection arrangements. Vegetable seed importers also expressed support and noted the usefulness at the initial feedback reports sent to them, though they perceived the follow-up periodic reports were of more limited use.

Despite these positive sentiments, the assessment of trial outcomes was hampered by operational challenges that resulted in far fewer consignments saving inspection than anticipated across both pathways. This related largely to implementation issues associated with access to technology by departmental officers and communication challenges between policy and operational parts of the department, and between department staff and external stakeholders. These issues are discussed in more detail in Chapter 4.

1.3 Key insights and potential department actions

The field trials represent the last in a sequence of three projects that sought to understand importer incentives for compliance with biosecurity requirements and then incorporate these incentives into the design of biosecurity assurance policies. Across the project phases relating to the design, testing and small-scale trialling of compliance-based inspection protocols, the project team has identified six key action areas that would support the department's biosecurity assurance activities, including

the development and roll-out of compliance-based interventions. These are that the department:

- develop pathway-specific understanding of factors that influence stakeholder behaviour;
- provide clearer guidance around what Australia's Appropriate Level of Protection (ALOP) means for designing assurance frameworks;
- reconfigure information management and operational systems to improve data capture and flexibility in rule design;
- improve internal information flows and clarify decision-making authority for frontline staff;
- more actively solicit stakeholder perspectives to improve external communication processes, including using structured feedback reports; and
- develop systems to record and incorporate stakeholder feedback more systematically.

A more extensive discussion of these action areas is included in the concluding chapter, Chapter 8.

2 Introduction

This report details the results of a proof-of-concept field trial of modified inspection protocols explored and designed in CEBRA Project 1304C and tested in CEBRA Project 1404C. These projects identified, and in some cases tested in a safe laboratory environment, the potential to roll out alternative mechanisms for biosecurity assurance. The main goal of these three projects was to better understand issues around inspection-protocol design using the in-built incentive structures inherent in government regulations. This work aims to understand stakeholders' incentives for compliance inherent in biosecurity-related interventions and identify behaviour-based devices that could improve how the Australian Government implements biosecurity regulation.

The proof-of-concept field trials, which form the basis of this report, built on the aspects deemed to have some merit in promoting compliant behaviour in the laboratory-based experiments. While the results from the laboratory experiments indicate possible responses of import-supply chain participants to changes in inspection protocols, a more complete understanding can be gained by assessing the performance of these protocols in the natural regulatory environment. In piloting new protocols in the field, stakeholder responses to changes to an inspection regime can be observed. Critically, the behavioural outcomes in the field setting could differ from those identified in the more controlled laboratory environment. Furthermore, discussions with stakeholders during the field trial present an opportunity to identify potential improvements to the way inspection protocols are communicated, designed and implemented.

The field trials on two plant-product pathways – *peat* and *selected vegetable seeds for sowing* – commenced on 29 August 2016 and finished on 15 December 2017. The types of protocols considered in the field trial were designed to:

- encourage voluntary action by import-supply chain participants to implement processes that reduce the likelihood of biosecurity risk material being present in consignments, consistent with a shared, collaborative approach to managing biosecurity risks between government and industry;
- better target the range and extent of interventions undertaken for compliant pathways and/or stakeholders, consistent with a risk-return approach for managing biosecurity risks;
- reduce the burden of regulation, in terms of cost and time, for system stakeholders with a strong track record of compliance; and
- in the longer term, improve the allocation of resources devoted to biosecurity activities within the department, increasing the focus on high-risk pathways or system stakeholders with poor compliance.

Field trials of this type may present risks to the department, since the behaviours fostered through the protocols being trialled could undermine the Australian Government's biosecurity objective. This sequence of projects has sought to mitigate these risks by:

- using laboratory experiments to identify potential suitable measures and avoid those more likely to pose greater risks to the biosecurity objective;

- consulting candidate pathway stakeholders (in CEBRA Project 1304C) to better understand the factors and processes influencing biosecurity risk management throughout the import-supply chain; and
- selecting pathways for the field-trial phase that already possess control mechanisms or other features likely to limit downside risk to trial outcomes.

From a risk management perspective, consideration was also given to demonstrating these protocols on pathways with low approach rates for biosecurity risk material under mandatory inspections first. This allowed the department to have more confidence in maintaining Australia's ALOP. This approach to staggering the roll-out of compliance-based inspections was likely to limit the ability to observe behavioural responses during the trial, but may nonetheless help reduce compliance costs borne by compliant stakeholders.

2.1 Objectives

This CEBRA project aimed to provide a framework for assessing, evaluating and improving processes associated with expanding the compliance-based inspection rules and protocols. A rigorous and scientific approach to evaluation was used to inform the department on how to develop tailored approaches for a wider roll-out of these types of mechanisms and inform future protocol evaluations and process improvement work within the department.

Once this type of framework becomes established and embedded within the department, the more ambitious goal of rolling out compliance-based inspection protocols on pathways with higher approach rates and/or higher anticipated costs of leakage could then proceed.¹ In this context, the behavioural responses could be more pronounced and cost savings to stakeholders could be much higher from improving the targeting of intervention. More broadly, this could allow the department to improve its internal allocation of resources devoted to biosecurity assurance activities.

2.2 Methodology

This project employed a mixed-methods approach; that is, it uses two complementary data collection and analysis strategies to evaluate the implementation of compliance-based biosecurity protocols through the field trial. The first involves a largely qualitative analysis of interviews with relevant biosecurity stakeholders and department staff, while the second adopts a primarily quantitative analysis of departmental import data. The benefits of a mixed-methods approach for this project included:

- mitigating the shortcomings of inferring causal behaviour using available import data alone; and
- enabling insights into the perceived experiences of stakeholders and operational staff, helping to further identify and explain observed patterns of behaviour (Lee and Cronin 2016; Jefferson et al. 2014).

As outlined in CEBRA Project 1304C, the evaluation strategy for the field trials focused on assessing 'footsteps of beneficial change' (Rossiter et al., 2016). It is a

¹ The CBIS program expansion has commenced on pathways with higher approach rates, such as citrus, avocado and stone fruit pathways, as a way of improving compliance. Regular and end-of-season performance reports are also being provided on those pathways.

second-best, yet pragmatic, approach that involves looking for and systematically observing changes in behaviour that imply the biosecurity assurance system is moving towards better outcomes from the department's perspective. In particular, it takes into account of the long lag times and measurement challenges associated with identifying practices in the import-supply chain that reduced the likelihood of biosecurity risk material arriving at the border.

2.2.1 Interviews with biosecurity system stakeholders

Stakeholder interviews enabled the project team to better understand what drives importer behaviour, when innovative mechanisms or incentive-based, risk-mitigation measures are introduced onto plant-product pathways. These interviews are one way in which to achieve insight into otherwise hidden behavioural changes, particularly by understanding the incentives faced by stakeholders in adopting new risk-management strategies that have both direct and indirect implications for the biosecurity system.

Two rounds of interviews were conducted with relevant stakeholders on each pathway over the course of the field trial. One round of interviews was also conducted with biosecurity 'operational' staff from the Assessment Service Group (ASG) and Inspection Service Group (ISG) within the department.²

All interviews were semi-structured discussions and were used to elicit an understanding of:

- stakeholder perceptions of, and experience with, Australia's biosecurity import management system and protocols, including discovering evidence of past changes in behaviour to improve biosecurity performance;
- established channels of communication between importers, customs brokers and suppliers;
- baseline importer behaviour;
- the direct and indirect costs associated with biosecurity compliance;
- the impact of the trial on stakeholders; and
- the implementation of the trial by operational staff.

The first round of stakeholder interviews was specifically designed to understand the 'baseline' in stakeholder behaviour and were held at the start of the field trial. The subsequent round of interviews was designed to understand whether there had been any change in behaviour in response to the protocols implemented under the field trial. The first round of interviews took place between October and December 2016, and the second round of interviews between May and June 2017, as summarised in Table 1.

There was a decrease in the number of external stakeholders interviewed in Phase II, particularly on the peat pathway. Participation in the interviews was voluntary, and when contacted to schedule Phase II interviews, many of the stakeholders who declined to be interviewed did so because they had not imported either peat or vegetable seed in the interim period or were not participating in the trial.

² Following a department restructure in 2018, these two groups became part of Biosecurity Operations Divisions.

Table 1. Interviewees by stakeholder type and pathway

	Phase I		Phase II	
	Importers	Customs brokers	Importers	Customs brokers
Selected vegetable seeds for sowing	15	8	15	7
Peat	7	6	5	3
Total	22	14	20	10

Note: stakeholders only include those who brought in at least 10 consignments over the trial period.

Interviews with operational staff members were undertaken between September and October 2017. Thirteen staff members – six inspection officers and seven documents assessment officers – spread across the department’s regional offices participated in this component of the evaluation. On average, interviewed staff had nine years’ experience in the department; several officers had more than ten years’ experience, with the most recent interviewee having only three months experience after completing their training. Among interviewees, there was a medium to high level of confidence for managing peat and vegetable seed consignments.

Interviews were undertaken either face-to-face or via telephone. Most interviews were digitally recorded. These were then transcribed by a third-party transcription service using ‘intelligent verbatim’, and in a format suitable for analysis using the qualitative data analysis package NVivo 11 Pro (QSR International, 2015).³ The three interviews not digitally recorded were transcribed by the interviewer into an NVivo-suitable format.

Design of questions/topics

The project team developed three semi-structured interview templates for:

- customs brokers (consisting of ten questions, Appendix C);
- importers (consisting of 15 questions, Appendix D); and
- operational staff (consisting of seven questions, Appendix E).

The stakeholder interview questionnaire was designed based on experience from question development in CEBRA Project 1304C.⁴ In particular, the project team aimed to construct questions that fulfilled a number of criteria essential to maintaining the rigour of the data collected. This included structuring interview questions to ensure they were open-ended, and not vague, biased, suggestive (leading), or unnecessary. Interviews ranged in length from 15 minutes to over 60 minutes – an expected feature of semi-structured interviews.

Interviewing operational staff members was not envisaged as part of the original project scope. The need to involve department staff in the interviews was identified during the analysis of the Phase I interviews with importers and customs brokers. As will be discussed in Chapters 4 and 5, these interviews revealed a number of implementation issues which stakeholders repeatedly identified as originating from

³ See Appendix F for a more fulsome description of the approach used to analyse the qualitative information obtained from interviews.

⁴ See Section 4.2 of Rossiter et al. (2016) for details of the previous experience interviewing biosecurity system stakeholders.

departmental systems and processes. To enable an informed and balanced assessment of these issues, the project team developed an interview template for operational staff members that aimed to:

- assess their level of awareness of the field trial;
- understand the implementation of the field trial from their perspective; and
- invite feedback on potential strategies as to how the implementation of the trial could be improved.

The staff interview questionnaire was designed based on the same principles as the stakeholder interviews.

Selection of interviewees

Potential importer and customs broker interviewees were drawn from a list of eligible organisations on the peat and vegetable seeds for sowing pathways using import data from the department's Agriculture Import Management System (AIMS) database accessed as part of CEBRA Project 1304C. To be considered eligible for interview, an entity had to be recognised as being 'experienced' on a pathway by being associated with at least 50 inspections on that pathway between July 2008 and June 2013.⁵

Potential stakeholder interviewees were contacted by email, after first telephoning their organisations to obtain details for the relevant contact person. The email contained information about the field trial, an invitation letter, Consent Form and a Plain Language Statement. Stakeholders indicated their willingness to participate in the interviews by contacting the team through an email reply, or during telephone contact with a member of the project team. In total, 65 stakeholders were contacted across both pathways – 43 on the vegetable seeds for sowing pathway and 22 on the peat pathway – to obtain the 36 interviews for Phase I.

For operational staff member interviews, potential interviewees were drawn from a list of operational staff in the two relevant teams – ASG and ISG – generated by team managers. A subset of staff from this list were sent an email inviting them to participate in the interview, of which 13 staff members responded and were subsequently interviewed.

Analysis of interview data

Transcribed interview data was analysed in NVivo. Interview data was coded according to a set of recurrent themes that emerged from the interviews. In qualitative research, coding refers to the process of identifying or 'tagging' blocks of text that convey a unique meaning (code) across interviews (Bazeley and Jackson, 2013). Coding recontextualises data, moving the frame of analysis from the interviews to the emerging patterns (or codes) that link the interviews. This allows the data to be grouped and considered according to codes rather than individual interviews, thus enabling further understanding of which codes (or themes) are significant with respect to the wider project. Appendix F documents the qualitative methodology adopted in this project in further detail, with the findings from the interviews discussed across Chapters 4 to 7 inclusive.

⁵ The minimum number of consignments was determined separately for the two pathways, based on the total number of inspections conducted on the pathway and advice from departmental officers familiar with each pathway.

‘Representativeness’ in qualitative data

Representativeness is a quantitative concept, primarily concerned with statistical validity and drawing on concepts from probability theory. The question of representativeness in a qualitative study is concerned more with the quality of the data collected, rather than the number of interview participants (Patton 1990; Morse 1994). No single interviewee can provide a complete and ‘true’ insight; one interview represents one subjective story, contingent upon the person’s relevant social, political and cultural context. Therefore, the more interviews conducted, the broader the insights or views that can be gathered.

The frame from which interviewees were selected was purposeful, based on predetermined criteria – specifically, the degree of experience and type of involvement on two plant-product pathways. These views were deemed to be the type of information-rich cases required to reveal ‘footsteps of beneficial change’. While the data gathered from these stakeholders are not likely to be completely representative of all stakeholders involved in importing peat and vegetable seed for sowing into Australia, it is possible to make ‘logical generalisations’ from the data because of the criteria applied in selecting interviewees (Patton, 1990). Essentially, the behaviours and experiences of this group is likely to illustrate behaviours of the broader group of stakeholders.

It remains, however, to determine how many cases are adequate. Typically, sufficient interview data are collected when researchers find ‘informational redundancy’ or ‘data saturation’ – a point in data collection when no new information or themes emerge (Saumure and Given, 2008). Based on the experience and insights gained from the interviews conducted as part of CEBRA Project 1304C, together with guidance from departmental officers, 36 interviews were considered sufficient to establish a baseline for the purposes discussed above.

2.3 Analysis of departmental import data

Data from the department’s AIMS and Incident databases were analysed to identify possible behavioural changes and estimate compliance-cost savings experienced by stakeholders. With informed consent from importer interviewees, non-department members of the project team were able to link interview information with importers’ import data, enabling a greater understanding of why specific changes may be appearing in the import data. Chapter 6 outlines the several dimensions of behaviour change able to be assessed through administrative data. More broadly, these measures can include changes in:

- the inspection failure rates on each pathway;
- the distribution of inspection failure rates between importers, suppliers and countries of origin;
- the reasons why consignments fail inspection and patterns associated with inspection failures;
- the relationships between importers, customs brokers and suppliers; and
- the frequency, size and composition of shipments coming to Australia.

2.4 Discussion of results

This project faced several implementation issues over the field trial which resulted in some of the original objectives of the project not being able to be fully realised. In particular, low participation rates in the trial precluded the discovery of causal behavioural changes by stakeholders in response to introduced incentives. Therefore, the discussion in this report focuses on the transferable lessons learned from this project, including:

- field trial design;
- field trial implementation within operational and IT-system constraints;
- insights from stakeholder interviews;
- a mixed-methods evaluation framework within which to evaluate current and future compliance-based inspection frameworks; and
- a conceptual framework that can be more widely applied to assess cost savings from new initiatives aimed at reducing the regulatory burden for compliant stakeholders.

3 Field Trial Design

The two pathways on which the field trials would be implemented, *peat* and *selected vegetable seeds for sowing*, were determined in CEBRA Project 1304C. However, the protocols that would ultimately be implemented were refined continually over time.

Initial recommendations from CEBRA Project 1304C were that a ‘menu of regulatory contracts’, with refined pathway definitions, be applied to both pathways. Under a menu of contracts, each importer could choose an inspection regime from a limited number of options (the ‘menu’) with different reward and consequence structures. The range of menu options available would be designed to maintain the department’s biosecurity objectives (Rossiter et al., 2016), while the option chosen by the importer would reflect (and thus reveal to the department) an importer’s private information about biosecurity practices within their import-supply chain.

Under this approach, pathway definitions could be refined to allow separation according to commodity characteristic, such as country of origin, or even commodity type⁶ to better reflect the differences in risks posed to maintaining Australia’s high plant, animal and human health status. The recommended menu offered to importers consisted of three items for each pathway. Although there were differences in the specific menu items suggested for each pathway, menus included the CSP-1 and CSP-3 rules and priority queuing⁷ where delay costs would be reduced for importers with a strong record of meeting Australia’s biosecurity requirements.

While the menu of contracts could be configured to offer importers clear incentives for compliance, the lack of flexibility inherent in departmental systems and resources to address these being unavailable at the time immediately preceding the proposed start of the trial⁸ meant that alternative mechanisms needed to be considered. Elements from the menu items were maintained in the development of mechanisms that could be trialled in CEBRA Project 1608C.

Further testing of potential mechanisms in the experimental economics laboratory setting (CEBRA Project 1404C) led to more refined recommendations of protocols that were likely to be implementable by department, namely:

1. adaptive inspection rules with refined pathway definition on both peat and selected vegetable seeds for sowing pathways;
2. structured feedback reports on importers’ inspection track record on the permitted vegetable seeds for sowing pathway; and
3. a limited rule choice, with eligibility based on additional biosecurity assurance from an industry-based accreditation scheme, for the peat pathway only.

⁶ For example, this would allow peat to be separated from coir and sphagnum moss. Similarly, vegetable seeds for sowing deemed to be lower risk and not require an Import Permit could be distinguished from other vegetable seeds that required an Import Permit.

⁷ Stakeholder interviews in CEBRA Project 1304C suggested that reducing delay costs would encourage importers to improve biosecurity compliance. Further discussions revealed that priority ordering for documentation assurance and physical inspections would involve large-scale system and process changes for the department and therefore was unlikely to be feasible within the next few years.

⁸ The period where most of the preparatory systems work for the trial was completed coincided with a peak period preparing for major system changes associated with the *Biosecurity Act 2015* coming into effect.

Mechanism 3 would have involved leveraging an internationally accepted RHP peat accreditation scheme.⁹ This scheme appeared to provide assurance that peat imported from accredited suppliers would be manufactured using processes and in conditions that would mean they were highly likely to be free from weeds, harmful organisms and diseases. Further investigation of the RHP scheme by Plant Import Operations Branch staff members suggested that the scheme did not provide a level of biosecurity assurance equivalent to the existing departmental protocols for peat. There was also no evidence that RHP-certified peat had a lower likelihood of containing biosecurity risk material. Given the department's requirements to maintain Australia's ALOP and its international obligations to set scientifically justified measures, it was not deemed appropriate to offer more favourable conditions to RHP-certified peat.

Mechanism 3 was therefore not pursued as a strategy for the trial involving peat. Mechanism 1 was then applied to the design of the protocols for pure peat, with Mechanisms 1 and 2 used in combination to design the trialled protocols for the selected vegetable seeds pathways.

The field trial commenced on 29 August 2016 with testing of:

- adaptive inspection rules with refined pathway definition for both the peat and selected vegetable seeds for sowing pathways; and
- structured feedback reports for the permitted vegetable seeds for sowing pathway only.

Mechanism 1 – Adaptive inspection rules with refined pathway definition

Under this mechanism, the AQIS Commodity Code (ACC) was used to profile within a tariff code, in part automating refined pathway definitions. As part of the trial, importers of eligible consignments would need to request their customs broker to proactively and manually enter the designated ACC in conjunction with the relevant tariff code ('LSTD' with tariff code 1209.91.00 for eligible vegetable seeds for sowing and 'FERT' with tariff code 2703.00.00 for eligible consignments of pure peat) when consignments were being lodged in ICS. In turn, leaving the ACC field blank signified a line entry was ineligible for the trial.

For eligible AIMS entries where the relevant ACC was listed, the CSP-1 algorithm was used to determine whether an inspection was required for a given line entry. The use of the ACC approach enabled goods that represented a lower biosecurity risk than others under the same tariff code to be targeted for a different intervention regime. Line entries lodged with the ACC were subject to the CSP-1 algorithm, with an importer's compliance history determining whether a particular entry would be eligible for saving inspection. For those entries without the ACC, standard mandatory onshore inspection requirements were maintained.

Mechanism 2 – Structured feedback reports

Under this mechanism, tailored feedback was provided to importers about their own importing performance and compliance history. Prior to the trial, this information had not been provided to importers in a consolidated form. Instead, feedback had only been available on a per-consignment basis to brokers,¹⁰ based on information

⁹ See http://www.rhp.nl/en/professional/over_ons/wat_is_rhp/ for more details.

¹⁰ Importers may or may not have been aware that customs brokers had access to this information.

contained in directions supplied by the department to the broker's registered email address in the process of managing imports, or upon specific request.

To get this information into a meaningful form for influencing business decisions, such as which entities to choose as their suppliers, an importer (or their customs broker) would have had to consolidate and significantly transform their import data. CEBRA Project 1404C had suggested providing tailored feedback to importers would likely assist them in making 'better' choices from the department's point of view.

3.1 Eligibility requirements for participation

3.1.1 Importer selection into the trial

As part of the proof-of-concept trial on both pathways, all importers of products eligible for the trial were able to participate by having their customs broker lodge consignments with the relevant ACC. This meant any importer of eligible products could self-select into the trial, rather than there being a random allocation mechanism to separate importers into a "treatment" group from a "control" group, as would be the case in a randomised control trial. This design choice reflected that:

- based on administrative data covering the pre-trial period, it was not possible to determine with certainty which importers were bringing in eligible (or ineligible) products under the relevant tariff code;
- in line with Australian Government requirements about transparency in decision-making, information about the trial could not be provided to some importers and withheld from others; and
- allowing some importers access to the benefits of reduced regulatory compliance costs and not others, where the distinction is not based on a scientific risk assessment, could be perceived as the department providing a commercial advantage to some importers over others.

The absence of a control group and randomisation to treatment limits the type of analysis possible to comparing attributes of interest for each importer who self-selects into the trial pathway¹¹ before and during the trial.¹²

3.1.2 Pathway-specific requirements

For peat imports to have been eligible for the trial, they must:

- be intended for use as fertiliser, soil conditioner, potting mix; and
- contain no additives (i.e. 100% pure peat).

Imports of peat with any additives, coir peat, coconut fibre and live sphagnum moss were **not** eligible for the trial. In addition, all imported full container loads of peat

¹¹ In some circumstances, an alternative would be a quasi-experimental "twin studies" approach, where the results of the trialled pathway could be compared with another pathway that shares similar characteristics. This would rest on the choice of pathway for the trialled protocols being quasi-random. This comparison strategy was discussed as part of CEBRA Project 1304C but not pursued for this project, reflecting the department's view that determining pathways with comparable risk profiles and biosecurity control approaches was not readily possible.

¹² A consequence of this design is that the causal impacts of the trialled protocols are difficult to identify based on administrative data alone. This motivates the use of stakeholder interviews as a secondary information source to corroborate whether behavioural responses suggested in the administrative data can be attributed to the trialled protocols.

being sent to rural locations remained subject to tailgate inspections as per the sea container delivery postcode classifications.

For vegetable seeds for sowing to have been eligible to participate in the trial, they must:

- be listed on Table 2 and imported under the tariff code 1209.91.00;
- have undergone offshore seed purity testing at a department-approved laboratory; and
- be imported through cargo (i.e. not imported through the mail).

Table 2. Vegetable seed species eligible for the compliance-based inspection trial

Genus	Listed permitted vegetable seed species	Common name(s)
<i>Allium</i>	<i>Allium</i> spp. listed in BICON as <i>Allium</i> spp. seed for sowing	Chives Leek Onion
<i>Amaranthus</i>	<i>Amaranthus</i> spp. listed in BICON as Permitted seed for sowing	Amaranth
<i>Apium*</i>	<i>Apium</i> spp. listed in BICON as Permitted seed for sowing	Celery
<i>Asparagus</i>	<i>Asparagus</i> spp. listed in BICON as Permitted seed for sowing	Asparagus
<i>Beta</i>	<i>Beta</i> spp. listed in BICON as Permitted seed for sowing	Beetroot Chard
<i>Brassica</i>	Species listed in BICON as permitted <i>Brassica</i> spp. seed for sowing	Bok choy Brassica Broccoli Cabbage Cauliflower Turnip
<i>Cichorium</i>	<i>Cichorium</i> spp. listed in BICON as Permitted seed for sowing	Endive
<i>Lactuca</i>	<i>Lactuca</i> spp. listed in BICON as Permitted seed for sowing	Lettuce
<i>Ocimum</i>	<i>Ocimum</i> spp. listed in BICON as Permitted seed for sowing	Basil
<i>Raphanus</i>	<i>Raphanus</i> spp. listed in BICON as Permitted seed for sowing	Radish
<i>Spinacia</i>	<i>Spinacia</i> spp. listed in BICON as Permitted seed for sowing	Spinach

**Apium* was removed from the trial on 3 April 2017 due to the implementation of emergency measures for *Candidatus Liberibacter solanacearum*.

Eligible seed lots less than 10 kg did not previously require seed purity testing as a condition of import; however, to receive the benefit of some lines being cleared on compliant documents alone, eligible seeds needed to undergo an offshore purity test regardless of the weight of the consignment.¹³ This seed-testing requirement was introduced by the department on biosecurity policy grounds, because it was deemed

¹³ Eligible seed lots less than 10 kg not tested offshore required inspection on arrival and are not eligible for counting towards compliance-based inspection requirements for this trial.

that allowing seed lots to cross the border without inspection or appropriate offshore testing was not consistent with meeting Australia's ALOP.

Apart from introducing confusion as to eligibility requirements for importers and their customs brokers, as discussed in more detail in Chapter 4.3, it also reduced the incentives for importers of smaller seed lots to participate in the trial. In Chapter 5, we discuss the effect this had on participation and importer incentives in more detail.

3.2 Applying field trial mechanism 1 – adaptive inspection rules with refined pathway definition

The adaptive inspection rule chosen for the trial was the original continuous sampling plan algorithm, CSP-1, developed by Dodge (1943). This algorithm, shown in Figure 1, has a much simpler structure and is easier to explain to the department's clients than the CSP-3 algorithm, which is the rule most commonly used for the CBIS.¹⁴ From an economic theory perspective, Rossiter and Hester (2017) showed that the CSP-1 algorithm is also in the department's interests, since it provides slightly stronger incentives for compliance.¹⁵

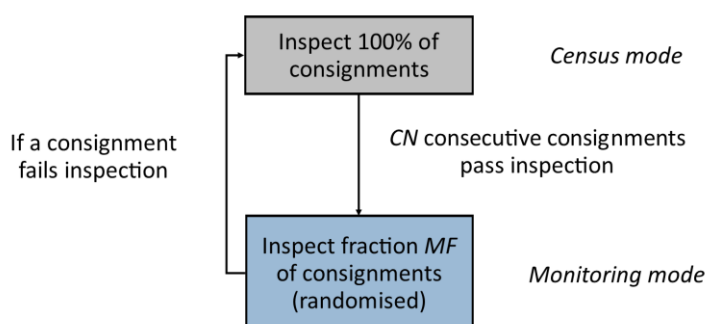


Figure 1. Schematic representation of the CSP-1 algorithm.

When a new importer starts on the CSP-1 algorithm, they are subject to mandatory inspections (in 'census mode') until they build up a good compliance record by passing CN inspections in a row. Once that threshold is satisfied, as a reward for demonstrating consistent adherence to biosecurity requirements, that importer's future consignments are inspected at random with a probability MF in 'monitoring mode'. This means a compliant importer who reaches 'monitoring mode' in the algorithm would be rewarded with a fraction $(1-MF)$ of consignments expected to save physical inspection and be cleared on documentation alone. This reward of saving inspections is available until an importer's consignment fails inspection in monitoring mode. The importer then returns to census mode, only receiving the benefits of saving inspection again after CN consecutive consignments pass inspection.

¹⁴ Since the project commenced, two pathways – durians and saffron – use the CSP-1 algorithm under the CBIS; the other plant-products under this scheme use the CSP-3 algorithm.

¹⁵ The CSP-1 and CSP-3 algorithms were also compared in the laboratory experiments as part of CEBRA Project 1404C. While the experiments did not find consistent systematic differences in the supplier choices of subjects between directly comparable CSP-1 and CSP-3 treatments, they showed that subjects tended to choose suppliers with lower biosecurity risk material approach rates when they understood the inspection rules better.

The clearance number (*CN*) and monitoring fraction (*MF*) are the two key parameters the department must choose when using this rule. For the field trial, the selection of appropriate values for *CN* and *MF* for each pathway were informed by two different, but complementary, modelling approaches, namely Markov-chain analysis and a simulation-based analysis of the department's import data. The results of these two methods are discussed in more detail in Appendix H.

Parameter selection in this context involves managing trade-offs associated with different choices that are partly quantifiable, together with qualitative characteristics related to communicating these rules with stakeholders. Determining what parameters could be reasonable, appropriate and defensible is therefore not an “exact” science, but one that admits some form of structured decision-making based on a series of principles that policy officers can apply to different pathways.

For both trial pathways, *CN* = 10 and *MF* = 0.25 were selected as *appropriate* rule parameters. Four principles underpinned parameter guidance for the two trial pathways.

1. The chosen parameters should be able to be communicated easily to, and readily understood by, biosecurity system stakeholders.

This reflects that rules featuring probabilistic elements can be difficult for stakeholders to understand and interpret.¹⁶ To aid communication, it would be preferable that the monitoring fraction chosen be one that has a “natural” interpretation that aids communication. For instance, a monitoring fraction of 0.2 has the natural interpretation that each consignment has a one-in-five chance of being inspected and that *on average*, for any group of five consecutive consignments, one consignment should be subject to inspection in monitoring mode.¹⁷ As such, the project team limited its focus to potential *MF* values that could be conveyed in readily understood fractional representations,¹⁸ while also assessing a range of values for *CN*.

2. The parameters and other aspects of the rules should be broadly consistent with existing advice available to plant-product importers as part of the CBIS so that the two trialled pathways could be brought into the CBIS relatively easily after the trial concluded.

This implied that preference was given to *CN* values between five and ten (inclusive) and *MF* values between 0.1 and 0.5 (inclusive), unless there was a compelling case to deviate from the existing guidance. It also meant that an

¹⁶ Chapter 2.2 of Rossiter et al. (2018b), the *Supplementary Report* for CEBRA Project 1404C, discusses the framing of probabilistic concepts in a way that allows them to be more readily understood in the laboratory experiment context.

¹⁷ As noted in CEBRA Project 1404C, difficulties arise when stakeholder erroneously interpret this statement as “every fifth consignment will be subject to inspection” or do not appreciate that, in any group of five consecutive consignment, the actual number inspected could be zero, one or more than one.

¹⁸ The specific values of interest included 0.1 (one-in-ten), 0.2 (one-in-five), 0.25 (one-in-four), 0.3 (one-in-three), 0.4 (two-in-five) and 0.5 (one-in-two).

inspection failure, which includes non-compliance issues that may not pose a direct biosecurity risk, constituted a failure for the CSP-1 algorithm for the trial.¹⁹

3. The parameters should admit a reward structure that encourages improvements in biosecurity outcomes.

For the CSP-1 rule, the selected *MF* places an upper bound (of $1-MF$) on the expected percentage of inspections saved for a fully compliant importer. In combination, the *CN* and *MF* values determine how quickly that expected reward for good compliance reduces as an importer's failure rate rises. Ideally, the parameters could be selected such that highly compliant importers expect to save a large share of inspections, while only moderately compliant importers achieve much smaller rewards.

4. The parameters should provide some degree of assurance that the likelihood of potential biosecurity risk material leaking, at the pathway level and for individual importers, is consistent with maintaining ALOP.

This proved to be the most challenging part of the process for the project team. Pure peat and selected vegetable seeds for sowing are associated with higher-risk end-uses, in that they are typically used in agricultural production in rural areas that potentially increased the likelihood of a pest or disease becoming established if it leaked across the border. As a result, there was agreement that the department's risk appetite would only tolerate a low likelihood of risk material leaking across the border.

While there was high-level agreement on this broad objective, the more difficult issue was around quantifying what "threshold" level of leakage was consistent with ALOP. Australia's high-level statement of what ALOP means provides no operational guidance on how much potential leakage constitutes "too much" risk to bear. The project team identified this as a gap, which led to recommending that more structured guidance be developed to assist policy officers in formulating appropriate inspection regimes for different pathways. For the two pathways for the trial, scenario and simulation analysis was used to determine what parameters seemed to be a reasonable threshold tolerance at both a pathway level and an individual importer level.

3.3 Applying field trial mechanism 2 – structured feedback reports

The evidence from the feedback-comparison treatments in CEBRA Project 1404 supported the notion that giving appropriately framed feedback on inspection performance could assist with importer decision-making around biosecurity risk options.²⁰ While feedback reports could contain information on an importer's recent history of biosecurity compliance relative to the most compliant importers on the pathway, this possibility was discounted early on due to departmental privacy

¹⁹ At the time of developing the trial, the department had not used quarantine failures as the basis to determine whether a consignment had failed inspection. Since that time, quarantine failures have been adopted as the failure metric for some pathways using CBIS rules, including imports of stone fruit from the United States.

²⁰ The potential benefits were the largest when feedback was provided around the inspection cost savings achieved.

policies. This also reflected some evidence in the behavioural economics literature that reference to “typical” behaviour may be counterproductive to the aims of the trial.

The feedback report developed for the trial informs an importer about their own biosecurity inspection performance, showing inspection failure rates by supplier, goods description and country of origin, as provided by the customs broker on lodging the entries on the ICS. The reports included counts of the inspection and documentation failures and provided detailed feedback on consignments where biosecurity risk material has been found, including the type of risk material found where that information was available (Table 3). An example of a graph contained within the feedback reports are given in Figure 2, with a full example template given in Appendix A.

Table 3. An example of information provided to the importer when their consignments are found to contain biosecurity risk material

AIMS Entry-Line Number	Goods Description	Supplier Name	Types of Risks Detected	Packaging Issue?	Organism/s: Specification to Genus (where available)
AIM1234567S – 1	Mixed Vegetable Seeds	Supplier C	Foreign Plant Material; Plant Disease	No	Liliopsida Cyperales Poaceae Triticum
AIM2345678S – 1	Carrot Seeds	Supplier E	Soil Contamination	Yes	Not available
AMI3451234S – 2	Cauliflower Seeds	Supplier A	Invertebrates (insects/arachnids); Fungi	No	Insecta Lepidoptera Pyralidae Plodia; Ascomycetes Pleosporales Pleosporaceae Alternaria
AMI3451234S – 4	Broccoli Seeds	Supplier A	Invertebrates (insects/arachnids); Fungi	No	Insecta Lepidoptera Pyralidae Plodia; Ascomycetes Pleosporales Pleosporaceae Alternaria

Note: Data represents all seed imported by the importer, not just seeds included in the trial.



Figure 2. Inspection failure performance supplier – example template from feedback reports.

Prior to the trial, summarised, consolidated information on inspection failure rates by supplier, goods description and country, as well as pest interceptions, had not been provided to importers. It would have been difficult for the importer to assemble this summary information, as feedback was only available on a per-consignment basis and would have required the importer (or their customs broker) to compile, consolidate and substantially transform information supplied by the department into a form meaningful to informed business decisions, such as which entities to choose as their future suppliers.

4 Field Trial Implementation

While the field trial commenced on 29 August 2016, preparation for the trial commenced more than 10 months earlier. Communication with stakeholders, adaption of existing IT systems, and gathering information from which to evaluate the trial were key parts of the implementation process and are discussed in this chapter. Implementation of this field trial achieved many firsts; in particular, it the first time the department had:

- implemented a new inspection regime as a field trial;²¹
- used the AQIS Commodity Code (ACC) to separate ‘below’ the tariff code; and
- sent consolidated feedback reports about inspection history to importers.

It was never envisaged that the trials on the two plant-product pathways would allow all potential protocol changes identified and/or tested in CEBRA Projects 1304C and 1404C to be implemented using current departmental systems. Instead, these preparatory projects sought to scope the range of possible changes that could help the department better leverage incentives for compliance. Of the potential changes, the project team worked with the department in the lead-up to the field trial to identify those that could make a significant impact while also being technically feasible, given existing system constraints.

The field trial was implemented simultaneously with the roll-out of the *Biosecurity Act 2015*, which replaced the century-old *Quarantine Act 1908*. With the timing of the legislative changes and the novel aspects of the trial, several unforeseen issues arose with IT systems capability, staff resources and the ability to fully apply the modified protocols as originally envisaged. As discussed later in this report, the complexity of the resulting operating environment for the field trial appears to have significantly impinged on stakeholder participation and the trial’s observed outcomes.

4.1 Communication strategies

Effectively communicating information about the field trial with all stakeholders on the pathway was crucial to the success of the trial, because:

- communication between brokers and their importer clients was critical for importers to understand the benefits of participating, as well as their eligibility to participate;
- brokers needed to understand how their clients’ eligible consignments could be correctly enrolled in the trial;
- importers whose consignments could be eligible for the trial needed to fully understand the application of the new inspection protocols if their behaviour is to change as economic theory and previous analysis suggests it should; and
- operational staff in the department needed to understand the importance of applying the changed protocols accurately and consistently if importers are going to receive the full benefits of the rules.

²¹ While the department had previous experience implementing the CSP-3 algorithm on a range of plant-product pathways through the CBIS, this trial represents the first time that the implementation of compliance-based protocols was evaluated.

Communication strategies with stakeholders involved a mix of established departmental methods: Industry Advice Notices (IANs);²² BICON alerts; numerous emails; and less prescriptive methods, such as a trial webpage and industry contact (Table 4). For operational staff, this included modified work instructions, BICON content changes, creating tagging profiles, as well as other internal communication channels.

Table 4. Key communication methods in the trial

	Date commenced	Date completed
Importers and customs brokers		
First IAN	18 March 2016	28 June 2016
Supplementary IAN for Solanum seeds and seed lots < 10kg ²³	30 June 2016	11 July 2016
Department webpage for field trial	14 July 2016	5 August 2016
BICON updates and alerts	5 July 2016	5 August 2016
Second IAN	4 June 2016	24 August 2016
Contact with industry organisations	5 May 2016	28 August 2016
Emails		As required before and after trial commencement
Department staff - operational		
Work instructions	9 July 2016	1 September 2016
Department staff – Plant Biosecurity		
‘for-noting’ minute		12 July 2016

Industry Advice Notices

The department provides updates to importers and customs brokers through IANs. Two of these were sent prior to the commencement of the trial. The first IAN was released for each pathway²⁴ one month before commencement of the trial. These first IANs alerted importers on each pathway to the forthcoming field trial, eligibility requirements, the availability of the ACC for immediate use in building up a compliance history in the lead-up to the trial and expected benefits to importers from participation in the trial.

²² The initial IANs and earlier versions of the trial webpage referred to the trial on the peat and selected vegetable seed for sowing pathways as the “reduced inspection trial”. During the trial, the department’s naming conventions changed, with the phrase “compliance-based inspection trial” used in preference. Consistent with good research practice and ethical research, we have used the original wording when quoting verbatim from information in department communications, extracts from the AIMS database, interview scripts in the appendices and stakeholder responses in the interviews. In other circumstances, we have used the phrase “compliance-based inspections”, consistent with current department conventions. For clarity, the terms “reduced inspection” and “compliance-based inspection” should be treated as synonymous for the remainder of the report.

²³ The supplementary IAN may be accessed at <http://www.agriculture.gov.au/import/industry-advice/2016/68-2016>.

²⁴ These IANs can be accessed at <http://www.agriculture.gov.au/import/industry-advice/2016/58-2016> and <http://www.agriculture.gov.au/import/industry-advice/2016/59-2016>.

A second, shorter, IAN announced the start date for the trial, briefly described the new inspection protocols being trialled and contained a link to the field trial's webpage.²⁵ The second IAN was published in the week leading up to the start of the field trial.

Trial webpage

A webpage for the trial was created in the month leading up to the trial.²⁶ It listed the trial's start date, eligibility requirements including the list of permitted vegetable seeds eligible for the trial, a diagram explaining the CSP-1 rule, how the ACC should be used, and a discussion of the expected benefits to participants. Once created, the website became the central channel for communications about the trial. The website subsequently became accessible through links on the CBIS and BICON webpages.

Contact with industry organisations

Many vegetable seed importers initially became aware of the trial through a discussion of the trial by operational staff at the Post-Entry Plant Industry Consultative Committee meeting (PEPICC)²⁷ in early May 2016. The department's Plant Import Operations Branch staff also emailed the Australian Seed Federation (ASF) – the peak industry body for the Australian seed industry – in late June 2016 to alert them of the trial and the publication of the first IAN. This contact led to the opportunity for two members of the project team to speak about the trial at the ASF's Seed Business 2016 Convention in Melbourne on 25 August 2016 – a few days before the trial's commencement.

The peak industry body in Australia for customs brokers is the Customs Brokers and Forwarders Council of Australia Inc. (CBFCA). The CBFCA was contacted in mid-August 2016 about the trial by a member of the project team. The organisation requested the team supply appropriate wording for a 'newsflash' that could be circulated to members.²⁸ News about the trial was also shared as a notice on the CBFCA website.

Direct stakeholder contact by email

Since the peat industry is not represented by any single organisation, the department undertook direct communication with peat importers through emails at various stages before and during the trial. This communication involved alerting importers to the trial and provided an explanation of some of the implementation issues that became evident in the weeks following commencement of the trial (see Section 4.3).

BICON

BICON (Biosecurity Import Conditions System) is used by importers and customs brokers to determine the import requirements for commodities intended for import into Australia. The BICON cases for peat and permitted vegetable seeds for sowing

²⁵ The second IAN can be accessed at <http://www.agriculture.gov.au/import/industry-advice/2016/82-2016>.

²⁶ While the trial webpage has now been decommissioned, an archive version is available from: <https://web.archive.org/web/20160911095215/http://www.agriculture.gov.au/import/goods/plant-products/risk-return/trial-peat-vegetable-seeds>.

²⁷ More information about the PEPICC may be accessed at <http://www.agriculture.gov.au/biosecurity/partnerships/consultative-committees/pepicc>.

²⁸ See http://www.cbfca.com.au/CBFCA/Member_news/2016/201606/Notices_29_June.aspx for the final version of the notice.

were updated to alert users about the trial and to indicate eligibility requirements. The AQIS commodity codes (ACC) and a link to the trial's webpage were also added as an 'information notice' within the conditions of each eligible BICON case pathway. BICON alerts about the field trial were sent to stakeholders who had subscribed to the individual import cases that are relevant to the field trial and were visible in BICON to any stakeholders who access the affected BICON cases.

BICON also contains information for departmental assessment officers. Onshore outcomes for consignments lodged with the ACC FERT or LSTD were included here, as well as links to the Hyperion dashboard and trial-specific work instruction as described below.

Work Instruction

A 'work instruction' is the method of describing a work-procedure to operational staff. It was crucially important that operational staff used the Hyperion dashboard correctly (see Section 4.2 for information about the dashboard). Development of the work instruction for the field trial was contingent on modification of the dashboard and the latter became delayed due to other time demands on staff who were required to undertake the necessary modifications. Once the work instruction was prepared, the Assessment Service Group within the department ensured it reached operational staff. The work instructions are dynamic documents, and were updated for clarity and to include changes as they arose during the life of the trial.

'Tagging' profiles

In November, additional profiles were created in the ICS which are automatically attached to any consignment that uses the LSTD or FERT commodity codes. These profiles are visible in AIMS to assessment staff and contain a notification that the code has been used and a reminder to refer to the dashboard and work instruction.

4.2 Modification of departmental systems

Successfully implementing the field trial required departmental staff to be flexible and innovative in using existing departmental systems and policies. Three aspects of the trial represented significant changes to established practices as:

- the AQIS Commodity Code (ACC) had never been used before, due to the technical limitations of rules not being designed to differentiate based on this code;
- a customised dashboard needed to be developed to implement the CSP-1 rule; and
- the idea of providing structured feedback reports to importers was also novel.

These three key aspects of the trial are discussed below.

AQIS Commodity Code (ACC)

An ACC is a four-character alphanumeric code that can be used to separate pathways below the tariff code level and was available in customs brokers' existing software. While never used by the department before the trial,²⁹ the ACC was already available

²⁹ A formal process for setting up use of the ACC was also developed as part of the trial. The department has always intended to use the ACC more widely but has been unable to do this

within AIMS. Unfortunately, the ACC was not linked to the department's Q-ruler – the mechanism that automatically dictates whether a particular consignment is inspected or not according to the relevant CSP rule. As a work-around solution, the project team were advised that the ACC could be used as part of a bespoke dashboard system, similar to that already used on the cut flowers pathway.

The ACC became available for use in late June, two months before commencement of the trial, in order that importers could immediately start to build up their compliance history and allow the dashboard to be tested on live data before deployment. Customs brokers were also encouraged to start utilising the codes available. In theory, if importers had passed ten consignments in a row before the trial, they would be able to get the benefits of compliance-based inspections once the trial commenced in August.

Dashboard

The 'dashboard' is a work-around – essentially a pre-set data query in the department's data analysis and reporting tool, Hyperion. This query is pre-set to tell the document assessment staff whether or not to apply an inspection direction to a given set of entries, where an entry could contain multiple lines. The dashboard extracts the relevant compliance history for a given importer and commodity, then applies the set CSP rule (including, for entries, a probability-based random selection mechanism for the set monitoring rate probability) to determine whether or not an inspection is required.

As part of the trial, the dashboard also incorporated a different way in which document failures were treated relative to the Q-ruler under the CBIS. For the dashboard, a documentation failure did not affect eligibility for being rewarded with a lower frequency of inspection when an importer was in monitoring mode. From the trial's perspective, non-compliances in documentation and issues identified with the physical consignment were treated separately. This was in contrast to the way in which the CBIS treated documentation failures. Under the Q-ruler, an importer's eligibility for the lower inspection frequency could be affected, depending on whether the consignment was flagged by the Q-ruler for a physical inspection or not. In part, this reflects that the Q-ruler determines the inspection flag for a given line entry at the time the consignment hits the AIMS after being referred by the ICS.

Feedback report for vegetable seeds importers

The structured feedback reports were a new communication tool for the department and thus business rules for sending the reports had to be developed. The project team decided that feedback reports would be sent to importers, whether or not they were participating in the trial. It was initially decided that those importers undertaking at least four imports per month would receive feedback reports every two months, otherwise reports would be sent out every four months. As the trial progressed a decision was made that all feedback reports would be sent every three months.

There was a departmental requirement that the feedback reports would only contain an importer's own data; data comparing an importer's performance with others on the

because of IT issues. The difficulties encountered in the trial with IT and timeframes of the trial necessitated the use of the ACC and a purpose-built dashboard.

pathway was not considered consistent with the treatment of protected information mandated under the *Biosecurity Act 2015*.³⁰

Rather than attempt to automate the creation of feedback reports through the dashboard (via a Java programming variant), the project team decided that R code would be used to develop the reports (see Appendix B) and that reports would be created manually and emailed to seed importers every three months by departmental members of the project team.

4.3 Implementation issues

As previously indicated, the novel aspects of the trial led to some implementation issues. While some unforeseen issues were expected, there is a likelihood that several of the issues affected the incentives of the stakeholders to participate in the trial and as a result the behaviour changes expected were not fully realised. A detailed reflection on the implementation issues experienced and discovered in evaluating the field trial has ongoing relevance, since the department has adopted the trial mechanics for three other commodities, namely:

- fresh lemons and limes from the United States of America (from November 2016);
- fresh stone fruit from the USA (from September 2017); and
- avocados from New Zealand (from October 2017).

4.3.1 Eligibility and variations to business-as-usual practices

Permit requirements for peat

While the department intended to include any peat that was only subject to tailgate inspection and had a low inspection failure rate in the trial – including peat with chemical/mineral additives, such as those used in mushroom casings – the department was forced to rule these as ‘out of scope’ at a late stage, due to unforeseen complications caused by:

- the incomplete removal of the permit requirement for some peat products under the new *Biosecurity Act 2015*; and
- the impossibility of applying compliance-based inspections to commodities with a BICON permit without changing the permit.

With the implementation of the *Biosecurity Act 2015*, the department decided to reduce the number of commodities that required import permits and use ‘standard conditions’ (i.e. the same conditions for all permits of the same commodity). This was possible because the *Biosecurity (Prohibited and Conditionally Non-prohibited Goods) Determination 2016* allows the same level of biosecurity protection to be legally enforceable without the need for an import permit and its associated administrative burden and cost.

³⁰ The biosecurity compliance record of importers would be classified as commercial-in-confidence information under the *Biosecurity Act 2015*, since such information is not in the public and its release could cause competitive detriment. Furthermore, several Australian import pathways tend to be dominated by a few very large importers. Disclosing information on the distribution of compliance rates by importer therefore has a reasonable likelihood of allow individual importers to be re-identified, meaning such information revelation would fall foul of the *Privacy Act 1988*.

Peat was one of the commodities for which the import permit requirement was removed under the new legislation. Unfortunately, the determination did not explicitly allow for the removal of composite peat with additive products; instead, it was initially assumed that these goods would be allowed in the composite product provisions. This turned out to be problematic due to the quantity limitations for importing the chemical components alone (without a permit) which could not easily be assessed in the peat/chemical composite products. This resulted in the late realisation that peat with additives still required an import permit under the new legislative framework – a requirement that may be removed in future amendments to the framework. This was not anticipated at the start of the trial, and introduced an unexpected complexity, as pure peat and peat with chemical additives had previously been subject to the similar biosecurity import conditions.

While goods requiring an import permit have not historically been a problem for introducing compliance-based inspection,³¹ differences between how cases were structured under BICON and its predecessor system under the *Quarantine Act 1908* – the Import Conditions database (ICON) – meant this was no longer the case. Under BICON, the onshore outcomes, which dictate the procedures to be followed and directions to be applied by biosecurity operations staff members, is now explicitly linked to individual permits. This means the biosecurity import conditions cannot be changed without amending and re-issuing all existing permits – a very time-intensive activity.

Unfortunately, this unforeseen complication necessitated the exclusion of peat with additives from the trial. The timing of the discovery of this issue (after the release of the new legislation) and difficulties it caused (BICON permits needing to be amended and re-issued) resulted in the late exclusion of peat with additives from the trial and some early inconsistencies with communication around trial eligibility.

Offshore seed purity testing for vegetable seeds

Many of the permitted vegetable seeds for sowing eligible for the trial did not previously require offshore seed purity testing as a condition of import if they were imported in lots less than 10 kg. However, under the trial, permitted vegetable seeds in lots less than 10 kg were excluded unless they had seed purity testing conducted offshore. This additional testing requirement was included in the trial after publication of the first IAN (published on 28 June 2016) but was advised via a supplementary IAN several weeks before the start of the trial on 11 July 2016. This reflected the opinion of seed experts in the department that Australia's ALOP could not be met without equivalent assurance measures. The department also wanted to encourage the use of the ISTA purity testing measures, as these are considered effective in detecting biosecurity threats. It was also thought that allowing lots under 10 kg to enter Australia without purity testing would create an incentive for consignments that would otherwise have entered as a lot over 10 kg, thus subject to ISTA testing onshore or offshore, to be repackaged into multiple lots under 10 kg in weight to avoid the costs associated with testing.

As discussed further in Chapter 5, the first round of interviews with seed importers indicated that many found the cost and time delays associated with meeting the

³¹ For example, green coffee beans, which have been part of the CBIS since 2013, required an import permit until the introduction of the new legislation.

offshore ISTA testing requirements for parcels that did not require testing (namely seed lots of under 10 kg) prohibitive; thus, there was no incentive for these lots to be brought in under the trialled protocols.

Splitting consignments

The Phase I interviews with vegetable seed importers revealed an unforeseen complexity of the trialled protocols that were not fully considered when designing the rules. Importers revealed they regularly import consignments containing individual lines of eligible and ineligible seed lots (with respect to the trial)³², and these lines would be subject to different inspection regimes once importers were in monitoring mode. The only way these mixed consignment types are likely to benefit from participating in the trial once the importer is in monitoring mode is if:

- inspection officers consistently distinguish between inspection directions and only inspect ineligible lines, thereby realising importers a time saving; or
- customs brokers are aware of their status in the trial and split consignments after documentation assessment.

Both are equally unlikely scenarios; the former is counter to the usual inspection regime officers implement, especially since mixed consignments represent additional biosecurity risk from cross-contamination/infestation, while the latter may pose additional costs to the importer. Unless either of these actions occur, stakeholders with this pattern of importing will not realise cost savings to the same extent as originally expected unless they modify their importing behaviour.

This outcome is not unique to this field trial; any mixed consignment imported where different import conditions may apply, including under existing compliance-based schemes, will not fully realise available time and cost savings. This is an important consideration for the department when determining which commodities to add to the CBIS, as well as when evaluating the incentives, uptake, and rate and pace of behaviour changes for existing schemes.

4.3.2 Communication

There were several issues that may broadly be described as relating to communication, and which may have variably affected the final outcomes of the trial. These issues share the underlying difficulty of communicating changes to stakeholders in a dynamic and information-saturated operating environment, particularly when the changes represent nuanced changes to business-as-usual processes.

Eligible vegetable seed species

The first IAN was modified shortly after its publication because:

- seeds from the *solanum* genus, such as eggplant seed, had to be removed from the list of permitted vegetable seeds; and
- seed lots less than 10 kg not accompanied by a valid purity-testing certificate were to be excluded from the trial.

³² Australian importers are not unique in this practice – other NPPOs have reported similar patterns.

Once the field trial commenced, further changes were communicated via the trial's webpage, emails to importers (as required) and BICON alerts. For example, seeds in the *apium* genus, including celery seed, were removed from the list of permitted seed genera on 3 April 2017 due to emergency measures for *Candidatus Liberibacter solanacearum*. The trial webpage was updated to reflect this change and targeted emails were sent to all brokers who had previously used the ACC on lodged consignments. These measures were in addition to the department's routine channels through which such changes are communicated.

Eligibility requirements for peat

Contact with importers and customs brokers prior to the trial and during the first round of interviews demonstrated confusion regarding eligibility for the trial. This confusion stemmed from uncertainty about whether 'mushroom casings' and peat with additives were eligible for the trial. Mushroom casings consist of peat with an additive – usually lime – so technically are not "100% pure peat"; only consignments that were 100% pure peat are eligible for the trial.

The first IAN (2016-59) stated:

Eligibility for the trial is restricted to peat imported for use as fertiliser, soil conditioner or potting mix. Peat imported for other purposes (such as packaging material), as well as coir peat, coconut fibre and sphagnum moss, will not be eligible.

Eligibility requirements were later updated on the trial's website, consistent with the permit uses identified earlier, as follows:

For peat imports to be eligible [...], they must:

- *be intended for use as fertiliser, soil conditioner, potting mix*
- *contain no additives i.e. 100% pure peat.*

Imports of peat with any additives, coir peat, coconut fibre and live sphagnum moss are not eligible for this trial.

This change to eligibility resulted in far fewer peat importers being able to participate in the trial than had been originally anticipated.

Additionally, Phase I interviews with stakeholders on the peat pathway highlighted that they had not fully understood that assessments for non-commodity concerns, such as the cleanliness of the container's exterior, would be required regardless of their status in the trial. This is consistent with the department's guidance on *Requirements for approved arrangement class 19.1: non-commodity for containerised cargo clearance*,³³ which are applied in addition and separately to commodity-related inspections.

There was also confusion among stakeholders about whether consignments of peat destined for rural locations were included in the trial. This was despite the first IAN

³³ See <http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/import/arrival/approved-arrangements/19.1-requirements.pdf> for the current version of the approved arrangement requirements.

and the trial webpage stating explicitly that consignments they were subject to (rural) tailgate inspections as follows:

[A]ll imported full container loads of peat being sent to rural locations will remain subject to tailgate inspections³⁴ as per the sea container delivery postcode classifications.

Use of ACC by customs brokers

During the first few months of the trial, the department noted a significant number of errors in the use of the ACC by brokers. Customs brokers were contacted and problems with their use of the code were resolved. Although the frequency of this misapplication of the ACC reduced, it remained an ongoing issue for the duration of the trial. Departmental members of the project team reported that several brokers who were contacted about misapplication of the ACC continued to incorrectly lodge goods in the ICS and AIMS.

ASG staff members reported this was most common for vegetable seed consignments and appeared to reflect ongoing confusion amongst stakeholders over eligibility to participate in the field trial. For example, consignments were regularly lodged for ineligible seed lots, or without the trial-specific ISTA certificate. Plant Import Operations Branch staff members monitored the use of the ACC and contacted brokers to inform them of the correct application of the code. However, owing to the manual and time-consuming process required to do this assurance, it was not feasible to monitor this issue thoroughly. This misuse reflects a limitation in the trial design which did not allow for automatic qualification/disqualification for consignments lodged in the ICS and AIMS.

Awareness of trial among ASG staff

The operational staff interviews highlighted that while initial internal communication about the trial was high, subsequent low participation in the trial likely resulted in expected loss of knowledge owing to limited exposure and experience implementing the trialled protocols. This was potentially exacerbated by incumbent workflow processes during the trial, where document assessment officers across all regions were required to process the next available entry in a queue. These operational requirements meant staff would need to be equipped, or have adequate support, to assess documentation in any commodity group. This consequent loss of knowledge presented challenges for the trial's implementation, since it relied upon consistent and correct application of protocols, particularly by ASG staff (Figure 3).

Interviews with operational staff members suggested that assessment officers regularly face uncertainty about the correct meaning or process for the commodity they are assessing. A recognisable pattern emerged in the operational staff interviews, where they consistently reported checking with senior members of their team – often with their supervisor – to clarify ambiguities in work instructions, and for general troubleshooting, particularly if the information could not be found or was not clear in BICON. This process of referral relies upon work supervisors being across an extraordinary level of detail; otherwise, it will result in a chain of referrals.

³⁴ This wording was meant to capture rural tailgate inspections, which apply if the delivery address falls within certain postcodes designated by the department; see <http://www.agriculture.gov.au/import/online-services/delivery-postcode> for further details.

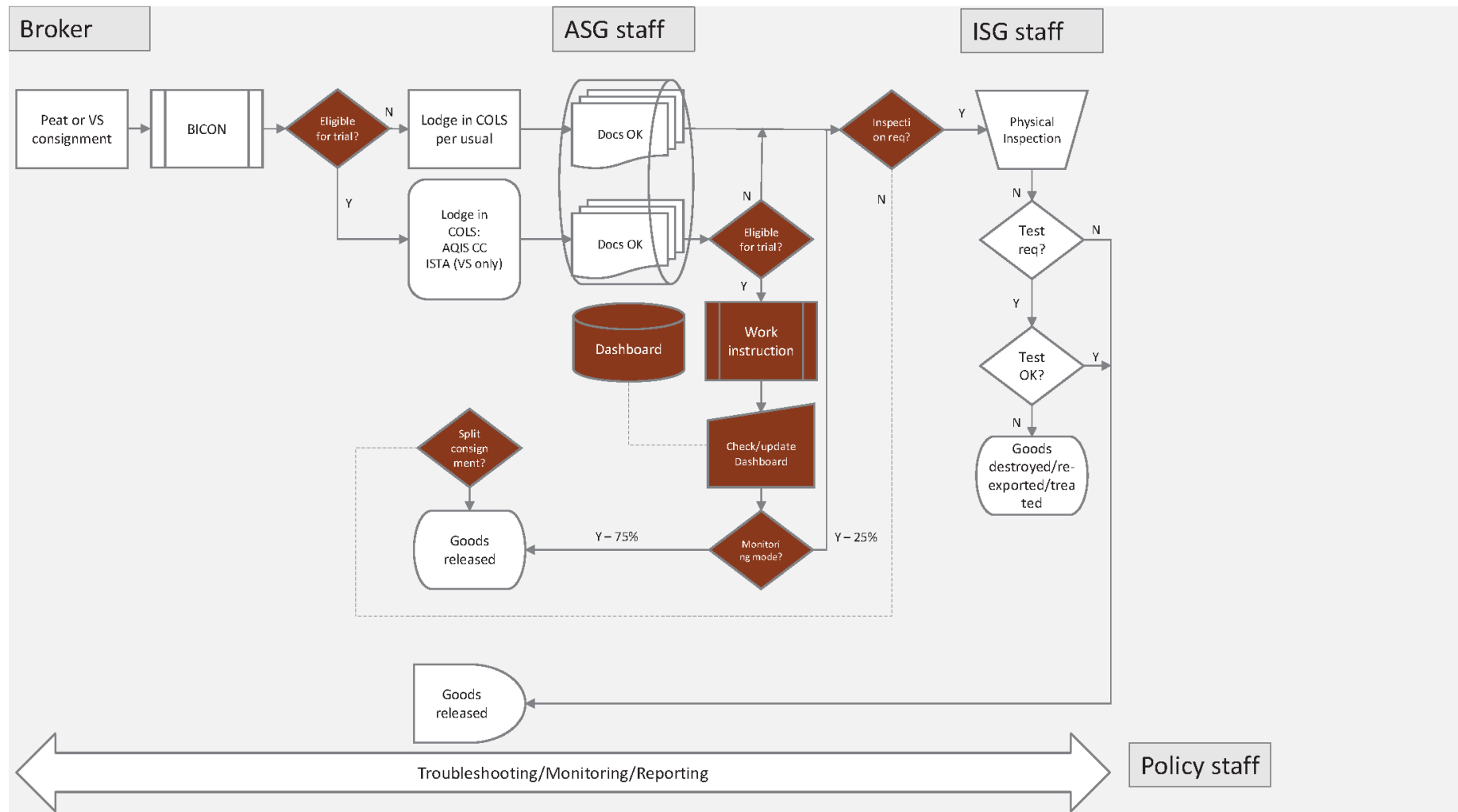


Figure 3. Graphical representation of the trial workflow, with implementation issues highlighted in red. This illustrates the process, and is not sourced from official DAWR documentation

It is important to note that, during the trial, the department was in the process of changing workflow allocation arrangements for document assessments to mitigate the limitations of an undifferentiated system. These changes have recently been completed, with the department also introducing measures to build staff capability against particular commodity groups, targeting commodity groups with more complex biosecurity requirements that would benefit from knowledge retention.

4.3.3 IT systems and capability

Availability of the dashboard

As the trial progressed, issues that affected biosecurity operational staff members' ability to implement the work instructions emerged and were confirmed by interviews with stakeholders and operational staff. These issues resulted in the dashboard lagging or being unavailable and included:

- operational staff needing to apply for access to see the dashboard;
- issues with web browser compatibility; and
- software bugs that affected the necessary syncing between AIMS and the dashboard.

Each of these issues affected whether documentation assessment officers were able to apply the field trial rules to eligible consignments. While these issues will not have impacted the overall rates of participation in the trial, which are related to importer incentives, they will have likely affected the realised outcomes for those importers correctly participating in the trial.

The extent to which these issues resulted in poor outcomes with respect to realising outcomes in the trial is difficult to gauge, owing to the complexity of the department's operating environment. For example, it is unclear how many eligible consignments were issued to document assessment officers who could not access the dashboard, or what the follow-up actions of those assessment officers were for each case.

Use of the dashboard by document assessors

During the first few weeks of the trial, Plant Import Operations Branch staff members identified a significant number of processing errors in their initial monitoring of the trial's implementation. Specifically, importers who had been using the ACC and had passed the required number of inspections in census mode were not seeing the benefit of saving inspections from the lower frequency of inspection they were rewarded for in the CSP-1 algorithm's monitoring mode.

The issue appears to be related to the technical limitations of AIMS, which required document assessors to use the dashboard system – an 'inconvenient work-around' – to implement this trial's protocols and provide appropriate directions to inspection officers. Operational staff members were potentially already overwhelmed with a large number of procedures documented through BICON and in work instructions, and employ work-arounds due to inflexible import systems. Therefore, in the first few weeks of the trial, each entry eligible under the trial was assessed by members of Plant Import Operations Branch to properly understand the nature and cause of the errors. Document assessors and inspection officers were then proactively contacted by Plant Import Operations Branch representatives to resolve identified issues.

While initial monitoring of the trial's implementation enabled certain issues to be resolved quickly, an ongoing issue was that the track-records of participating

importers suggests operational staff members were routinely not using the dashboard³⁵ to determine whether a particular eligible line required a physical inspection or not. One reason for this could be that the dashboard was a work-around representing an extra processing step. As an operational tool, the dashboard is unfortunately a cumbersome addition to an already time-stressed workflow. Furthermore, comments included in the AIMS records of participating importers revealed a number of instances where operational staff members explicitly recorded issues when trying to access and use the dashboard for eligible consignments.³⁶ The cumulative number of instances revealed in the importer track-records suggests a range of reasons, some of which have been discussed above, that resulted in the variable use of the dashboard by operational staff member.

Inability to monitor trial participation

Customs brokers familiar with the operation of CBIS had requested that the dashboard output include information on whether an inspection was required because:

- not enough passes had been achieved in census mode;
- a random inspection was triggered in monitoring mode; or
- a consignment had recently failed inspection, putting the importer back into census mode.

While instructions to copy and paste the dashboard output (which included this information) into direction comments were included in work instructions, this was not always operationally possible due to a limit of 256 characters on each comment field in AIMS.

Additionally, it was not feasible to follow up actions for consignments that were not processed using the dashboard unless an importer noticed and enquired why they were not seeing benefits of saving inspections as they had expected. This reflected that the department had no feasible, real-time way of monitoring the trialled protocols in the current operating systems.

4.4 Lessons learned: complex trial mechanics in a complex operating environment

Figure 3 (page 41) summarises the trial mechanics and highlights the identified points in the theoretical process that were particularly susceptible to ongoing implementation issues, notably inflexible existing IT systems that required multiple (often manual) work-arounds to be applied. It highlights the limitations of relying on manual application of nuanced changes to business-as-usual processes for stakeholders and operational staff in an environment that has time pressures and is subject to constant change.

The early changes to eligibility clearly limited importers' incentives to participate in the trial. A key lesson learned was one that underpinned the early changes to

³⁵ As noted earlier, this may also reflect some document assessment staff being unable to access the dashboard system and therefore use the 'default' of issuing an inspection direction for that line, regardless of the importer's mode in the CSP-1 algorithm.

³⁶ It is impossible to determine why the dashboard was not used as intended in every instance, since this reporting by operational staff members was *ad hoc*. Nonetheless, the trial highlighted department-wide issues with using the dashboard systems – something which the department is actively working to resolve.

eligibility and resulted from decisions made in the design of the field trial. In particular, the focus on selecting pathways with low inspection failure rates for the field trial as part of CEBRA Project 1304C largely neglected the potential consequences of biosecurity risk material leaking into the environment for the candidate pathways.³⁷ Peat and vegetable seeds are principally used as inputs for agricultural production, where biosecurity risk material leakage may pose considerable harms to the environment and/or agricultural industries. As a result, eligibility for compliance-based interventions for both trial pathways needed to be tightened to ensure, from the department's perspective, that Australia's ALOP was maintained. In hindsight, the field trial design may well have been better suited to be *tested* on goods with lower-risk end-uses from a biosecurity perspective, such as immediate human consumption, rather than those that may be associated with higher potential consequences.

Second, the trial mechanics did not fully account for the considerable complexity in baseline importer behaviour. This is particularly the case for vegetable seed importers, who frequently import consignments containing lines of eligible and ineligible seed, or even multiple commodities. While it is likely that sustained compliance-based inspection arrangements should encourage modified importer behaviour, the vegetable seed pathway proved too complex as a test commodity for assessing behaviour change over the life of the trial.

Finally, the trial mechanics placed considerable pressure on operational staff – in particular, document assessment officers – to be across significant detail, but also to apply a work-around solution. This change was exacerbated by the appropriation of a dashboard system, which proved to be unreliable and required manual input by operational staff. This serves as an important lesson for future field trials. An expanded use of automation, as currently available through the Q-ruler, should help mitigate some of these implementation issues and enable the wider adoption of compliance-based interventions. However, the CBIS faces large technical barriers because of the wide range of goods included under single tariff codes as part of the Harmonized Commodity Description and Coding System of tariff nomenclature. Until enhancements to existing information management systems, such as AIMS, are fully realised, the department still needs to implement manual work-arounds to operationalise compliance-based interventions.

³⁷ The change in emphasis to incorporate assessments of both the likelihood and consequence of leakage into determining appropriate biosecurity interventions occurred gradually over the course of the collaboration between the department and CEBRA on this sequence of projects. While it may have been preferable to select alternative field-trial pathways, it was perceived that the extant control mechanisms inherent in the vegetable seeds and peat pathways were likely to limit downside risk to trial outcomes, and therefore remained appropriate field-trial candidates.

5 Participation, Understanding and Incentives in the Field Trial

As discussed in the previous chapter, low participation rates were anticipated early into the trial and can be related to multiple implementation issues. This chapter focuses on the field trial itself, briefly discussing the outcomes of the trial in terms of participation, and stakeholder and operational staff understanding. It also assesses the overall incentives for compliance-based inspection regimes that this field trial aimed to leverage. Chapters 6 and 7, respectively, will assess evidence of behaviour change by stakeholders in response to the incentives for compliance, and examine the compliance-cost savings reaped by stakeholders throughout the trial.

5.1 Participation in the trial

Peat importers

While 46 peat importers brought in one or more consignments under the tariff code 27.03.0000 during the trial period, only 21 (46 per cent) applied the 'FERT' ACC to at least one consignment during the period of the trial. In total, 677 peat consignments were lodged by customs brokers with an ACC applied³⁸. Of the 21 importers who lodged consignments with the ACC, three qualified for monitoring mode by building up a compliance history of ten consecutive passes one or more times during the trial and were therefore eligible to save at least one inspection.

Figure 4 summarises the pattern of participation for the largest four peat importers for the duration of the trial, among those who lodged at least one consignment with the 'FERT' ACC applied. This figure illustrates that the number of consignments eligible for the trial's potential benefits, except for a handful of importers, was typically low. Furthermore, 17 of the participating importers brought two consignments or fewer with the ACC applied for the duration of the trial (data not shown).

Vegetable Seed importers

Of the 42 vegetable seed importers who brought in one consignment under tariff code 12.09.9100 between 29 August 2016 and 15 December 2017, only 18 (43 per cent) applied the 'LSTD' ACC to at least one consignment. In total, 1684 vegetable seed line entries were lodged with the 'LSTD' ACC applied. Of these 18 vegetable seed importers, nine qualified for monitoring mode one or more times during the trial, with eight of these eligible to save at least one inspection.

Figure 5 summarises the patterns of participation of the four largest vegetable seed importers for the duration of the trial. In contrast to the peat pathway, these importers averaged a larger number of consignments with eight importers bringing in 60 or more consignments over the course of the trial.

³⁸ The estimated number of consignments (or line entries) represents an upper bound. This does not account for the presence of a few duplicated entries, meaning the actual number of consignments (line entries) will be slightly lower.

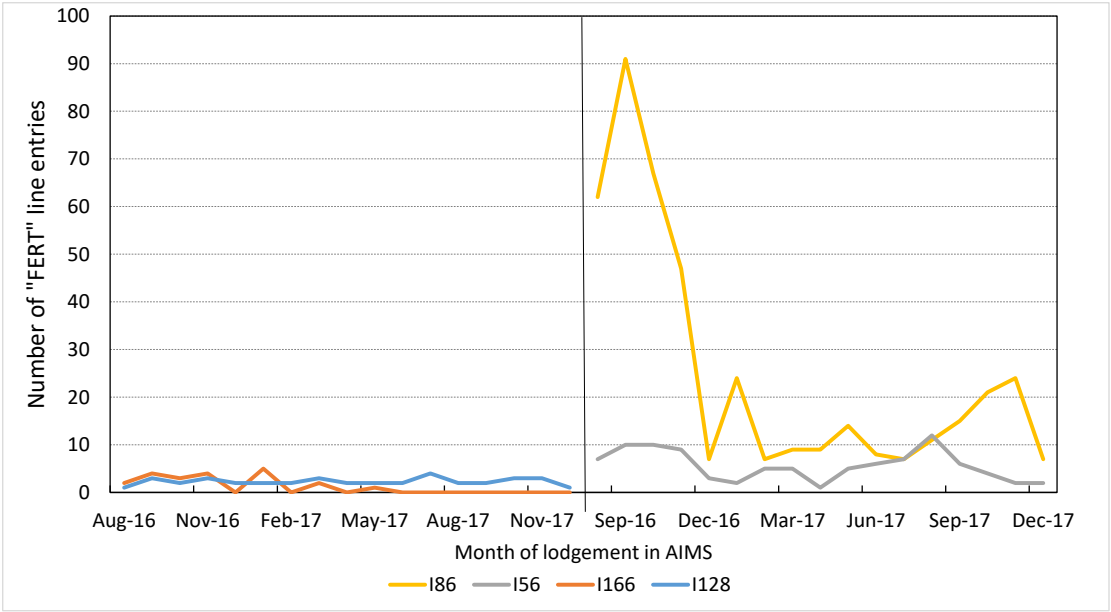


Figure 4. Peat pathway trial participation for the largest 4 importers

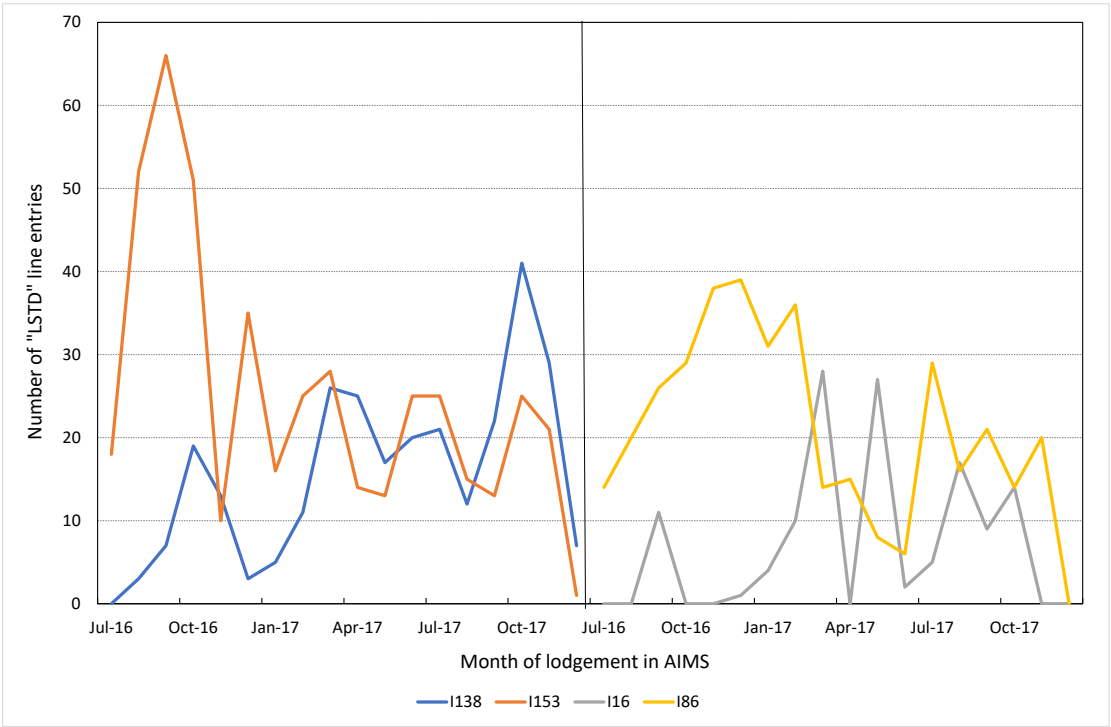


Figure 5. Vegetable seed pathway trial participation for the largest 4 importers.

5.2 Incentives to participate

Interviews with stakeholders provided valuable insights that contextualised the likely spectrum of considerations and experiences of the wider group of importers and customs brokers participating in the trial.

General reception of field trial: an observed appetite for change

The specific aims of the trial were generally well-received by almost all stakeholders. Once they understood the mechanics of the trial, many of them both expressed interest in the trial and the potential future direct and indirect benefits to their businesses. Most frequently, interviewees expressed the benefits of participating in the trial in terms of simplifying the task of managing the logistics of clearing and transporting consignments. This included:

- fewer delays;
- a faster rate of clearance;
- less complicated transport arrangements; and
- a greater predictability around when clients – both the importer or final client (retail or rural) – could expect the goods.

A second, related set of benefits stemmed from the implication of compliance-based inspection protocols on the goods itself. For example, interviewees anticipated less damage to their goods caused by waiting to pass inspection, and partial unloads. They also anticipated potential savings from reduced loss of goods due to testing.

The other most common reflections on the trial were indirect benefits. Many stakeholders saw the underlying design of compliance-based inspections as an explicit acknowledgement and reward for individual stakeholders who consistently and rigorously sought to improve their compliance. It also meant these highly compliant importers were not treated in the same manner as those who were routinely failing to meet requirements specified by the department. As one interviewee discussed:

That's why I'm so interested in doing this [trial] ... I think it should be looked at on a company basis and a historical basis ... so we're in our own little basket, not in everybody else's or those - and I use the word too – cowboys' basket. I don't want to be linked with them in any way, shape or form.

This perspective was reflected in the opinion of many interviewees, who also closely linked their business processes to ensure compliance with biosecurity requirements – from their choice of supplier to broker – to their market reputation.

Many interviewees, including operational staff, recognised that a one-size-fits-all approach to inspections was an inefficient use of finite resources available to the department. Many interviewees related some of the inconsistencies they experienced in importing and clearing commodities to operating staff who they perceive to be stretched to capacity. Finally, a large number of interviewees articulated a connection between the implementation of the trial and the trend by the department to explore and embrace changes, particularly those that had clear benefits for consistently compliant stakeholders.

In some cases, however, interviewees displayed ambivalence about the trial or finding out more about the trial because they believed the incentives on offer would “not come to fruition”, or that “it was just a trial and nothing had officially changed”.

These attitudes which signal a lack of engagement can, in addition to the implementation issues discussed in the previous chapter, help explain not only the low participation rates seen in the trial, but other implementation issues experienced during the trial, including the misapplication of the ACC to ineligible consignments.

Additionally, although many interviewees expressed early interest in the intentions of the trial, this did not necessarily always translate to an immediate expression of participating in the trial. For example, one broker noted about the trial:

I couldn't go back and educate my client and say to him it would be a three per cent referral rate drop ... there were uncertainties of what this program will mean to the client.

The most common general considerations among interviewees that deterred them from participating were that the time-frames for the trial were unclear, and they needed to spend more time considering the costs and benefits of participating. Later interviews showed ten importers and/or brokers' clients who were actively participating in the trial. Various considerations specific to commodity type and business-as-usual processes can help contextualise how stakeholders constructed and valued incentives to participate in the trial. These are briefly discussed below.

Peat

Many stakeholders on this pathway originally reported a high degree of interest in participating in the trial because peat is a particularly clean commodity from a biosecurity perspective. The change in the types of peat eligible for the trial, from peat (including with additives) to just pure peat, generated the most amount of confusion among peat importers and their brokers, since peat importers reported applying the 'FERT' ACC early. This change prevented many importers from further participation in the trial because they did not import pure peat at all, or in large enough quantities to generate any benefit from the compliance-based inspection regime. Finally, peat importers and their brokers noted that since peat consignments with a rural destination were still subject to tailgate inspections, the overall benefits to participating, such as through time savings, were somewhat lowered.

Vegetable seeds

A distinct set of vegetable seed importers were more reticent about participating in the trial. Almost all the interviewees who were seed importers, or had client who were, noted that the requirement for all seed consignments – including under 10kg lots – to have an ISTA certificate would deter them from participating in the trial. Interviewees reported that this was due to a combination of:

- the cost of the tests themselves, particularly for multiple eligible seed lines in a single consignment; and/or
- the time required to generate the certificates for each line of eligible seed.

Additionally, these importers represented a more complex pattern of importing. Several scenarios were raised and discussed by the interviewees importing in this pathway, with each scenario presenting a different set of incentives and considerations for them. Table 5 summarises these considerations for consignments containing single seed lots of only eligible seed for the trial.

Table 5. Incentives for vegetable seed importers under the CSP-1 rule.

	Consignment type	ISTA required under standard import conditions?	ISTA required (obtained offshore to be eligible for the trial)	Primary on-shore inspection	Trial mechanics after 10 consecutive passes	Implications for participation in trial
	<i>Single seed lines only seed eligible for trial in consignment</i>					
1	Under 10 kg line, any size	N	Y	Visual	75% of consignments cleared after document assessment	Importers need to balance the cost of an ISTA certificate obtained offshore at a department-approved laboratory versus potential savings (time and cost) from saving an onshore inspection. This is likely to reduce participation in trial as offshore ISTA certificates are relatively expensive.
2	Over 10 kg line, > 8 mm in diameter	N	Y	Visual		
3	Over 10 kg line, < 8 mm in diameter	Y	Y	If no offshore purity test - Visual + ISTA sampling onshore If offshore purity test – Visual/verification (match lot numbers on ISTA certificate etc.)	All consignments inspected, no inspections saved 75% of consignments cleared after document assessment	Potential reduction in burden, depending on the relative cost of offshore versus onshore ISTA sampling. For those already getting offshore ISTA certificates, the trial should lower compliance costs.

From the perspective of importer incentives, in determining whether to be part of the trial for seed lots less than 10 kg, an importer would need to weigh up their current costs of importing with:

- the costs of having each line of eligible seed tested overseas in department-approved laboratories;
- the delays induced by offshore testing and generating certificates for each line of eligible seed before the shipment left their source country;
- the delay costs that might occur initially from splitting up a multi-line consignment into eligible and ineligible seeds; and
- the anticipated savings in inspection costs and delays at the border that would occur once eligible imports were subject to lower inspection frequency under the CSP-1 algorithm applied under the trial.

To help understand the incentives for participation better, the project team included questions on the costs and delays involved in both offshore and onshore testing in the second round of importer interviews. Relatively few importers of eligible seed lines who brought in lots under 10 kg systematically tested their goods offshore. Those who did this mainly used offshore testing as a way to guarantee the quality of their goods. In contrast, offshore testing was conducted routinely among importers bringing in larger consignments.

The costs and time involved in testing varied substantially according to each importer; for example, the costs involved in offshore testing varied from slightly under AUD100 per seed line to more than AUD1 000 per seed line reported in one case. Notwithstanding the range of responses, importers tended to consider onshore testing cheaper and less time-consuming than offshore testing. As such, this invariably meant it would not be beneficial for many importers to participate in the field trial where they were importing seed lines less than 10 kg, since ISTA purity testing was not mandated.

Another common issue raised in the interviews was that vegetable seed importers often imported multiple seed lines in a single consignment, including lines that were not eligible for the trial.³⁹ The trial mechanics for these consignments was unclear to importers, because they frequently understood the trial applied at the consignment level, and that all lines in the consignment would be treated equally. Instead, the determination as to whether a physical inspection was or was not required once an importer was in monitoring mode was made at the line level. This meant some seed lines would likely be flagged for inspection even in multi-line consignments that contained only eligible seed.

For importers bringing in multiple seed lines as part of a single consignment to realise a reduction in inspection burden by participating in the trial, either:

- customs brokers or importers would need to split lines cleared after document assessment, only forwarding those lines requiring physical inspection; or
- inspection officers would need to distinguish between lines that did and did not save inspection and adaptively apply different clearance procedures to each seed line.

³⁹ The need to apply the ACC at the line level would have also had an impact on brokers, since they would be required to identify seed and then lodge eligible and ineligible seed separately in the ICS.

The interviews with stakeholders suggested that there was little incentive to split lines, owing to the cost of doing so relative to the time saved in releasing these lines earlier. Therefore, those importers who regularly import consignments containing lines of both eligible and ineligible seed were not likely to experience a reduction in inspection burden, reducing their incentive to participate in the trial.

5.3 Understanding and experience of the trial

Stakeholder awareness and understanding of the trial

The effectiveness of the communication strategies adopted for the field trial was assessed by asking stakeholders and operational staff to describe their awareness and understanding of the field trial. As previously mentioned, high levels of awareness and understanding of the trial mechanisms was critical for:

- stakeholders to understand the benefits of participation and therefore modify their behaviour; and
- document assessment and inspection officers to correctly implement the principles and procedures required for the trial.

Phase I interviews with stakeholders revealed that early engagement with the trial was, in some respects, compromised by the broader changes to the biosecurity regulatory environment during the period. Phase I interviews were conducted between August and December 2016, during which time interviewees, when asked to describe their “understanding of the trial”, systematically associated the trial with “changes to quarantine clearance methods”. For peat importers in particular, the trial was perceived to relate to changes to the import permit system.

Phase II interviews were conducted between April and June 2017 and demonstrated that, while there was a higher level of awareness of the ongoing field trial on the two pathways, there was still widespread confusion about the trial’s aims and mechanics. This wide distribution in understanding may be linked to the complex operating environment, which influenced the way in which protocols changes could be effected, and the implementation issues experienced over the course of the trial, as discussed in Chapter 4.

It was identified that a number of interviewees during the Phase I interview process first found out about the trial during the interview itself. Interviewees who reported *prior* knowledge of the trial reported the following common sources for finding out about the trial:

- BICON case alert;
- direct e-mail communication by the department;
- direct communication by the CEBRA team through phone and/or e-mail, particularly for those stakeholders who participated in the first set of interviews conducted for CEBRA Project 1304C;
- the ASF conference presentation in Melbourne on 25 August;
- the CBFCA newsletter or a CBFCA-delivered continuing professional development course; and
- word-of-mouth, with importers learning from the brokers or brokers learning from their importer clients.

Seed importers displayed the highest awareness of the trial. As one importer observed:

My feedback is positive. I think you went through the right channels. Once you start to communicate with the Australian Seed Federation ... then that information quickly funnels out to all members. They're all of the reputable businesses within this country... I think everything has been pretty clearly communicated.

Brokers, on the other hand, noted that they commonly first learned about the trial from their clients. This was a source of frustration, as both brokers and importers consistently noted that monitoring and disseminating relevant changes in biosecurity regulation is the purview of customs brokers. Many brokers and importers noted that they communicated with each other on finding out about the trial. Therefore, the rapid dissemination by word-of-mouth was a frequently cited source of information about the trial.

On first finding out about the trial, a number of interviewees reported going to the department's website for further information. They reported mixed success on finding the specific trial webpage on the department's website. Many stakeholders also repeatedly identified the variable knowledge of the trial among departmental officers as a point of confusion. One interviewee noted that, on asking one officer, they were told that the opposite – that stronger inspection protocols were to be expected on the associated pathways.

Another interviewee framed their expectations slightly differently, noting the department could have done more to improve awareness and potential participation in the trial:

if they [officers] notice customs entry coming in with Tariff Item 2703 or HSC Code 2703 and no Commodity Code, they could probably zero in on that and go to that broker and say, look do you realise that you could use the Commodity Code FERT...

Many stakeholders who received a targeted e-mail about the trial expressed positive feedback to this approach, particularly given the background context of the wider changes to the biosecurity system.

For those interviewees who had heard about the trial, but displayed mixed understanding of the trial, the most common points of confusion surrounded the eligibility and mechanics of trial. For example, some interviewees thought the accumulation of ten consecutive passes was determined by supplier not by line or importer. Other stakeholders thought all eligible lines would automatically qualify, while some confused the exact percentage of inspections required when an importer was in monitoring mode for this trial with other parameters under the related CBIS. When probed, this confusion appeared almost always to be related to the sources through which stakeholders learned about the trial, and to the incentives each stakeholder perceived in participating in the trial.

Using the ACC

One aspect of the trial that almost all interviewees reported knowledge of was the availability of the two ACCs – 'FERT' and 'LSTD' – required to participate in the trial. Almost all interviewees reported receiving timely communication about these

codes, and how to apply them. None of the interviewees reported problems with the software; many interviewees specifically noted that the communication they received – including follow-up phone calls – was “ample”, “good” and detailed. For the few interviewees who had not heard of the codes, they too reported having the codes as drop-down fields in their software program. Overall, the manner in which the introduction of these codes was managed and communicated was successful.

This ease of use accompanied by mixed understanding of the trial and eligibility to participate likely explains the misapplication of the ACC identified throughout the trial, of which the majority were ineligible species of vegetable seed. For example, an analysis of AIMS data suggests at least 16 per cent of all lines lodged with the ‘LSTD’ ACC were from ineligible seed genera.⁴⁰ Estimations of incorrect use of the code requires significant manual retrieval; therefore, it is likely that the rate of misapplication of the code would increase if non-adherence of offshore ISTA testing requirements were also included.

Document assessment and inspection staff member understanding

The trial data showed a low number of saved inspections, despite both pathways being characterised by low failure rates. As discussed in the previous chapter, the correct application of the trial lay almost exclusively on the correct execution of procedures listed in BICON and work instructions by operational staff members. As will be discussed in Chapter 6, participating importers’ track-records demonstrate that they should have realised greater benefits from participating in the trial than they did. The unavailability and issues surrounding the dashboard system appears to have contributed to the lack of realised benefits, with AIMS data from the trial recording staff reporting comments, including:

- “Dashboard not working”;
- “Dashboard returned nil result”;
- “Eligible for reduced inspection trial ... Dashboard not working”;
- “No status in CBIS dashboard after 30 minutes so applied inspection line”;
- “1hr 20min processing system delays with dashboard”; and
- “...dashboard results have confused processing staff”.

A first pass of AIMS data found over 130 instances of reported issues with BICON, the dashboard, or both.⁴¹ Additionally, it appears some document assessment staff did not attempt to access the dashboard when assessing the documentation of eligible consignments. Finally, there were repeated instances that reflected mixed understanding of the trial by operational staff members, including their supervisors, which resulted in misapplication of the trial mechanics as discussed in Chapter 4.

⁴⁰ This estimate was based on a preliminary analysis, and it is possible that a more detailed analysis of all comment fields would find further instances of ineligible genera where the ACC ‘LSTD’ was applied.

⁴¹ In examining AIMS data, the CEBRA project team noted incidences where a comment on one line within a consignment was applied to all lines even if it was not completely relevant to these. If this occurred for comments on difficulties with the BICON and/or the dashboard system, this would inflate this count of issues. Conversely, a more thorough investigation of the free-text comment columns may reveal hitherto undetected instances of issues with BICON and/or the dashboard system, or a greater number of those issues found in the preliminary inspection.

The cumulative effect of these issues is reflected in the track-records of participating importers, many of whom achieved ten consecutive inspection passes, but:

- did not qualify for monitoring mode; or
- qualified for monitoring mode and did not realise the compliance-based inspection benefits.

Inability to track or monitor ongoing participation

Several interviewees noted they would have liked a confirmation of their participation in the trial and/or a way to monitor where they were the CSP-1 algorithm that determined whether or not their consignments were subject to inspection. As one interviewee noted:

we were never guaranteed that they'd actually picked it up [first pass with community code applied] and used it as their first tick to continue on the scheme.

For the field trial, an importer or broker would have to request clarification of where in CSP-1 algorithm they were, as this information could not be automatically generated and was not regularly reported to them. The track-records of importers participating in the trial, supported by the interview data, suggested only a few importers actively monitored their compliance history and followed up with the department about the benefits they should have realised by participating in the trial.

This behaviour suggests there is merit in investing in future systems capability that enables stakeholders to easily track their progress in compliance-based inspection schemes. Doing so will potentially reduce their uncertainty, as well as decrease the burden placed on departmental staff by enquiries about unrealised benefits. It will also enable stakeholders to associate the rewards of participation more transparently and easily in a compliance-based inspection scheme and foster behaviour that aligns with the department's underlying policy objectives. This view is supported by the changes in behaviour elicited by the feedback reports, as discussed below, and is in line with the behavioural economics literature that shows providing particular feedback to stakeholders on consequences of their decisions may influence future choices (Lunn, 2014).

5.3.1 New biosecurity inspection performance reports for vegetable seeds importers

Biosecurity inspection performance reports

Vegetable seed importers received targeted feedback reports, as discussed in Chapter 3.3. Between October and December 2016, customised *Biosecurity inspection performance reports* (feedback reports) were sent to vegetable seed importers, detailing their compliance record for a two-year period ending 26 August 2016 for all seed lines imported during that period; see Appendix A for an example report. Subsequently, a modified version of this report was sent to vegetable seed importers every three months for the duration of the trial, showing compliance for eligible and ineligible seed lines. The CEBRA team sought comment and feedback about the usefulness of the report from seed importers who participated in both interview phases (Appendix C).

Overall, the feedback from importers about the aim and nature of the report was generally positive. Some participants were unable to comment on the specific

usefulness of the report to their organisation because, at the time of the interview, they had not received their individualised report and could only comment on the example report distributed to attendees at the ASF conference presentation if they attended. In a small number of instances, the CEBRA team were able to get Plant Import Operations Branch staff members to send the tailored report to the interviewee after the interview and elicit feedback via e-mail. For other interviewees, the CEBRA team used the sample report generated for the ASF conference to discuss the content and general aims of the report, and still sought feedback on the potential usefulness of such reports to importers.

Based on the feedback provided by the importers, it was clear that the type of supply-chain model a business participates in, and the frequency and volume with which they import seeds, was directly related to:

- the usefulness of the report in providing new business insights to them, and
- the likelihood for the reports to support or drive changes to improve biosecurity compliance.

For example, importers with a large or diverse network of suppliers, who may also engage multiple customs brokers, and import a number of seed lines are most likely to both:

- benefit from the information provided in the report; and
- be most likely to use that information to drive or inform future behaviour.

Conversely, importers with:

- a long-standing high rate of compliance through investing heavily in quality assurance processes;
- are typically in a vertically-integrated supply-chain model; or
- have long-standing relationships with one or two suppliers,

recorded mixed feedback about the usefulness of the report. As one such interviewee described it, the new report was “interesting, but not useful”, because they already knew their compliance record was strong. However, others in a similar supply-chain model described the report as being valuable confirmation that their internal quality assurance processes are working and validating their continued investment in ensuring their goods remain compliant. Therefore, there may still be value for these importers to receive such feedback, particularly from the department, as it serves as external validation of good practice.

Driving desired behaviour

Importers identified a number of different ways in which this report, and future reports, might drive internal operational change that has positive biosecurity implications. For example, one importer with a diverse supplier network noted the following:

We may choose to use that report when we have dialogue with our suppliers going forward, because I don't think sometimes suppliers necessarily take heed of all of the occasional rejection and/or requirement for additional cleaning on-site in Australia of seeds supplied by them. So, that actually becomes an important document for us.

We've got two suppliers in [country], where they're constantly giving us seed, giving us reports, telling us that it's all good and then the seed arrives here and we'll find something in it. Those reports, ultimately, will determine which companies we continue to do business with.

Several importers with similar supply-chain models echoed this sentiment, emphasising the value of these reports:

- as a tool in identifying repeatedly problematic suppliers;
- as a reminder to re-visit and reflect on past problems that could be overlooked in fast-paced operational environments; and
- in validating or demonstrating trends over time.

Improving quality of AIMS data

A second outcome identified by importers was that the report provided them prompts to refine the quality of the information being entered in Full Import Declarations in the ICS by customs brokers. The first feedback report revealed to some importers the extent of the inaccuracy or incompleteness of data being systematically lodged on their behalf by their customs brokers. For example, several importers noted incorrect supplier information, or incorrect seed lines against a consignment. As data gathered in this set of interviews demonstrates, brokers and importers largely discuss issues with short-term goals in mind, such as:

- completing information for permits;
- coordinating activity; or
- adjusting for immediate circumstances related to a generated direction or inspection outcome.

However, once the consignment has been released, there appears to be very little retrospective reflection, particularly on what are considered minor issues. This includes the exact detail submitted by the brokers into the ICS.

Importers reported their intention to raise this with their brokers, with Plant Import Operations Branch staff members noting that the goods description field tended to include more specific information on the type of seed imported relative to the period before the first feedback report was issued.⁴² This behaviour is an example of a “footstep of beneficial change”, as it ensured more detailed information on seed imports was available to the department. This also had indirect regulatory implications, as the department sought to incentivise behaviour that promotes biosecurity compliance. That is, equipping importers with accurate and comprehensive information that reflects their biosecurity compliance record by supplier, and by seed type, will help promote business decisions based on the closest

⁴² As discussed in Chapter 4.1 of Rossiter *et al.* (2016), customs brokers tended to use the goods description provided on the invoice or bill of lading when preparing their ICS entries. Under mandatory inspections and where structured feedback was not provided to stakeholders, there was little incentive for suppliers or importers to include further detail on their consignments that could assist classification at a finer level. For example, the description “vegetable seeds” or “seeds for sowing” was frequently used in preference to descriptions that could indicate the botanical or common names of the seeds.

possible version of the truth. It will also improve the quality of AIMS data the department can draw upon in future to:

- understand pathway complexities;
- determine patterns of compliance and non-compliance as part of routine monitoring;
- assist the rectification of processes by the department; and
- provide better information to use as an input to biosecurity policy.

Future reports – outcomes, feedback and considerations

Since the launch of the feedback reports to vegetable seed importers in late 2016, the department has used a similar reporting format to send end-of-season compliance reports to importers on select CBIS pathways, including importers of US lemons and limes, US stone fruit and NZ avocados. Additionally, feedback reports have been sent out as a part of a set of regulatory changes made to cut flower import conditions.

Suggested changes to the feedback reports from interviewed vegetable seed importers appeared to be related to flexibility for stakeholders to receive reports that aligned with their individual business needs and reflected individual frequency and volume of imports over a given time frame. Some of the options included importers being able to:

- use an online interface to generate their own tailored reports. ABARES has recently moved towards this form of report generation for their land-use reports and the *State of the Forest Report*⁴³ and have reported increased readership as a result. In the context of individual importer feedback reports, however, consideration would have to go into ensuring that each importer's consignment details were kept private and only available to themselves, consistent with provisions under the *Biosecurity Act 2015* and *Privacy Act 1988*; and
- vary the frequency of the reports. Interviewed vegetable seed importers who had very few inspection failures, were in long-term partnerships with their supplier(s) or were part of a vertically integrated supply chain found the quarterly reports less useful than the initial two-year report.

From the department's perspective, future feedback reports could include additional metrics to help the department drive desired behaviour. This could include, for example, reporting importer performance against aggregated data for the specific commodity or pathway that transparently maps individual importers against their competitors. Consideration would have to be given to ensure this type of biosecurity performance benchmarking did not enable, with a reasonable likelihood, individual importers to be re-identified from information supplied by the department. As such, these measures may not be appropriate for all commodity types, particularly those where imports are dominated by a few significant entities.

Alongside these reports, the department could use the types of measures discussed later in Chapter 6 to evaluate the impact of routine feedback reports on importer behaviour. Specifically, the department could assess whether importers are tending to switch away from suppliers with higher failure rates to those with lower failure rates.

⁴³ See <http://www.agriculture.gov.au/abares/forestsaustralia/sofr> for more information about reports in this series.

The department may also be able to assess any pathway-level changes associated with the pattern of imports, such as if some importers with lower failure rates are importing more frequently. These evaluation approaches would ideally be accompanied by targeted stakeholder interviews, to assess how the feedback reports may be influencing importer and supplier behaviour in less obvious ways.

A suggested improvement from operational staff members interviews was to provide importers with information on their brokers' documentation compliance.⁴⁴ This reflected document assessors' combined experience that brokers face few consequences for consistently lodging inaccurate documentation and this type of reporting could create an incentive to boost broker compliance. This could be achieved by:

- reporting numbers of documentation errors; and/or
- implementing a system of warnings or blackmarks which allows importers to monitor and understand how their brokers are performing.

The notion that this type of framework could be effective in reducing documentation issues draws on similar behavioural links to those found in a recent randomised control trial (Australian Government, 2018).⁴⁵

⁴⁴ To implement this suggestion, consultation with the Department of Home Affairs would be required, since they are the body in charge of licensing customs brokers under the *Customs Act 1901*. For more details about customs broker licensing arrangements, see <https://www.homeaffairs.gov.au/busi/cargo-support-trade-and-goods/licensing/for-customs-brokers>.

⁴⁵ This study, in the public health domain, suggested that peer benchmarking and tailored communication could reduce the incidence of somewhat undesirable practices of over-prescribing antibiotics among those general practitioners with the highest rate of prescriptions.

6 Identifying Stakeholder Behaviour Changes in Response to Regulatory Changes

The department's interest in using compliance-based inspection protocols relates to progressing three objectives, namely:

- encouraging biosecurity system stakeholders, particularly importers, to make changes to their operations consistent with lowering the approach rate of biosecurity risk material arriving at the Australian border;
- reducing the costs of regulatory compliance for stakeholders who maintain strong biosecurity standards in line with Australia's import requirements; and
- reducing the relative effort and resourcing levels applied to pathways that represent a lower threat to the overarching biosecurity objective of preserving Australia's human, plant and animal health at a high level to allow more resources to flow to pathways that represent greater threats.

This chapter assesses the first of these objectives by investigating the response of stakeholders on the pure peat and selected vegetable seeds pathways to the new inspection protocols. The second objective, relating to compliance costs, is assessed in the following chapter. Given the relatively small scale of the two field trials, progress towards the third objective is deferred to future investigation when the scale and scope of protocol changes will allow for a robust analysis of system-wide resource reallocation.

Identifying and characterising the potential behavioural responses from import-supply chain participants on the trial pathways requires drawing on evidence available through:

- the department's import databases (AIMS and Incident)⁴⁶ to identify potential changes in importer patterns of behaviour; and
- interviews with importers and customs brokers, which allow for self-reporting of behaviour changes and the reasons why such changes have been instigated.

We first introduce the approach used to identify behaviour changes in the field trial context before assessing evidence of whether changes, either positive or negative, appear to have occurred during the trial.

6.1 Measuring biosecurity outcomes in the field trial

The main aim of the trialled protocol is a reduction in biosecurity risk material coming in to Australia. One way of measuring whether this happens would be through a leakage survey, which would involve checking (or re-checking) every consignment imported whether it had been inspected or not. Instituting this arrangement as part of the trial would have been an expensive process; furthermore, it would have undermined attempts to change the biosecurity-related delay costs faced by highly compliant importers relative to those importers who tended to have lower rates of compliance.

Decrouez and Robinson (2018) developed statistical methods that enable confidence-interval estimates of the approach rates for pathways subject to inspection rules based on the CSP family. In principle, these estimates can be compared to the approach rates

⁴⁶ See Appendix G for a detailed discussion of these databases and data cleaning procedures.

under the mandatory inspection scheme that applied before the trial commenced. This approach would allow the department to assess whether there may have been a positive (or negative) impact on approach rates associated with the introduction of compliance-based inspections. Given the implementation issues faced during the trial and the small number of lines that were released on compliant documents alone in practice, we leave this type of investigation and illustration for future research on other pathways.

As an approximation, it is possible to compare the inspection and quarantine failure rates of importers before and after the trial, essentially ignoring those (few) consignments that saved inspection.

6.2 Measuring stakeholder behaviour change in the field trial

When it comes to identifying how and why stakeholders have responded to the trialled protocols, the field setting poses several measurement challenges. In the laboratory-based economics experiments used in CEBRA Project 1404C, all relevant data were recorded throughout the experimental sessions, as the controlled environment narrowed the focus of potential behavioural responses down to the choice of supplier. However, in the field, the lag times for behavioural responses may be long and the outcomes are difficult to track, since responses may manifest themselves across several dimensions of interest.

The next best approach to identifying responses to the different incentives facing importers under the compliance-based inspection trial is to observe what can be referred to as the “footsteps of beneficial change”. This means looking for and systematically observing changes in behaviour that imply that the biosecurity system is, ideally, moving to a better outcome. CEBRA Project 1304C described several types of changes that could be conceived as beneficial for the biosecurity system during a trial of designed protocols. While some footstep measures are more directly relevant to the department in designing border inspection protocols, understanding the scope of indirect behavioural change is critical, given such responses could strengthen (or potentially undermine) the efficacy of compliance-based inspection protocols as a regulatory strategy.

Whether potential behaviour changes are observed depends on the particular circumstances of importers and suppliers. Given the differences in capability, technology and costs for different importers and their suppliers, different types of importers could be expected to respond differently to inspection protocols changes. Critically, the extent of changes in behaviour will likely depend on how well the new protocols are implemented; for instance, significant changes within the supply chain may only be instituted if stakeholders “trust” the department to implement compliance-based inspection systems on an ongoing basis.

For both the selected vegetable seeds and pure peat pathways, the analysis of interview and import data suggested no evidence of substantial behaviour change among import-supply chain participants directly related to the trialled protocols. This was largely as expected, because both pathways were already very “clean”, with most importers having low inspection and quarantine failure rates. Furthermore, well-established industry protocols and standards that support biosecurity risks being managed well throughout the import-supply chain would limit the potential for further action to be readily identified.

The following sections illustrate how insights from import data⁴⁷ can be combined with evidence from stakeholder discussions to assess the extent of behaviour change in response to new biosecurity protocols. The remainder of the chapter focuses on evaluating behavioural responses for the selected vegetable seeds pathway, with Appendix I providing analysis for the pure peat pathway.

Before proceeding to analysing the available import data, one major caveat is that information in the AIMS database does not allow a “pure” before-trial comparison group to be readily constructed. This is because only a subset of entries recorded under the relevant HS tariff code were eligible for the trial. In attempting to generate an appropriate pre-trial comparison group, the project team used the goods description category entered by the customs broker into the ICS and free-text comments added in AIMS by document assessment and inspection officers to try to gauge whether a given line would have been eligible for the trial.⁴⁸ The problems associated with relying on free-text fields were well-understood from CEBRA Project 1304C. For example, brokers often used generic descriptions such as “vegetable seeds for sowing” in the pre-trial period for entries brought in under the HS tariff code 1209.91.00. Similarly, comments from department staff were also frequently generic and did not refer to either the common names, genera or species identifiers. As a result, many ineligible lines are probably included in the before-trial comparison group, meaning evidence of behaviour changes from AIMS data should be treated with caution.

6.2.1 Inspections saved during the trial phase

One obvious measure is the number of physical inspections saved by importers through the trial phase⁴⁹, both in absolute terms and relative to the theoretical “best case” of a fully compliant importer⁵⁰. Given the implementation challenges identified in Chapter 4, the number of inspections saved will be far less than the theoretical “best case”, even for importers with a strong compliance record.

On the selected vegetable seeds pathway, eight importers received the benefits of compliance-based intervention at the border, with 67 line entries in total not requiring inspection. However, the importer track-records available in AIMS for those using the “LSTD” AQIS Commodity Code suggests many more vegetable seed lines could

⁴⁷ An extension to the analysis shown in this chapter would be to control for importer characteristics, such as through regression analysis. If significant behaviour change were identified, this would enable us to address questions such as the importer or supply-chain characteristics more likely to be associated with behaviour change. As noted in Appendix G, the AIMS database captures a limited set of importer characteristics which can be inferred from import patterns. The semi-structured interview templates, shown in Appendices C and D, allowed some additional characteristics to be discovered for some importer stakeholders. Given the limited evidence of behaviour change in this trial, the project team decided not to pursue this level of analysis at this time.

⁴⁸ More details on the approach used to generate a pre-trial comparison group can be found in Appendix G.

⁴⁹ The number of importers meeting eligibility for the lower inspection frequency at a given point in time could be a measure of potential behavioural responses at the pathway level. Because of implementation issues, the project team chose not to assess this as part of this report.

⁵⁰ Comparisons could also be made relative to the compliance record of an importer before the trial, though this could require applying the methods used by Decrouez and Robinson (2018) to provide a more appropriate gauge of success.

have been released on compliant documentation alone.⁵¹ During the trial, one major importer brought in more than 300 consecutive lines of seed across multiple AIMS entries using the “LSTD” AQIS Commodity Code and recorded no inspection or documentation failures for these consignments. Based on that importer’s strong record, they could have expected to not require inspection for between 240 and 270 lines (with a probability of greater than 0.93). In practice, this importer only benefited from one line of seed not requiring a physical inspection.

6.2.2 Changes in consignment size and/or frequency

If an importer knows clearance of their goods through biosecurity checks is faster, cheaper and/or easier, they may look to bring in smaller shipments on a more frequent basis to reduce the holding cost of inventories in Australia.⁵² This pattern may be evident from departmental databases through changes in the time elapsed between consecutive shipments⁵³ and the distribution of consignment weights.⁵⁴ Because these changes may reflect other influences on importer operations, stakeholder interviews would be needed to verify this change was in response to the incentives for good compliance available through the trial.

Of the vegetable seed pathway stakeholders participating in second round of interviews, many indicated that the size⁵⁵ and frequency of consignments had not changed because of the trial. Some noted slight increases in the frequency of shipments, but this seemed to reflect market conditions rather than taking advantage of the faster clearance times that would have been afforded through the trial.

The distribution of consignment weights for a given importer, where distributions have been calculated on a quarterly basis, is shown in Figure 6. The use of quarterly breakdowns for calculating the distribution of weights acknowledges that the timing of changes may not exactly coincide with the trial’s start date; doing a simple before versus during trial comparison may miss any adjustment phase that importers go through in adapting to the new protocols. To alleviate potential scaling issues, the weights are expressed as the base-10 logarithm of the weight of the consignment in kilograms.⁵⁶ Based on Figure 6, the distribution of consignment sizes has seen little change between the pre-trial and trial comparison phases; the main difference appears

⁵¹ Some lines with “LSTD” applied by customs brokers are likely to have been ineligible for the trial and therefore unable to be cleared on documentation alone. The incomplete way in which information on trial eligibility was recorded in AIMS means it is difficult to measure how many consignments could have saved inspection in a “best case” scenario.

⁵² While this is one form of “beneficial” behaviour, changes in the size and/or frequency of shipments could represent a negative development from the government’s biosecurity objective, particularly if importers seek to “game” the system by timing consignments strategically to take advantage of the lower frequency of inspection offered in monitoring mode.

⁵³ This comparison is made possible because AIMS records the date and time when consignments are lodged by brokers. Since vegetable seed importers often bring in multiple lines of seed under the one AIMS entry, interarrival times are calculated as the difference in time between different AIMS entries rather than line entries. This better reflects importers’ operations and avoids having a significant mass of the probability distribution at zero.

⁵⁴ The AIMS database captures this information since customs brokers are required to provide information on the size of consignments as part of the lodgement process.

⁵⁵ Although not connected with the trial, one importer’s vegetable seed consignments were observed to increase in size because of changes to the department’s onshore testing requirements.

⁵⁶ This means a one-tonne consignment would have the value of three and a one-kilogram consignment would take the value zero in this figure.

to be the absence of large consignments exceeding one tonne during the trial period.⁵⁷ That said, this change in the log-weight distribution of consignments before and during the trial for this importer is confirmed by the two-sample Kolmogorov-Smirnov test, for which the null hypothesis of equality of distributions has a p-value of around 4×10^{-8} . Furthermore, the figure shows around three-quarters of this importer's consignments during the trial period were less than 10 kg⁵⁸ – a threshold for which ISTA purity testing is not mandated for seeds entering Australia.

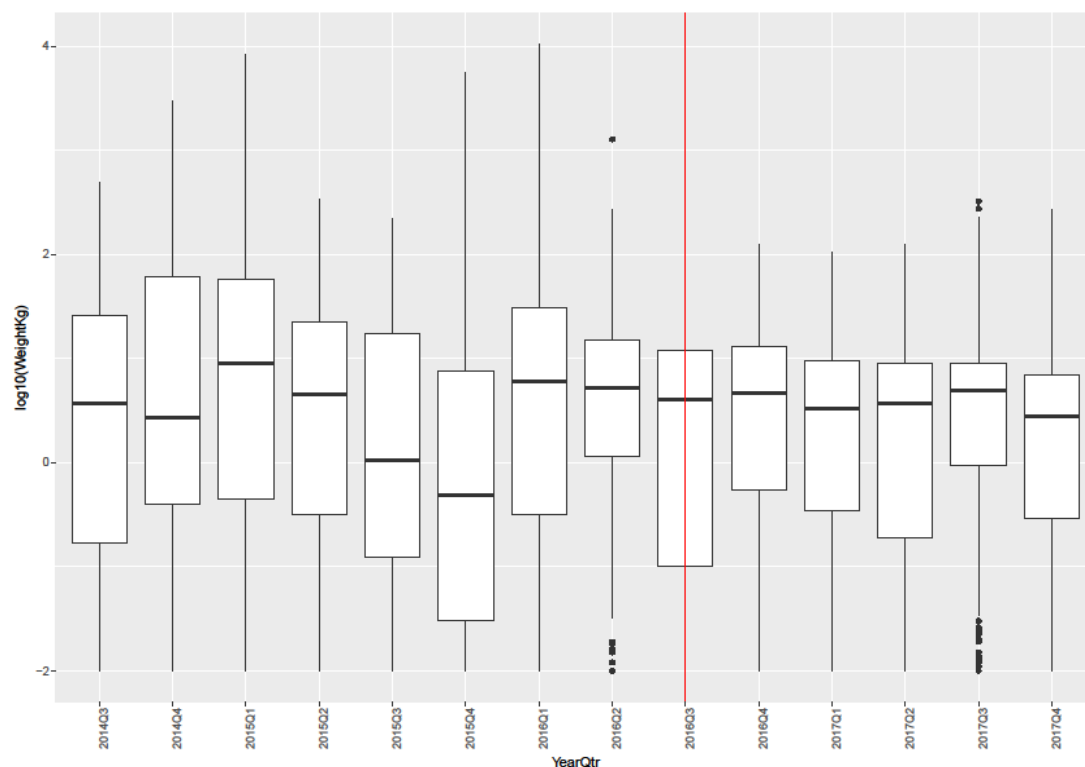


Figure 6. Boxplots of the distributions of consignment weights for selected vegetable seeds, before and during the trial for a given importer

Note: The red line on the chart indicates the quarter (September quarter 2016) when the trial formally commenced and separates the pre-trial and trial periods.

Figure 7 shows the variability in duration of time between consecutive AIMS entries for vegetable seed importers participating in the trial. The figure suggests inter-arrival times for vegetable seed consignments may have increased during the trial period, though this may reflect problems with constructing the pre-trial comparison group.

⁵⁷ In part, this may reflect the difficulties associated with splitting eligible from ineligible lines in the pre-trial phase.

⁵⁸ This corresponds to the value 1 on the y-axis in Figure 6, given the base-10 logarithm scale.

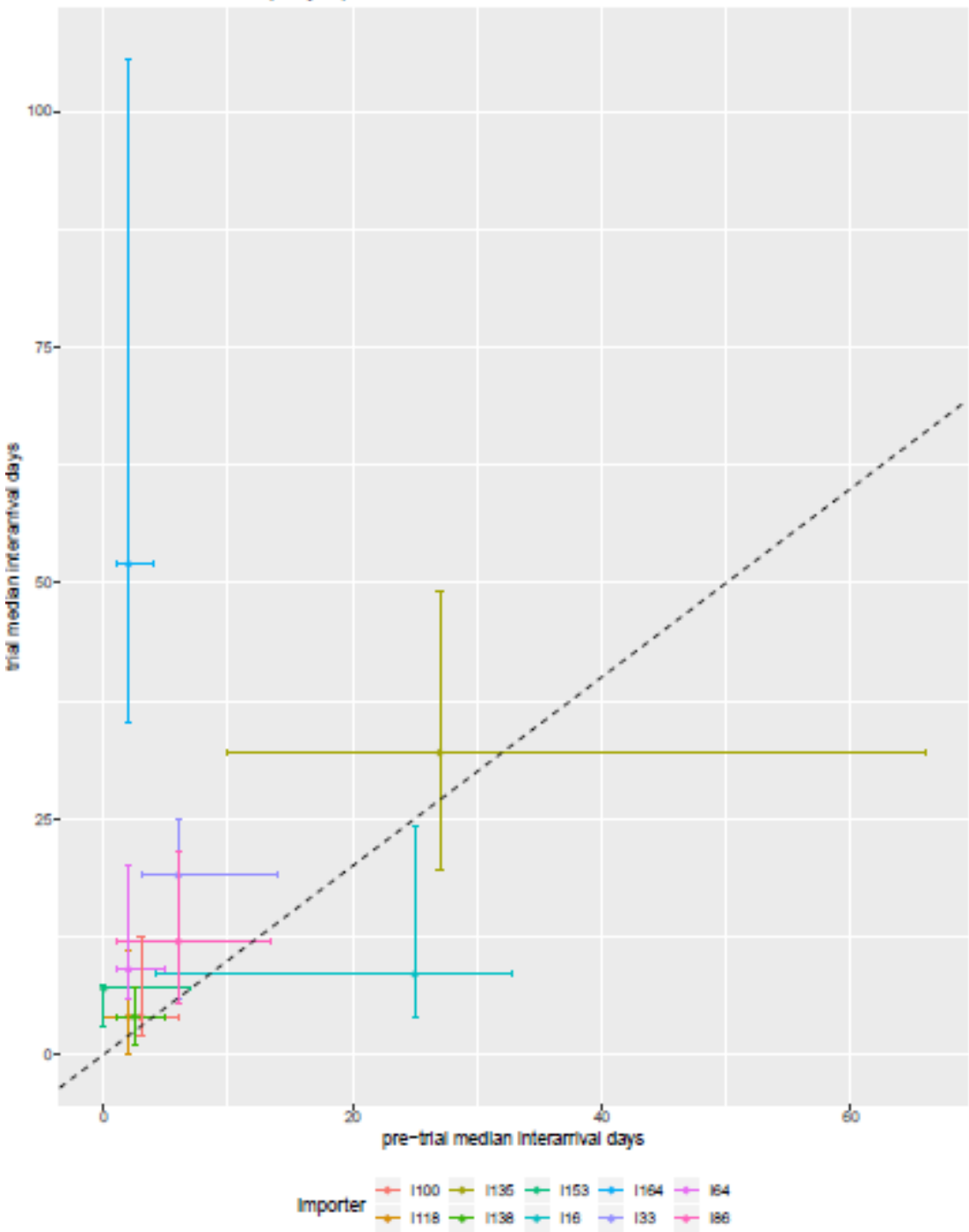


Figure 7. Inter-arrival times for selected vegetable seeds, before and during the trial for a number of importers. Bars show the range of vales from first to third quartile of inter-arrival times; the dashed lines indicates equality of pre-trial and trial median inter-arrival times.

Note: Importers are restricted to those with a minimum of five inspections in both pre-trail and trial periods.

6.2.3 Changing suppliers and/or source countries

Importers could seek to take advantage of the cost savings available from switching suppliers and/or source countries with lower inspection failure rates. This behaviour could be attributed to the incentives for good compliance if the importer's current supplier or source country is associated with frequent inspection failures, and the importer knows of other suppliers or source countries with better compliance records. Evidence of switching behaviour should be available from departmental databases through changes in the composition of suppliers and/or source countries. Importers' motivations for these changes will need to be verified through the interview process to avoid identifying changes attributable to other operational considerations.

The extent to which this behaviour can be observed depends on the structure of the import-supply chain. Vertically integrated importers cannot readily switch their overseas suppliers, so only those with a diverse range of suppliers could be expected to exhibit this type of behavioural response. Changing suppliers may be difficult for importers with longstanding commercial relationships; stakeholder interviews in CEBRA Project 1304C highlighted there could be significant costs associated with switching suppliers, including the effort required to build trust in key relationships. Critically, switching suppliers is something that may take time, even for importers without long-term commercial relationships. On the other hand, switching source countries may be more readily available for a range of business structures, provided goods are available from a range of locations from the same supplier.

According to stakeholders interviewed in the second round of interviews, most importers reported they had continued with their existing supplier networks and source countries during the trial. Two interviewees noted the addition of new suppliers and/or source countries, but these changes were reported to be unrelated to the new protocols.

Figure 8 shows the network diagrams for the suppliers and countries of origin for one of the larger importers in the trial;⁵⁹ the left-hand panel shows the network before the trial and the right-hand panel is for the trial period. For a given importer, behaviour changes of the type we are looking for would show up as using a different mix of suppliers and/or countries of origin during the pre-trial and trial periods. On these charts, the importer (labelled I153) is designated with a blue dot. From these diagrams, this importer used only one supplier (labelled S233) in the pre-trial and trial periods, which appears as a dot in the centre of the network diagrams, and a range of countries of origin for their seed imports, represented by dots emanating from the centre of the diagram, other than the blue dot which denoted the importer.

⁵⁹ In presenting these network diagrams and other figures throughout this report, we have ensured the anonymity of the full supply chain. Importers, suppliers and source country are labelled with numbers with the letter prefix "I", "S" and "C" added respectively.

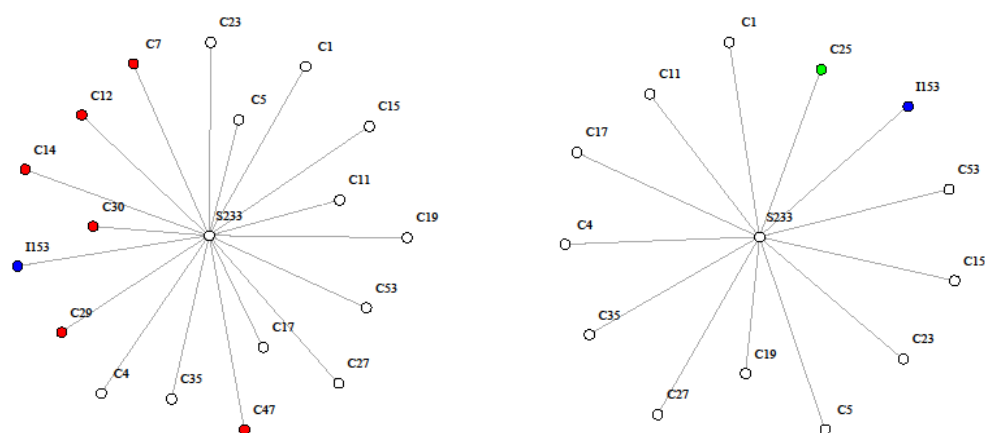


Figure 8. Network diagrams for the suppliers and source countries for a given importer, before (left-hand panel) and during (right-hand panel) the trial

During the trial phase importer I153 no longer used several source countries (labelled C7, C12, C14, C29, C30 and C47 and coloured in red on the left-hand panel) and in their place had added a new source country (labelled C25 and highlighted in green in the right-hand panel). Interestingly, this importer was interviewed and stated there had been no changes in the source countries used for their seed.

In addition to the caveat noted earlier around appropriate pre-trial and trial comparison groups discussed earlier in the chapter, the way in which brokers record the country of origin in AIMS may pose challenges to interpreting country of origin changes. This is because goods are sometimes transhipped via other countries and the country of origin designated by the broker may reflect the last port of departure, consistent with documentation presented as part of lodgement, rather than the true origin of the seed.⁶⁰ This means that information from stakeholder interviews may well be a more reliable source for understanding behaviour change than AIMS data.

6.2.4 Biosecurity risk mitigation procedures

The reward structures in the trialled import protocols may encourage changes to biosecurity risk mitigation procedures in the exporting country and in the transportation process that would, ideally, reduce the likelihood of biosecurity risk material appearing in consignments. This form of behaviour changes will only be evident from interviewing importers and customs brokers, since these processes are not directly observable from data captured in department information systems. It may be possible to confirm the effects of any process or procedural changes indirectly

⁶⁰ It is also possible that brokers may incorrectly lodge entries in ICS with the incorrect country code.

through movements in the estimated approach rate over the course of the trial using appropriate statistical procedures.

Several vegetable seed importers interviewed identified recent upstream process and procedure changes, though only some of these appeared to be related to seeds eligible for the trial. Some importers identified that process changes often occurred because of external forces, such as changes in import conditions, rather than improvements being led by suppliers.

One interviewee identified that a supplier was changing their processes to reduce the potential for seed contamination, thereby improving biosecurity outcomes at the border. Comments from other interviewees mainly related to the ability to do in-house testing for some diseases. One interviewee identified new in-house capability in one of its suppliers to test for cucumber green mottle mosaic virus (CGMMV), while another noted that internal testing capacity was being withdrawn, meaning it was no longer viable to do testing for seed lots less than 10 kg. In another case, an importer identified that testing costs were now being passed on to importers by the suppliers, though this mainly related to seed outside the scope of the trial.

6.2.5 Pathway composition patterns

At a pathway level, a beneficial change of the trialled protocols could be that certain types of importers no longer bring in goods while other types of importers (ideally with a better record of compliance with biosecurity requirements) have more and/or larger shipments. This behaviour may not be solely attributable to biosecurity rule changes; however, it might indicate that sufficiently strong rewards are available for highly compliant stakeholders, which in turn encourages a shift in the pathway's composition consistent with a lower approach rate and overall better biosecurity standards.

Consistent with intelligence from CEBRA Project 1304C, the vegetable seeds for sowing pathway features several larger importers, with a range of mid-size importers focusing on specific seed markets. Figure 9 shows the share of lines imported on the vegetable seeds pathway, with the left-hand panel showing the counts of importers (vertical axis) by market share (horizontal axis). Any importer with records in the trial period is considered, not just trial participants. The right panel shows market share counts for only trial participants in the trial period – importers represented in the right-hand panel (18 importers) are a subset of the importers from the left panel (42 in total). The smaller importers in the trial (right panel) make up a smaller fraction of the whole than small importers from the entire pathway (left panel). Clearly, the two biggest importers in the trial period are trial participants.

Overall, the graphs suggest there was no significant shift in the pattern of imports over the trial period. However, it is worthwhile noting that only a few of the more frequent importers before the trial commenced seemed to be active participants in the trial.

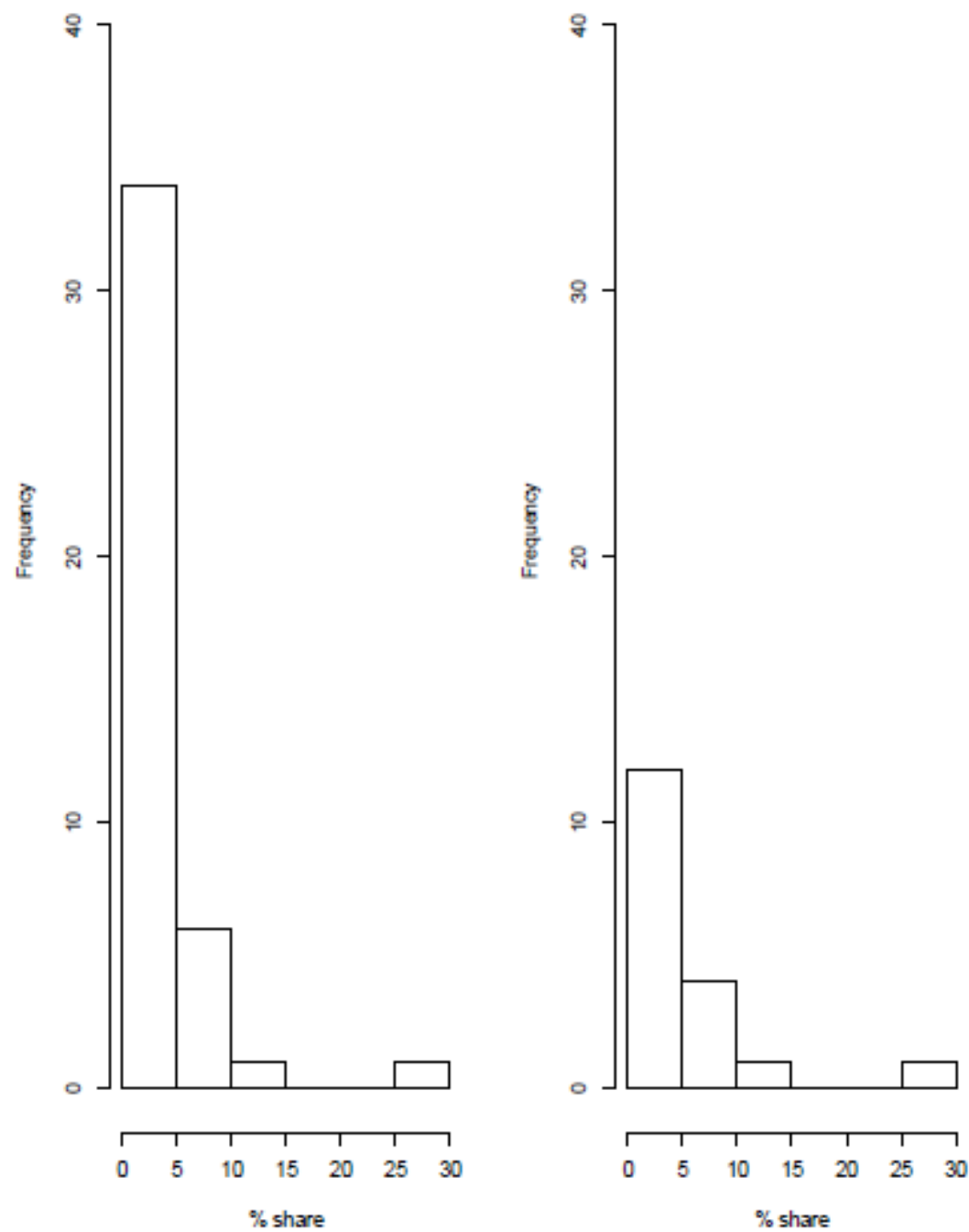


Figure 9. Importer composition changes for the vegetable seed pathway during the trial period: left-hand panel is for all importers (42); right-hand panel is only trial participants (18).

7 Identifying Regulatory Cost Savings for Biosecurity System Stakeholders

The Commonwealth Government's *Deregulation Agenda* is focused on improving the quality of regulation, which includes minimising the burden of regulation on businesses, community organisations and individuals.⁶¹ The use of compliance-based inspection protocols on select pathways is one way in which the department is seeking to fulfil Australia's overriding biosecurity objective while achieving it at a lower cost to Australian consumers and businesses.

The measurement of regulatory cost savings provides two benefits, namely:

- quantifying the potential cost reductions accruing to highly compliant importers from saving inspections, which could in turn be passed on to Australian businesses and consumers in the form of lower prices;⁶² and
- improving the understanding of financial incentives to importers whose goods are eligible to be cleared on documentation checks alone, thereby aiding the calibration of regulatory schemes that account for stakeholder incentives.

This chapter documents and applies a framework, consistent with the *Australian Government Guide to Regulation* (Commonwealth of Australia, 2014), for assessing the compliance-cost savings reaped by importers from not having each consignment inspected at the border because of their good compliance record.⁶³ It draws on information obtained through the second round of stakeholder interviews to develop indicative benchmarks for various cost components associated with a consignment underdoing (or not requiring) an inspection. While this approach only deals with biosecurity inspections, it is possible to apply methods similar to those used in this report to other pathways and other forms of biosecurity interventions.⁶⁴

⁶¹ More information about the Deregulation Agenda can be found on the Department of Jobs and Small Business' website: <http://www.jobs.gov.au/deregulation-agenda>.

⁶² These indirect economy-wide benefits accruing to Australian consumers and businesses at large is the principal reason for reducing the burden of regulation not necessary to fulfil biosecurity objectives. The focus on compliance-cost savings should not be construed as seeking to manage or improve the profitability of importers; instead, it reflects the downstream impacts of improving allocative efficiency in the Australian economy, enhancing the competitiveness of local businesses using imported products and boosting consumer welfare from enabling access to imported products at lower prices.

⁶³ If similar changes were instituted on a broader scale, it would also be expected that the department would also experience cost-savings from the new protocols, in the form fewer hours being required to be used for inspections. Given the small scale of the trial, we defer calculation of these benefits to future research.

⁶⁴ The department's internal Cargo Import Cost Model, currently in preparation, would enable these comparisons at a higher level.

7.1 Framework for assessing stakeholder costs of undergoing inspection

Importers face a variety of different costs, both direct and indirect, associated with a consignment undergoing an inspection. In addition to fees charged by the department as part of the inspection process,⁶⁵ changes in the protocols may affect importers’:

- delay costs related to the inspection process;
- costs of storage at the port and/or inspection facility;
- transport costs; and
- third-party costs arising from the need for physical inspections of cargo.

Stakeholder discussions undertaken during a predecessor project (CEBRA Project 1304C) identified several cost components related to the inspection process that could be avoided or reduced by changing inspection requirements. These savings would mainly accrue to importers, as cost reductions experienced by customs brokers would be anticipated to be largely passed on to importers through lower fees for service. The following cost components were considered relevant and easily quantifiable for determining cost savings on a per-consignment basis and could be tested with stakeholders as part of this project.⁶⁶

1. Direct inspection costs charged by the department.

The average time spent on inspections per consignment is available from the department’s import databases and can be confirmed by importers and customs brokers. These costs can be estimated by applying the relevant charge-out rates; for the 2016-17 and 2017-18 financial years, this was \$50 per 15-minute period or part thereof for goods arriving during usual hours of operation.⁶⁷

2. The opportunity cost of time for the importer to attend the inspection, or the attendance fees paid by the importer to the customs broker or another agent if they attend the inspection on their behalf.

This is relevant for assessing compliance-cost savings, since the time involved in attending an inspection could be otherwise spent on activities that would increase an importer’s earning capacity. Inspections can occur away from importers’ or customs brokers’ premises, meaning travel time (and costs) may also need to be factored into this calculation. Depending on who attends the inspection, the opportunity cost could be valued based on an hourly wage rate (inclusive of on-costs) for an unskilled worker, a skilled worker or a manager or professional.⁶⁸

⁶⁵ Direct costs are likely to reflect only a small fraction of the total costs incurred by importers from undergoing an inspection. The *total* costs involved in the inspection process forms one of the crucial parameters used in Rossiter and Hester’s (2017) model of biosecurity inspections that can help to calibrate parameters for inspection rules from the continuous sampling plan family.

⁶⁶ See Appendices C and D for the list of interview questions in the second phase of stakeholder consultation to see how these costs were elicited from importers and customs brokers.

⁶⁷ The current *Cost Recovery Implementation Statement: Biosecurity 2015-16* (available from <http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/australia/cost-recovery-arrangements/cost-recovery-implementation-statement-biosecurity-2015-16.pdf>) contains the fee schedules for the department’s biosecurity-related activities.

⁶⁸ These distinctions are based on the classification used in the Victorian Government’s Time Cost Calculator (available from <http://www.dtf.vic.gov.au/sites/default/files/2018->

3. The opportunity cost of time for the broker or importer booking the commodity in for inspection.

Since a separate form needs to be filed to book in an appointment for inspections, this time needs to be accounted for separately. While consignments frequently needed to be re-booked for inspection due to delays beyond the control of brokers or importers, initial estimates of the cost would just focus on the time taken to complete the form.

4. The cost of any product destroyed during inspection or rendered unsaleable following inspection.

Whether this cost component is relevant and material will depend on the nature of the goods. It may be possible to develop a reasonable proxy by estimating the costs of the additional items importers need to bring into the country to cover goods destroyed or made unsaleable as part of the inspection process. Some importers may have a good estimate of these costs, while consignment invoices presented as part of documentation assessments could be another source for this information.

5. Additional storage costs associated with delays with booking in for and completing the inspection.

There are two main components of the information required to estimate the storage costs saved, namely:

- estimates of the time saved (in hours or days) in storage by avoiding inspection; and
- estimates of the daily or hourly demurrage charge at the Approved Arrangement site or port facility.

In some cases, the facility may offer a number of “free” or included days as part of their arrangements in handling the goods. Under these circumstances, the cost impost “felt” by the importer would be non-zero only if inspection activities resulted in breaching the free-day limit.

6. Additional transport costs associated with taking consignments to and from an inspection point.

This involves measuring the difference in costs of transporting the goods between:

- the port of entry direct to the importer's depot because a consignment is released on compliant documentation alone; and
- the port to the inspection point and then from the inspection point to the importer's depot.

Since the counterfactual outcome may not be readily observable to importers and customs brokers, the project team generally used the cost of transporting the goods from the port of entry to the inspection point as a proxy for these cost savings.

[02/Victorian%20Government%20time%20cost%20calculator.xls](#)), since similar guidance on default wage rates is not readily available from the Department of Prime Minister and Cabinet's Office of Best Practice Regulation (OBPR). The resulting wage rates are nonetheless consistent with OBPR's methodology.

Once the savings per consignment (or line item) are established, the estimated regulatory burden savings for the trial can be estimated by multiplying this by the number of consignments not inspected. While estimating the extent of per-consignment savings has been the focus for these field trials, a more complete assessment would assess other benefits accruing to stakeholders from better targeted intervention. These could include:

- savings resulting from holding lower inventories by business (such as lower rental expenses from storage at depots/warehouses) due to reductions in the amount of time required to get products to market;
- improvements to product quality at the point of sale for products with a limited shelf-life; and
- broader market-wide competitive adjustments resulting from products imported by highly compliant stakeholders being offered a cost advantage over other products.

Given the time-limited nature of the trial, these benefits were not considered explicitly for this project.

7.2 Measuring cost savings on the trial pathways

7.2.1 Using stakeholder interviews to assess cost savings

Much of the analysis on cost savings in this report relies on information obtained from the second set of interviews conducted with importers and customs brokers partway through the trial. Importers were asked to comment about costs associated with biosecurity compliance in two ways, namely:

- whether they noticed lower charges passed on by their customs brokers as a result of a line entry saving inspection and, if so, how did these savings come to their attention;⁶⁹ and
- estimates of the various cost components identified in Chapter 7.1, based on discussions with importers in CEBRA Project 1304C, that could be associated with a consignment having to undergo a physical inspection at the border.⁷⁰

The project team also sought information from customs brokers in their second round of interviews,⁷¹ in seeking an alternative, corroborative source of information.

Of all importers interviewed across both trial pathways, only one was able to confirm that they noticed lower charges associated with consignments saving inspection because inspection fees were not applied to that consignment. Another two importers “assumed” that charges were lower, though they could not recall how they identified this change in costs. Because of the scant evidence of importers’ actual cost savings, the project team used questions on cost components to build up an indicative estimate of regulatory costs savings that would accrue from a consignment saving inspection.

While care was taken to ensure the scope of the questions on cost components was well-understood by stakeholders, several caveats need to be noted with this analysis.

⁶⁹ See Question 10 in the second round of interviews, as described in Appendix C.2.

⁷⁰ See Questions 11 to 15 inclusive in the second round of interviews, as described in Appendix C.2.

⁷¹ See Questions 9 to 12 inclusive in the second round of customs broker interviews, shown in Appendix D.2.

First, the detailed level of the discussions revealed that there was significant heterogeneity in how business operations were established, and hence differences in cost pressure points for businesses. For instance, some vegetable seed importers have their own Approved Arrangement sites, implying there were no transport cost savings if a consignment was released on compliant documentation alone. In other circumstances, customs brokers' and freight forwarders' use of packaged fees for services meant some importers were less able to comment on individual cost contributions to the overall inspection process.

There was also huge variation in how interviewees expressed costs and time frames.⁷² For example, when asked about time to arrange an inspection, some only referred to time taken to fill out the form, while others referred to time taken to confirm a slot. While the former was the intention of the question, the latter provided extra intelligence about the sources of delays in the inspection process. Similarly, costs for attending a quarantine inspection appeared to be expressed by importers as a combination of the broker's fee plus quarantine fees that the broker passes on, whereas sometimes this was reported as a separate amount.

Where possible, the project team sought to disentangle individual cost components based on how brokers and importers responded to the questions. For the point estimates⁷³ of per-consignment cost savings for the selected vegetable seeds pathway, shown below, and the pure peat pathway, provided in Appendix I, the tabulated values should be treated as indicative only. The accompanying discussion also seeks to document the range of costs⁷⁴ and experiences identified by stakeholders for individual components.

7.2.2 Regulatory cost savings for the selected vegetable seeds pathway

Table 6 shows an indicative per-consignment compliance cost saving of around \$400 if an inspection is saved,⁷⁵ with transport-related and direct inspection costs being the most significant components.⁷⁶ This costing makes the simplifying assumption that shipments are single-line consignments; the savings are likely to be considerably

⁷² One learning from these differences in interpretation for future studies is that questions on cost components need to be even more narrowly defined than the questions documented in Appendices C and D to ensure their scope is well-understood by stakeholders.

⁷³ These estimates sought to capture the most common, or modal, experience of biosecurity system stakeholders reported in stakeholder interviews. Where there seemed to be little consensus on cost component estimates among interviewees, a value that seemed to reflect the median of the distribution of responses was used.

⁷⁴ Based on indicative ranges of cost outcomes described in the various sections, it would be possible to generate interval estimates of the various cost components. Given the significant heterogeneity in reported values, we have sought to illustrate this where reasonable for individual cost components. We have not done this for a combined estimate of total costs, since combining these interval estimates would result in a total cost saving interval estimate that was so large as to render it meaningless for policy purposes.

⁷⁵ This estimate of cost savings does not incorporate the additional cost of obtaining an ISTA certificate offshore, which was required for importers to be eligible for the trial.

⁷⁶ It is difficult to estimate what share of total costs this represents for seed importers, given the wide range of unit prices attached to different seed lines and the quantities imported in any one shipment. For example, importers interviewed noted spinach seeds can be imported as full-container loads, whereas some seed lines could be brought in as air parcels with a total weight of less than one kilogram.

lower for multiple-line consignments where only some lines are released on compliant documentation alone.⁷⁷

Table 6. Indicative estimated per-consignment savings on compliance costs for selected vegetable seeds

Cost Component	Estimate (\$)	Basis for calculation
Direct inspection costs	100	2017-18 rate for between 15 and 30 minutes of inspection services at an out-of-office location during regular business hours.
Inspect attendance costs	80	A customs broker attending the inspection for one hour.
Inspection booking opportunity costs	20	15 minutes for a broker or logistics operator to fill in the booking form. No allowance is given for rescheduling the inspection.
Cost of goods destroyed/being made unsaleable	50	Average reported losses due to processing at the border.
Storage cost savings	0	Most brokers or freight forwarders did not charge for storage separately.
Transport cost savings	150	Average cost based on importer interviews to send a consignment from the wharf or airport to the inspection depot (Approved Arrangement site).
Total	400	

Notes: Costs rounded to the nearest \$5 per component. Time-based rates are based on the Victorian Government's Time-Cost Calculator, (available from <http://www.dtf.vic.gov.au/sites/default/files/2018-02/Victorian%20Government%20time%20cost%20calculator.xls>), which include allowances for on-costs.

Given 67 line entries avoided inspection throughout the trial, \$26 800 is the estimated savings in compliance costs reaped by stakeholders over the course of the trial. More details about the intelligence used to develop of indicative estimates of the cost components for vegetable seeds is provided below.

Direct inspection costs

The inspection process for permitted vegetable seeds for sowing, which covers the seeds subject to the trial, involves assuring that the sample of seeds provided is free from live insects, signs of disease and the contents of the sample match the accompanying certification. Based on the range of inspection attendance times and departmental import data records, Table 8 allows for between 15 and 30 minutes to

⁷⁷ Importers verified that multiple-line consignments where some lines were not required to be inspected were usually being appropriately split at the Approved Arrangement site. At a minimum, this would have allowed for compliance-cost savings through a reduced time spent inspecting a given shipment.

undertake the sampling and inspection, resulting in an estimate of the direct inspection fee of \$100.

Inspection attendance costs

The importers and brokers interviewed generally confirmed that the customs broker or their representative will usually attend the inspection on behalf of the importer.⁷⁸ The time involved attending an inspection seemed to vary widely depending on the complexity and size of the consignment. For some consignments, the time spent attending the inspection was up to four hours; in other cases, it may be as little as 10 minutes for some straightforward inspections.⁷⁹

The benchmark estimate used in Table 6 is based on a one-hour allowance, which was the most commonly reported time frame for attending an inspection.⁸⁰

Inspection booking opportunity costs

In many cases, the customs broker is responsible for booking the inspection. The range of filing times reported was between 5 minutes and 15 minutes, though one broker noted it often took multiple times filing the online form to obtain a slot. For the assessment of compliance costs, we used a benchmark estimate of 15 minutes assuming a single filing of the form.

Cost of goods destroyed/being made unsaleable

Many importers reported that the inspection process often renders the seed taken for sampling unsaleable. The cost of this seed varies dramatically, depending on the seed type. Some importers ascribed relatively low values to the sample of seed taken; for example, one importer noted that it amounts to around \$10 per consignment. In contrast, another reported up to \$1 000 per consignment of seed is destroyed through the testing process.⁸¹ Table 6 ascribes a value of \$50 per consignment to be the value of seed rendered unsaleable from the inspection process.

Storage cost savings

The few importers who noted some of their consignments were not inspected noted the time saved was typically a few days. Most of this appeared to come from delays in booking an inspection time, which many importers and brokers noted was a significant source of delay in the process. Rather than an instant confirmation, they noted it typically took between a few hours and three days to confirm an inspection time.

⁷⁸ Only in two cases, where the importer's warehouse is an Approved Arrangement site, did the importer usually attend an inspection.

⁷⁹ Based on this range of responses, the implied opportunity cost estimate for this component could be between \$15 and \$320.

⁸⁰ In two cases, the broker stated they charged a fee for attending the inspection of around \$50. While this is lower than the implied opportunity cost calculation, it may reflect misunderstanding the question, given the amount the fee charged for an inspection of up to 15 minutes by the department.

⁸¹ In a more extreme case, one importer reported that the amount of seed damaged amount to around \$25 000 over the previous year.

In Table 6, we have used a value of zero for storage cost savings.⁸² Charging separately for storage seemed to be highly unusual, based on importer and customs broker feedback. Part of this reflects that some importers have their own premises and so it is already included in their overall cost base. For others, it was because they received a single bill from the freight forwarder or broker that did not allow them to separately itemise storage costs.

Of those stakeholders who gave some indication of being charged for storage, one importer noted that storage costs were only charged if the time at the Approved Arrangement site exceeded 30 days. Only one broker and one importer of those interviewed highlighted that storage was charged for separately on a routine basis.

Transport cost savings

Transshipment costs seem to be one of the significant costs that can be avoided through not requiring a consignment to be inspected. Costs for this component vary significantly depending on the size and nature of consignments. In some situations, where the importer's warehouse is an Approved Arrangement site, no additional transport costs are incurred due to the requirement for goods to be inspected. In other circumstances, cartage rates could be as low as \$50 for small shipments brought in by air; if a full container load of seed is involved, on the other hand, transport costs could easily exceed \$500. For the purposes of obtaining a single figure, we have used \$150 in Table 6 to represent an "average" estimate of the costs involved in transporting a seed consignment from the port (or airport) to an Approved Arrangements site for inspection.

⁸² When not charged for separately, the opportunity cost of storage is only likely to be apparent to importers or brokers if warehouse capacity limits are reached. Based on previous discussions as part of CEBRA Project 1304C and visits to Approved Arrangement sites, it appears capacity is only reached in exceptional cases.

8 Compliance-Based Inspections: An Overview of Opportunities and Challenges

This report documents CEBRA Project 1608C, *Testing incentive-based drivers for importer compliance*, which sought to evaluate a time-limited trial of designed inspection protocols on selected vegetable seeds for sowing and peat. Ultimately, this trial aimed to inform the department on strategies for the wider implementation of compliance-based inspection protocols to enable the department to better balance competing objectives associated with Australia's biosecurity system.

This project was the last in a sequence of three projects, namely CEBRA Projects 1304C, 1404C and 1608C, that have scoped, designed, refined and tested the potential for using compliance-based inspection protocols in biosecurity assurance. In closing the sequence of projects investigating the use of "carrots and sticks" in biosecurity regulation, we first summarise the key findings from the three projects. We then highlight six priority action areas the project team considers crucial to using compliance-based intervention strategies and would enable the department to improve how it acquits its regulatory responsibilities.

8.1 "Carrots and sticks" to support biosecurity regulation

8.1.1 Designing regulatory schemes accounting for stakeholder incentives (CEBRA Project 1304C)

The first project in the sequence sought to better understand the incentives importers and others in the supply chain face around compliance with biosecurity requirements and how these may affect the design of regulatory schemes. The project identified two pathways – vegetable seeds for sowing and peat – that could be used to trial some of the features investigated in this sequence of projects.

Drawing on economic theory, import data analysis and qualitative analysis of interviews with importers, customs brokers and industry associations, the project also found that:

- industry cost structures, particularly the costs related to embedded, technology-based risk mitigation solutions, are a major determinant of whether compliance-based interventions are likely to induce behaviour change. Pathways where the costs of biosecurity interventions represent a larger share of total costs are more likely to be influenced by rewards associated with biosecurity compliance;
- changes in stakeholder behaviour are likely to be encouraged through a consistent regulatory regime over a relatively long time horizon;
- a move to incentive regulation in biosecurity would be supported by shifting the focus of regulations from prescribing treatment requirements on consignments towards an approach based more on outcomes. This may involve offering stakeholders several ways to demonstrate assurance along the biosecurity continuum that are equivalent to the assurance provided by inspections at the border;
- biosecurity outcomes could be supported by systems that provide larger relative rewards for compliant parties, particularly through reducing the indirect costs accrued through the time taken to clear the inspection process. For instance, it may be possible to reduce delay costs at the border through a

priority queuing system where eligibility is determined in part by a strong history of compliance; and

- providing importers with more structured feedback on their inspection performance, including information about why they failed inspections. Many importers reported that this would support them implementing processes to reduce the likelihood of future non-compliances.

A companion publication, Rossiter and Hester (2017), provided a game-theoretic investigation of how to design biosecurity regulation to account for stakeholder incentives. The framework admitted several policy predictions of relevance to the department, including that:

- the CSP-1 algorithm generally provided stronger incentives for compliance than the CSP-3 algorithm with similar parameterisations;
- in instances where the consequences of leakage were very high, mandatory inspections would remain the socially preferable option for a biosecurity regulator;
- significant caution should be applied in setting the monitoring fraction in CSP rules at a low level, say below 0.25. This is because this may create a strong incentive for “cheating” behaviour, such as the withdrawal of biosecurity risk mitigation effort, among stakeholders; and
- compliance-based inspection rules were likely to be most appropriate if the regulated entity faced high costs of failing inspection and/or being inspected, in part reflecting the already strong incentives for compliance faced by stakeholders.

8.1.2 Laboratory testing aspects of candidate rules (CEBRA Project 1404C)

CEBRA Project 1404C involved testing specific aspects of candidate compliance-based inspection rules in a highly controlled economics experimental laboratory. The experiments were designed to inform the design and reduce risks associated with the roll-out of protocols to be trialled in the field (CEBRA Project 1608C) and demonstrate aspects of rule design that could not be ascertained easily in a field setting. The key findings from this project were that:

- the behaviour of experimental subjects under the CSP-1 and CSP-3 algorithms was broadly similar. The project team subsequently recommended the CSP-1 algorithm form the basis for the field trial and as part of the wider roll-out of compliance-based inspection protocols across the department, reflecting its simpler structure compared with the CSP-3 algorithm and its better theoretical properties as identified in Rossiter and Hester (2017);
- providing increased disclosure about the inspection rules to which importers are subject and offering targeted feedback on stakeholders’ regulatory performance is likely to encourage stakeholder behaviours more consistent with government biosecurity objectives. This informed the communication strategy for the field trial and resulted in changes in the way the department communicated CBIS rules to stakeholders and the development of feedback reports for the field trial and subsequent use across the department;
- pathways (or importers) where the cost of being inspected and/or the cost of failing inspection are high are likely to be more suitable for compliance-based inspection protocols. This tended to support pursuing the selected vegetable seeds for sowing and pure peat pathways for the trial, given the former was

reported to have a high cost associated with failing inspection and the latter had a relatively high cost of being inspected. It also provided further guidance for the department around which pathways may be suitable for compliance-based interventions in future; and

- the application of a “menu of regulatory contracts” in biosecurity regulation is where eligibility to “lighter touch” regulatory options is based on certifiable or verifiable measures that reduce the likelihood of biosecurity risk material being found in consignments. The experiments demonstrated allowing stakeholder choice may be counterproductive if that choice is between rules with different parameter combinations with no distinguishing eligibility criteria.

8.1.3 Small-scale testing in the field (CEBRA Project 1608C)

The two field trials on the selected vegetable seeds for sowing and pure peat pathways documented in this report found little evidence to indicate there had been significant behavioural change among key import-supply chain participants. While this was not unexpected, implementation and operational issues attenuated the likelihood of behavioural responses in this environment. With many fewer consignments saving inspection than originally anticipated, the estimated regulatory burden savings for highly compliant stakeholders was also significantly lower than expected.

8.2 Priority action areas for compliance-based interventions

While the outcomes of the field trials were not as expected, they were useful as a “proof of concept”, offering the project team insights into potential systems and process improvements that would support the broader application of compliance-based interventions within the department. The six priority action areas identified through the current project and its predecessors are discussed in more detail below.

8.2.1 Developing pathway-specific understanding of factors that influence stakeholder behaviour

A key feature of this suite of projects for the department has been around developing awareness of the role private incentives could play in influencing compliance with Australia’s biosecurity requirements. All regulatory regimes possess default incentive structures for regulated entities which can encourage, or potentially discourage, stakeholders to behave in a manner consistent with the regime’s underlying policy objectives. For importers responsible for ensuring compliance from a legal perspective, these incentives stem from the direct and indirect costs of compliance and the potential savings that could accrue to them from greater adherence to requirements.

Designing and calibrating appropriate regulatory frameworks to encourage importer compliance requires a nuanced approach, drawing upon scientific, technological and economic aspects that underpin biosecurity assurance. Constructing rules based on the regulator’s objectives alone, as done in risk-based regulation and operationalised in the department through tools such as the RRRRA framework, will not guarantee a system that fosters behaviours focused on compliance. Constructing rules whose

default incentive structures reward risk-mitigating activities and discourage actions inconsistent with biosecurity objectives requires knowledge of aspects such as:

- production processes;
- product development stages;
- biosecurity risk mitigation strategies;
- equivalent assurance options; and
- the costs of complying with biosecurity requirements, both direct and indirect, borne by stakeholders.⁸³

Frameworks to support the development of this knowledge are currently being developed in several CEBRA projects,⁸⁴ which should assist the department apply incentive regulation more widely.

While there is the potential to capitalise on in-built incentive structures on a range of pathways, there may be limits on the ability for regulatory incentives to realise positive behaviour change on some pathways and/or for some stakeholders. In some cases, biosecurity-related costs represent a small share of the total commercial return anticipated from importing activities; alternatively, on-shore rectification options may be easily accessible and relatively inexpensive. In these circumstances, the incentives to encourage compliance with biosecurity requirements is relatively weak. There may also be significant transitional costs associated with behaviour modifications, such as switching suppliers or improving production processes, that represent a hurdle that may not be readily overcome by modest rewards for compliant behaviour. An appreciation of Australia's place in the international goods trade as a relatively small market is also required when considering potential influences on the behaviour of upstream entities in the global supply chain.

The above discussion highlights the need for flexible yet targeted approaches to regulatory design to cater for different types of stakeholders. Ideally, this will demonstrate a focus on outcomes that offers some flexibility in how the required level of biosecurity assurance is achieved.

A one-size-fits-all approach is highly unlikely to work on all pathways, or even all importer stakeholders on a given pathway, given the heterogeneity of products and cost structures under an individual tariff code or BICON case. Indeed, the field trials documented in this report did not have close to universal participation or influence on all stakeholders as might have been expected. Tailored arrangements that can account for this heterogeneity, such as tailored Approved Arrangements or menus of regulatory contracts where eligibility to lighter-touch rules is based on demonstrating equivalence, are likely to be more beneficial to both import-supply chain participants and the department. Importantly, these approaches can recognise multiple channels of engagement, touchpoints and types of regulatory interventions throughout the supply chain that can deliver the level of biosecurity assurance necessary to deliver upon

⁸³ Some of these features form part of a related CEBRA Project 170608 'CBIS/CSP sensitivity analysis', which assesses quantitative and qualitative factors required to calibrate biosecurity interventions.

⁸⁴ These include CEBRA Project 1606B 'Operational imports analysis on compliance; CEBRA Project 170602 'Increasing confidence in pre-border risk management'; and CEBRA Project 170608 'CBIS/CSP sensitivity analysis'.

government policy objectives while making distinctions justified on scientific principles.

8.2.2 Providing clearer guidance around what Australia's ALOP means for designing assurance frameworks

Under the *Sanitary and Phytosanitary Measures Agreement*, Australia is entitled to designate and maintain its Appropriate Level of Protection (ALOP), reflecting the level of protection considered appropriate to protect life or health within its territory. In the *Biosecurity Act 2015*, ALOP is expressed as providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero.

While this framing of ALOP provides high-level guidance around Australia's risk appetite, it does not provide sufficient guidance to assist department officers determine what biosecurity assurance frameworks are appropriate for given pathways. While the risk estimation matrix used as part of import risk analyses (Australian Government Department of Agriculture, 2016) provides some additional information for department staff, the qualitative underpinnings of this approach can lead to a range of interpretations of the guidelines. More clearly articulated statements around the level and types of risks the department is willing to accept is required to readily translate the high-level framing of the Australian Government's risk appetite into the design, calibration and operation of biosecurity assurance frameworks.

The rule calibration process for the field trial demonstrated the need for clearer statements of risk appetite and a more systematic use of metrics. The latter is being addressed in part through a follow-up project (CEBRA Project 170608) to develop a decision-support tool that builds upon the metrics outlined in Chapter 3 and Appendix H. A focus on these two aspects of decision-making will enable the department to draw upon information on the likelihood and consequence of various biosecurity risks that may be present on a pathway, in combination with factors that influence behaviour, to recommend appropriately designed rules for specific pathways and/or stakeholders.⁸⁵

Under both risk-based and incentive regulation, clear statements from the government (or regulator) as to what risks it seeks to mitigate and how to manage these risks are essential ingredients for a consistent framework that achieves buy-in from key regulatory stakeholders. Providing these clear statements can help import-supply chain participants develop a shared understanding of biosecurity priorities and an appreciation of the regulator's goals for biosecurity. This may encourage positive behaviour change among stakeholders by improving trust in the regulatory framework, thereby enabling import-supply chain participants to adopt longer-term strategies to manage biosecurity risks.

⁸⁵ It may be helpful for decision-making to apply a cost-benefit analysis framework (see, for example, Keller et al., 2007) that incorporates the trade-offs in regulation between the degree of biosecurity assurance and the costs of regulation borne by domestic consumers and businesses.

8.2.3 Reconfiguring information management and operational systems to improve data capture and flexibility in rule design

To achieve the desired level of biosecurity assurance and trust in the regulatory framework, sound design features need to be accompanied by consistent system implementation. The two field pilots in this project identified some opportunities for improvement in the current implementation of biosecurity interventions at Australia's border. Moreover, the overall implementation strategy must consider all relevant touchpoints along the biosecurity continuum and address potential incentives to "game" the system and develop work-arounds to side-step regulatory hurdles.⁸⁶

Delivering an effective biosecurity assurance framework requires adept technology systems, robust internal communication and internal stakeholder buy-in, and management frameworks that enable effective decision-making.

With respect to technology systems, the department is already acting to address gaps identified through the project with the redesign of the Australian Import Management System (AIMS) platform. This system upgrade should improve data capture, provide improved flexibility and allow for a more consistent stakeholder and frontline staff experience. It could also mean that "workaround" solutions to allow some flexibility for supporting compliance-based inspection models, such as dashboards that led to some issues in the trial, may not be necessary in future.

Improving the way information is captured in AIMS could offer greater use of automated systems for delivering reliable and targeted stakeholder feedback. In response, importers, suppliers and transport operators may be able to more readily rectify processes and procedures to address non-compliance issues. Furthermore, department staff would be able to monitor, identify and target pathways and system stakeholders characterised by either routine non-compliance or excellent compliance records more easily. In the longer term, this may enable the department to amend biosecurity protocols and reallocate available resources based on intelligence gleaned from import systems that ultimately strengthens the nation's biosecurity system.

8.2.4 Improving internal information flows and clarifying decision-making authority for frontline staff

Another critical enabler for system improvements reflects improving information flows and decision-making frameworks within the department. Discussions with frontline officers highlighted significant challenges in discharging their roles, particularly around the broad range of pathways they needed to cover and ensuring they have timely access to information and systems when the requirements for certain pathways are either unfamiliar or subject to frequent changes.

As initially recommended in CEBRA Project 1304C, triaging arrangements, where officers can specialise to some degree for pathways that involve more complex assessments, may be one way to address this. System updates implemented in early 2018 allowed document assessors to move towards this type of approach by setting up 'competency' groups and funnelling complex assessments to staff with the necessary experience and training. The department is also changing the business model for its inspection activities, allowing for a more segmented approach where

⁸⁶ An example of these types of incentive problems in pre-border assurance is being considered as part of CEBRA Project 170602 'Increasing confidence in pre-border risk management'.

complex inspections are completed by officers with specialist knowledge. The roll-out of this new model has been complemented by a renewed focus on staff capabilities through competency-based training.

More formal mechanisms as to how frontline staff can provide input into how regulatory changes are communicated and managed internally would also aid more seamless implementation of biosecurity regulations. This may help develop improved change management systems within the department and enable a reform-minded focus to be shared among all departmental staff involved in the biosecurity system.

Consistent with this, the department has recently agreed upon and published formal processes for communications between Plant Import Operations and Biosecurity Operations Division. Additionally, the Plant Import Operations Working Group has become a forum for engagement between policy and operational staff when planning and implementing policy and process changes. The department is also seeking to address gaps in the information chain by improving communication with operational supervisors to ensure adequate localised understanding of new requirements.

The lived experience of frontline officers, as captured through interviews as part of this project, highlights the value of other recommendations gleaned from discussions with importers as part of CEBRA Project 1304C. Clarifying and improving the guidance on delegation of decision-making authority, accountability and task ownership for frontline officers, in consultation with policy areas responsible for managing biosecurity risks, is key to enabling a more consistent implementation of biosecurity regulations. Ultimately, the responsibility for the effective design and implementation of biosecurity assurance systems is a shared responsibility between frontline staff and policy officers.

There is also a significant opportunity to better capture feedback, such as observed patterns in assessment or inspection outcomes or concerns or confusion identified when dealing with external parties, from those involved in implementing biosecurity regulations. More formal capturing of this type of information, either directly in an ad-hoc manner through workflow management systems or through semi-structured discussions between policy and operational staff, could be used and reflected in biosecurity policy settings and in how policies are communicated with both internal and external stakeholders. In turn, this information can be used to improve the department's delivery of biosecurity assurance services.

8.2.5 More actively soliciting stakeholder perspectives to improve external communication processes, including using structured feedback reports

Interactions with stakeholders as part of CEBRA Projects 1304C and 1608C has highlighted how more active and extensive external engagement can aid the department implementing its regulatory frameworks more effectively. The use of multiple communication channels and proactive approaches, including industry body engagement and targeted emails, were well-received by external stakeholders. Targeted feedback reports⁸⁷ on regulatory performance, introduced for the vegetable seeds trial and adopted on other pathways (such as cut flowers, fresh lemons/limes and stone fruit from the United States, and avocados from New Zealand), and the

⁸⁷ System limitations mean the current process for tailored communication and feedback is highly resource-intensive from the department's perspective. Flagged upgrades to import systems should improve the cost-effectiveness of this type of approach in future.

introduction of industry liaison officers over the past two years represent significant steps to improve engagement with biosecurity system stakeholders. There is the potential, however, for a continued focus on this as an opportunity for the department.

Stakeholder interviews as part of this project suggested there remains scope for improvement in how the department communicates, particularly around changes in import and inspection requirements. This reflects that importers and customs brokers are required to comprehend a significant amount of information related to biosecurity requirements for their consignments.

Some industry associations and other representative bodies already have significant opportunities to engage with the department through several channels. However, there is scope for the department to further leverage its relationships with these bodies as part of generally improving stakeholder communication. Some bodies could be prepared to work with the department and their members to help test various methods or approaches to communicating changes, even to the extent of collaborating to develop strategies to ensure stakeholders better comprehend, and therefore manage, regulatory changes. Implementation features, such as the biosecurity inspection performance reports, could also be enhanced with industry input to ensure the information supplied to stakeholders is valuable to them. As noted in CEBRA Project 1304C, this kind of participation in the regulatory system may improve stakeholder awareness of the department's aims and needs and facilitate a stronger compliance mindset among key groups.

While existing relationships can be an important source of input and insight for the department, care needs to be taken to ensure stakeholders without organised representation are not neglected in this feedback process. It would therefore be advantageous for the department to develop systems that allow for a more uniform stakeholder representation approach. This would incorporate enhanced formal liaison directly with importers as part of routine operations, including the type of tailored email communications that were used in the trial⁸⁸ in addition to targeted consultation, discussion and participation in educational fora on proposed regulatory changes.

8.2.6 Developing systems to record and incorporate stakeholder feedback more systematically

The department should investigate ways to foster enhanced two-way communication with all system stakeholders⁸⁹ to obtain a better understanding of stakeholder experiences and pathway complexities. This may include leveraging a greater range of analytical tools, including semi-structured stakeholder interviews. Qualitative analysis approaches, such as those used in this report, would offer opportunities to incorporate feedback to improve service delivery in a much more systematic way. Combined with a more formal way of incorporating frontline officer feedback into systems, this

⁸⁸ Tailored communication is often used on high-risk pathways, particularly when emergency measures are implemented. A broader application of this approach could be beneficial to glean intelligence from system stakeholders around implementation and risk management issues.

⁸⁹ Established relationships and communication channels may already exist between system stakeholders, such as between importers and their customs brokers or importers and the relevant industry association. However, the department's communication strategy needs to acknowledge that information may need to be distributed through multiple channels, both direct and indirect, to ensure stakeholders are able to act on it appropriately.

would represent a powerful mechanism to ensure the department delivers an effective and efficient biosecurity system.

Naturally, this type of engagement with import-related stakeholders could cause concern with others with a keen interest in maintaining Australia's biosecurity status. This could reflect perceptions around the department being "captured" by regulated entities, with a consequent diminution in oversight and enforcement of import requirements. The potential for such conduct could easily be ameliorated by the department establishing ground rules that reinforce its role as the sole decision-maker regarding regulatory arrangements. This could be accompanied by statements regarding how it is seeking input through various engagement opportunities to more effectively deliver upon its existing and well-established biosecurity objectives, while achieving these at lower costs to Australian consumers and businesses. Overall, this form of targeted, nuanced engagement can be in the national interest – a principle that is shared with the intent of Australia's biosecurity system.

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Appendix A: Feedback Template for Vegetable Seeds Importers

A.1. July 2014-June 2016

Biosecurity Inspection Performance Report: Seed Importer XYZ

ABN: 12345678910

Compliance-Based Inspection Trial for Selected Vegetable Seeds for Sowing

Report date: 25 August 2016

Dates covered by this report: 13 July 2014 to 24 June 2016

Purpose

This report is designed to help you understand how you can improve your compliance with Australia's biosecurity requirements as part of the compliance-based inspection trial for selected vegetable seeds for sowing (under tariff code 1209.91.00) being conducted by the Department of Agriculture and Water Resources (the department).

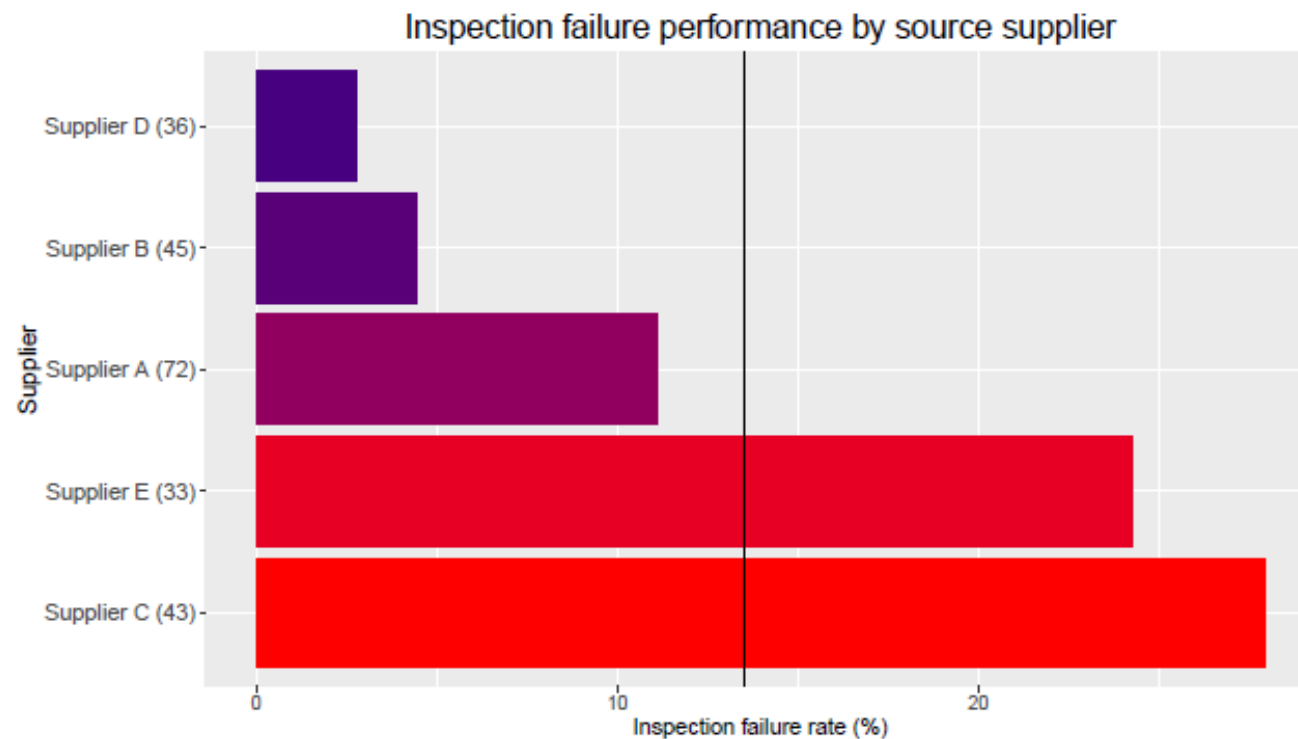
This is first report sent to you as part of this trial by the department. It shows your compliance with biosecurity requirements across all seeds, both eligible and ineligible for the trial, imported under the tariff code 1209.91.00. Future reports will only provide information for eligible seeds where your broker enters the AQIS Commodity Code **LSTD** when lodging consignments.

Ensuring your goods meet biosecurity requirements will enable faster (and less costly) clearance of your goods on arrival and reduce the number of inspections you experience at the border as part of the trial. The department wants to ensure goods brought into Australia are practically free from contamination with biosecurity risk material, such as live insects, soil, plant pathogens, foreign seeds, bark or other plant material – all of which have potential to introduce exotic pests and diseases into Australia. See the department's import conditions database **BICON** for the full list of requirements for your vegetable seeds for sowing.

Your recent biosecurity inspection performance

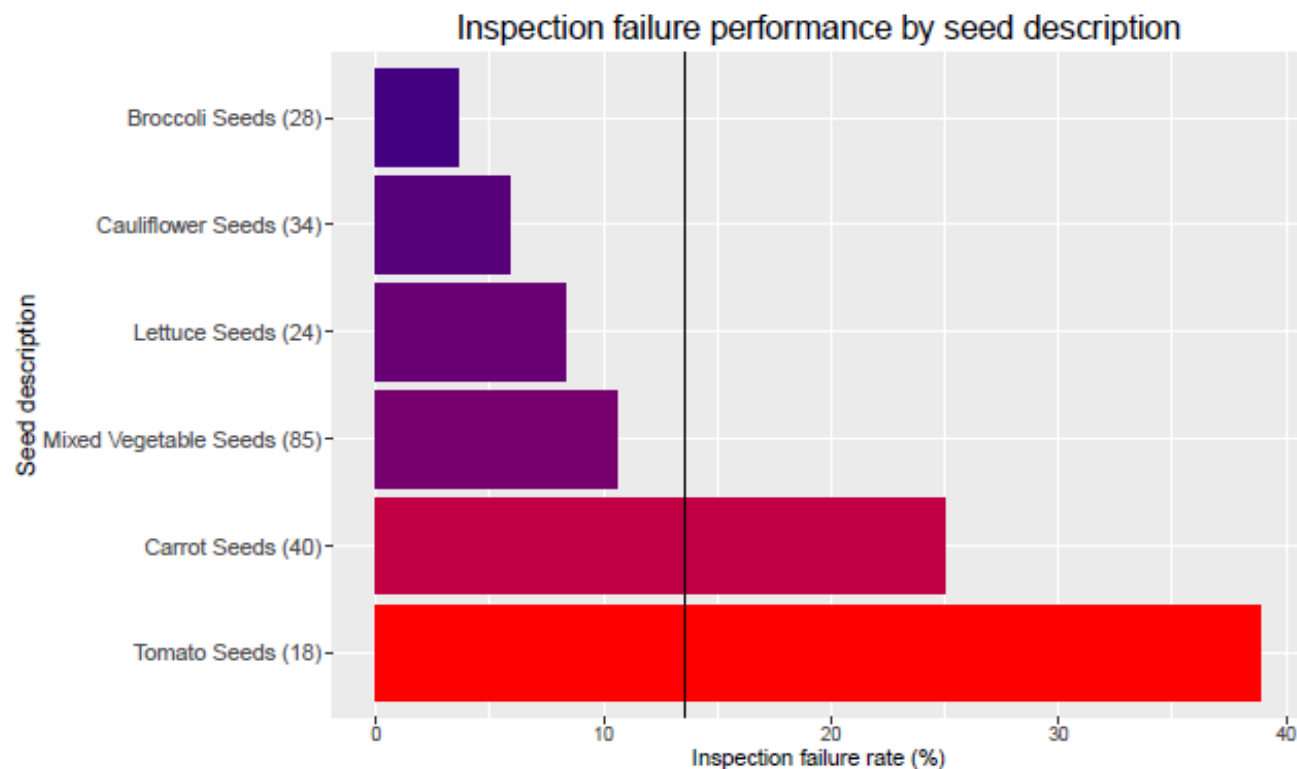
This section shows the percentage of inspections for which non-compliances (such as incorrect declaration of goods, packaging failures or the presence of biosecurity risk material) have been identified during border inspections. Failure rates are shown by the suppliers used, the goods description entered by your broker and the seeds' country of origin to help you identify any sources of concern. The tables in the appendix provide more detailed information about your biosecurity performance.

Supplier performance



Notes: Suppliers are ordered from lowest to highest failure rate. Only suppliers used for at least 10 line items shown. The number of line items associated with the supplier are indicated in brackets after supplier name. Duplicate or similar supplier names may appear in the list because of how the broker entered the consignment into the Agriculture Import Management System (AIMS). The black vertical line indicates your organisation's average inspection failure rate.

Seed description



Notes: Seed descriptions are ordered from lowest to highest failure rate. Only descriptions used for at least 10 line items shown. The number of line items associated with the seed descriptions are indicated in brackets after the description. The black vertical line indicates your organisation's average inspection failure rate.

Seed country of origin



Notes: Countries of origin are ordered from lowest to highest failure rate. Only descriptions used for at least 10 line items shown. The number of line items associated with the country of origin are indicated in brackets after the country label. The black vertical line indicates your organisation's average inspection failure rate.

Inspection failures where biosecurity risk material found

The department identified 4 consignments over the period covered by this report where biosecurity risk material was found in your vegetable seed consignments. The table below provides more detail below about these consignments, including the types of risks detected.

Table 1: Consignments with biosecurity risk material

AIMS Entry-Line Number	Goods Description	Supplier Name	Types of Risks Detected	Packaging Issue?	Organism/s: Specification to Genus (where available)
AIM1234567S – 1	Mixed Vegetable Seeds	Supplier C	Foreign Plant Material; Plant Disease	No	Liliopsida Cyperales Poaceae Triticum
AIM2345678S – 1	Carrot Seeds	Supplier E	Soil Contamination	Yes	Not available
AMI3451234S – 2	Cauliflower Seeds	Supplier A	Invertebrates (insects/arachnids); Fungi	No	Insecta Lepidoptera Pyralidae Plodia; Ascomycetes Pleosporales Pleosporaceae Alternaria
AMI3451234S – 4	Broccoli Seeds	Supplier A	Invertebrates (insects/arachnids); Fungi	No	Insecta Lepidoptera Pyralidae Plodia; Ascomycetes Pleosporales Pleosporaceae Alternaria

Further information

For more information or advice, please contact the Department of Agriculture and Water Resources via:

Email: imports@agriculture.gov.au

Phone: 1800 900 090 (and follow the prompts)

Appendix: Detailed biosecurity performance information

This appendix provides more detailed information in tabular form of your recent inspection performance by source supplier, seed description and seed country of origin. These tables are ordered according to the number of inspections (from largest to smallest) which correspond to the relevant attribute. Tables are only shown here where figures are presented in the main part of the document.

Supplier performance

Table 2: Inspection outcomes by source supplier

Supplier	AIMS Identifier	Inspection Failures	Inspections	Inspection Failure Rate (%)
Supplier A	AMI3451234S	8	72	11.1
Supplier B	DAF2723933F	2	45	4.4
Supplier C	AIM1234567S	12	43	27.9
Supplier D	DAW9651230R	1	36	2.8
Supplier E	AIM2345678S	8	33	24.2

Performance by seed description

Table 3: Inspection outcomes by seed description

Seed Description	Inspection Failures	Inspections	Inspection Failure Rate (%)
Mixed Vegetable Seeds	9	85	10.6
Carrot Seeds	10	40	25.0
Cauliflower Seeds	2	34	5.9
Broccoli Seeds	1	28	3.6
Lettuce Seeds	2	24	8.3
Tomato Seeds	7	18	38.9

Performance by country of origin

Table 4: Inspection outcomes by seed country of origin

Seed Country of Origin	Inspection Failures	Inspections	Inspection Failure Rate (%)
Country A	9	102	8.8
Country B	14	58	24.1
Country C	1	34	2.9
Country D	1	21	4.8
Country E	6	14	42.9

A.2. Quarterly report

Biosecurity Inspection Performance Report: Importer_17

ABN: Importercode_17

Compliance-Based Inspection Trial for Selected Vegetable Seeds for Sowing

Report date: 29 May 2018

Dates covered by this report: 30 August 2016 to 11 July 2017

Inspection outcomes summary

This report presents your compliance with biosecurity requirements for all consignments imported into Australia under the **vegetable seeds for sowing** tariff code (1209.91.00). *Table 1: Consignment outcomes summary* summarises your compliance history for these imports during the reporting period. Seed lines eligible for the [compliance-based inspection trial for selected vegetable seeds for sowing](#) are presented as a subset of the total number of vegetable seed lines imported. The trial is currently being run by the [Department of Agriculture and Water Resources](#) (the department).

Please note that only inspection failures affect your ability to benefit from the reduced inspection rate offered under the trial. Documentation and seed purity testing failures are presented for your information.

Table 1: Consignment outcomes summary

	All seed lines (number)	All seeds lines (per cent)	Seed lines eligible for trial (number)	Seed lines eligible for trial (per cent)
Lines imported	294		0	
Documentation failures	20	6.8% (20/294)	0	0.0% (0/0)
Lines cleared on documentation	0	0.0% (0/294)	0	0.0% (0/0)
Failures identified through onshore testing	8	2.7% (8/294)	0	0.0% (0/0)
Lines inspected	294	100.0% (294/294)	0	0.0% (0/0)
Inspection failures	1	0.3% (1/294)	0	0.0% (0/0)

This trial offers importers the opportunity to benefit from a risk-based, reduced rate of inspection at the border for selected vegetable seeds provided they continue complying with the relevant [import conditions](#). Only vegetable seed species listed on the trial's [website](#) and imported under the tariff code 1209.91.00 are eligible to benefit from the trial. Additionally, the following eligibility criteria must be met: 1) your customs broker must enter the AQIS Commodity Code **LSTD** when lodging the entry, 2) the entry must be lodged in **Line Mode**, and 3) consignments

must have undergone offshore seed purity testing at a department-approved laboratory, regardless of the size of the consignment. For further information, see the compliance-based inspection trial for peat and selected vegetable seeds [website](#).

This report has been produced using information supplied by your customs broker when they lodge consignments on your behalf as well as inspection outcomes recorded by the department. Only consignments lodged under the tariff code 1209.91.00 during the reporting period are included. If you identify any anomalies in this report, you may wish to discuss them with your broker and contact the department.

Details of inspection and testing failures

As shown in *Table 1: Consignment outcomes summary*, inspection failures were recorded during the border inspection of 1 consignment/s and 8 consignment/s failed onshore testing. These failures occur when invertebrates, vertebrates, fungi, foreign plant material and/or symptoms of disease that may pose a biosecurity threat to Australia are detected on goods or packaging. Details about these failures are provided in the following table. Where available, the class, order, family and genus of the organism/s found are given.

Table 2: Consignments with inspection and testing failures identified at the border

AIMS Entry-Line Number	Goods Description	Supplier Name	Onshore Testing Issue?	Types of Risks Detected	Packaging Issue?	Organism/s found: Specification to Genus (where available)
AIM4162391S-1	Okra Seed	Supplier_129	Yes	Not available	No	Not available
AIM3976414S-3	Onion Seeds	Supplier_26	Yes	Not available	No	Not available
AIM6725373S-5	Basil	Supplier_26	Yes	Not available	No	Not available
AIM7167684S-4	Radish Celesta	Supplier_26	Yes	Not available	No	Not available
AIM3097765S-6	Redleaf Lettuce	Supplier_39	No	Invertebrates (insects/arachnids)	No	Insecta Psocoptera Liposcelidae Liposcelis
AIM3097765S-10	Lettuce	Supplier_39	Yes	Invertebrates (insects/arachnids)	No	Insecta Psocoptera Liposcelidae Liposcelis
AIM5520893S-5	Lettuce	Supplier_39	Yes	Not available	No	Not available
AIM5520893S-6	Wild Rocket	Supplier_39	Yes	Not available	No	Not available
AIM6445753S-2	Onion	Supplier_60	Yes	Not available	No	Not available

Details of documentation failures

Of the total number of vegetable seed lines imported during the reporting period, 20 failed their documentation assessment. Details regarding these failures are presented in the following table. Please note that these issues do not affect your ability to take advantage of the risk-based inspection rate offered under this trial. This information is provided to ensure your consignments can be processed by the department in a timely manner.

Table 3: Consignments with documentation concerns

AIMS Entry-Line Number	Goods Description	Supplier Name
AIM6115208S-1	Tomato Seeds	Supplier_26
AIM6115208S-2	Sweet Pepper	Supplier_26
AIM6115208S-3	Sweet Pepper	Supplier_26
AIM2478548S-1	Capsicum Seeds	Supplier_44
AIM7634451S-1	Cabbage	Supplier_60
AIM7634451S-2	Cabbage	Supplier_60
AIM7634451S-3	Cabbage	Supplier_60
AIM7634451S-4	Celery	Supplier_60
AIM7634451S-5	Hybrid Carrot	Supplier_60
AIM7634451S-6	Onion	Supplier_60
AIM7634451S-7	Onion	Supplier_60
AIM7634451S-8	Onion	Supplier_60
AIM8210121S-1	Cabbage	Supplier_60
AIM8210121S-2	Chinese Cabbage	Supplier_60
AIM8210121S-3	Hybrid Carrot	Supplier_60
AIM8210121S-4	Squash	Supplier_60
AIM8210121S-5	Chinese Cabbage	Supplier_60
AIM8210121S-6	Chinese Cabbage	Supplier_60
AIM8774639S-1	Onion	Supplier_60
AIM8774639S-2	Onion	Supplier_60

Further information

For more information or advice, please contact the Department of Agriculture and Water Resources via:

Email: imports@agriculture.gov.au (please include 'Tier 2 - CBIS' in the subject heading)

Phone: 1800 900 090 (and follow the prompts)

Appendix B: R Script Used to Generate Feedback Reports

This code allows summary reports to be generated from merged data captured in the department's AIMS and Incident databases. It consists of two parts:

- an R script that does the required manipulation of the data into a form suitable for reporting; and
- a RMarkdown file that allows PDF reports to be generated for all importers with sufficient throughput over the period covered by the data set.

This represents the first set of reports generated that look at an importer's past compliance before the trial formally commenced. It includes summaries of their performance by the supplier, description and country of origin of the vegetable seed lines imported. It also lists cases where inspection failures have found biosecurity risk material and classifies those according to what is available in the Incident database.

Follow-up reports have also been generated for distribution every three months, though their focus is considerably more narrow than this initial report. Code for the follow-up reports will be included in the final report for the project.

B.1. R script for manipulating AIMS and Incident data

```
# Program for analysing vegetable seed quarantine inspection data using  
# cross-tabulations & presentation of this information graphically  
# Also generates rMarkdown reports for importers at the end of this code  
# Written by: Anthony Rossiter  
# Date: 21 August 2016
```

```
# Establish relevant libraries required  
# Java library first  
library(rJava)  
library(data.table)  
library(plyr)  
library(stringr)  
library(stringi)  
library(lubridate)  
library(knitr)  
library(markdown)  
library(rmarkdown)  
library(gridExtra)  
library(grid)  
library(ggplot2)  
library(xtable)  
library(reshape2)  
library(pander)
```

```
# Set working directory  
HOME <- "C:/Users/User/Documents/Centre for Market Design/DAFF  
Biosecurity/Data/1504C Analysis/"  
seedfile <- "VegSeed_CSV.csv"
```

```

# Threshold parameters
# Generating report
threshgenrep = 20
# Include statistics on this attribute in the individual reports
# Note - code has a maximum of 20 individual identifiable lines
# for the purpose of the bar charts; modified threshold is twice
# the value displayed here
threshstats = 5

# Read in data set of interest from CSV file
# Only taking out columns that needed
datprel <- read.csv(file.path(HOME, seedfile),
                    colClasses = c("character", "NULL", rep("character", 3), rep("NULL", 5),
                                   rep("character", 2), rep("NULL", 6), rep("character", 5),
                                   rep("NULL", 8), "character", "NULL", "character", "NULL",
                                   "character", "NULL", rep("character", 3),
                                   rep("NULL", 4), "character", "NULL",
                                   rep("character", 2), "NULL", "character"),
                    stringsAsFactors = FALSE, header = TRUE)
# Convert to R date format
inspectdate <- as.POSIXct(datprel$Initiating.Date, format = "%d/%m/%Y %H:%M",
                          tz = "Australia/Queensland")
# Fix importer & broker codes to right format
impptest <- as.character(as.numeric(datprel$Importercode))
impna <- is.na(impptest)
impptest[impna] <- datprel$Importercode[impna]
# Pest identifier
datprel <- within(datprel, {
  pestcomb <- paste(Class, Order, Family, Genus)
  pestcomb <- gsub("^ +| +$( ) +", "\\1", pestcomb)
  pestcomb[pestcomb == ""] <- NA
  # Correct formatting problem with Hazard ID field
  Hazardname[Hazardname == "<New1>"] <- NA
})
# Prepare cleaned data table with new categories
vegseeddata <- data.table(
  Entry = datprel$Quarantine.Entry,
  Description = datprel$Goods.Description,
  LineNum = datprel$Line,
  IncidentID = datprel$Incidentid,
  InspectDate = inspectdate,
  InspectType = datprel$Direction,
  Outcome = datprel$Direction.Result,
  PestPresent = datprel$Present.in.Aust,
  Origin = datprel$Country,
  Importer = as.factor(impptest),
  ImporterName = datprel$Importername,
  Supplier = datprel$Suppliercode,
  SupplierName = datprel$Suppliename,
  IncCommod = datprel$Commoditytype,

```

```

Hazard = datprel$Hazardname,
FormalID = datprel$pestcomb)
rm(datprel, inspectdate, impptest, impna)

# Create definitive indicator for pass or failure - inspection failure
# For moment, label Fail as "1", Pass as "0" and Not Inspected as "-1"
vegseeddata <- within(vegseeddata, {
  OutIndic <- NULL
  OutIndic[str_detect(Outcome, coll("breach", ignore_case = TRUE)) |
    str_detect(Outcome, coll("com fail", ignore_case = TRUE)) |
    str_detect(Outcome, coll("failed", ignore_case = TRUE)) |
    str_detect(Outcome, coll("com pass & non-com fail", ignore_case = TRUE)) |
    str_detect(Outcome, coll("not ok", ignore_case = TRUE)) |
    str_detect(Outcome, coll("other inspection", ignore_case = TRUE))] <- 1
  # | str_detect(Outcome, ignore.case("samples"))
  OutIndic[str_detect(Outcome, coll("com not insp ", ignore_case = TRUE)) |
    str_detect(Outcome, coll("insp cancelled", ignore_case = TRUE)) |
    str_detect(Outcome, coll("not conducted", ignore_case = TRUE)) |
    str_detect(Outcome, coll("re-inspection waived", ignore_case = TRUE)) |
    str_detect(Outcome, coll("not performed", ignore_case = TRUE)) |
    str_detect(Outcome, coll("see following", ignore_case = TRUE)) |
    str_detect(Outcome, coll("see next", ignore_case = TRUE))] <- -1
  # Separate designation for samples taken - check for if this is overridden
  # later in inspections
  OutIndic[str_detect(Outcome, coll("samples", ignore_case = TRUE))] <- -0.5
  OutIndic[str_detect(Outcome, coll("com pass & non-com pas", ignore_case =
TRUE))] |
    str_detect(Outcome, coll("inspected ok", ignore_case = TRUE)) |
    str_detect(Outcome, coll("inspection ok", ignore_case = TRUE)) |
    str_detect(Outcome, coll("result ok", ignore_case = TRUE)) |
    str_detect(Outcome, coll("performed ok", ignore_case = TRUE)) |
    str_detect(Outcome, coll("t/g ok", ignore_case = TRUE))] <- 0
  # Override direction result to say it is an inspection failure if an incident
  # number is attached to the result; this requirement is removed to avoid the
  # potential for a quarantine failure in one line for a quarantine entry to
  # come across to all of the entries
  # OutIndic[IncidentID != ""] <- 1
  # If inspection result blank, assume it is not inspected
  OutIndic[Outcome == ""] <- -1
})

# Create definitive indicator for whether a consignment is a quarantine failure
# This requires the pest found to be not present in Australia or uncertain
# whether it is in Australia or not
# For moment, label quarantine failure as "1" and not as "0"
vegseeddata <- within(vegseeddata, {
  QtineFail <- NULL
  QtineFail[PestPresent %in% c("Uncertain", "No") |
    (PestPresent == "" & IncidentID != "")] <- 1
  # Also QtineFail if OutIndic is "Fail" & PestPresent blank

```

```

# Other types listed as not a QtineFail
QtineFail[PestPresent %in% c("Yes", "Limited Distribution") |
  (PestPresent %in% c("", "Not Applicable") &
    IncidentID == "")] <- 0
QtineFail[is.na(QtineFail)] <- 0
})

# Aggregate results so each quarantine entry only has the one outcome
# Also allows the opportunity for splitting up the entries if the importer,
# broker, supplier or tariff code of the products involved differs
vegseeddata <- within(vegseeddata, {
  CombEntry <- paste(Entry, LineNum, Description, Importer, Supplier, Origin)
})
entrycomb <- unique(vegseeddata$CombEntry)
vegseed2 <- rbindlist(
  llply(entrycomb, function(i){
    coffrec <- subset(vegseeddata, vegseeddata$CombEntry == i)
    CombOut <- max(coffrec$OutIndic)
    # Note reassignment above for cases where samples taken but no other outcome
    # In these cases, these inspection outcomes are redesignated a "pass"
    CombOut[CombOut == -0.5] <- 0
    # Multiplying by CombOut ensures only inspection failures where a "not okay"
    # type of outcome is given is included as a quarantine failure
    # This gets around problem of incorrect matching of failures across the same
    # quarantine entry, where it might only apply to one line in the entry
    QtineOut <- max(coffrec$QtineFail) * abs(CombOut)
    DateInsp <- min(coffrec$InspectDate)
    data.table(
      Entry = coffrec$Entry[1],
      Description = coffrec$Description[1],
      LineNum = coffrec$LineNum[1],
      IncidentID = coffrec$IncidentID[1],
      Date = DateInsp,
      Result = CombOut,
      QFail = QtineOut,
      Origin = coffrec$Origin[1],
      Importer = coffrec$Importer[1],
      ImporterName = coffrec$ImporterName[1],
      Supplier = coffrec$Supplier[1],
      SupplierName = coffrec$SupplierName[1],
      CombEntry = coffrec$CombEntry[1])
  })
)

# Subset for tables containing quarantine failure lists
qfailsubs <- unique(subset(vegseed2$CombEntry, vegseed2$QFail == 1))
vsquarfail <- subset(vegseeddata, vegseeddata$CombEntry %in% qfailsubs)
vsquarfail <- within(vsquarfail, {
  FailComb <- paste(CombEntry, FormalID, Hazard)
  QuarIssues <- NULL
})

```

```

    QuarIssues[str_detect(Hazard, coll("animals", ignore_case = TRUE)) |
      str_detect(Hazard, coll("invertebrate", ignore_case = TRUE)) |
      str_detect(FormalID, coll("insecta", ignore_case = TRUE)) |
      str_detect(FormalID, coll("arachnida", ignore_case = TRUE))] <-
    "Invertebrates (insects/arachnids)"
    QuarIssues[str_detect(Hazard, coll("borer", ignore_case = TRUE))] <- "Borer"
    QuarIssues[str_detect(Hazard, coll("documentation", ignore_case = TRUE)) |
      str_detect(Hazard, coll("declaration", ignore_case = TRUE)) |
      str_detect(Hazard, coll("undeclared", ignore_case = TRUE))] <-
    "Documentation/Declaration"
    QuarIssues[str_detect(Hazard, coll("bark", ignore_case = TRUE))] <- "Bark"
    QuarIssues[str_detect(Hazard, coll("plant material", ignore_case = TRUE)) |
      str_detect(Hazard, coll("seed", ignore_case = TRUE)) |
      str_detect(FormalID, coll("lilopsida", ignore_case = TRUE)) |
      str_detect(FormalID, coll("magnoliopsida", ignore_case = TRUE))] <-
    "Foreign Plant Material"
    QuarIssues[str_detect(Hazard, coll("disease", ignore_case = TRUE))] <- "Plant
    Disease"
    QuarIssues[str_detect(FormalID, coll("ascomycetes", ignore_case = TRUE)) |
      str_detect(FormalID, coll("basidiomycetes", ignore_case = TRUE)) |
      str_detect(FormalID, coll("zygomycetes", ignore_case = TRUE))] <-
    "Fungi"
    QuarIssues[str_detect(Hazard, coll("soil", ignore_case = TRUE))] <- "Soil
    Contamination"
    QuarIssues[is.na(QuarIssues)] <- NA
    QuarPacking <- NULL
    QuarPacking[IncCommod == "Packing"] <- 1
    QuarPacking[is.na(QuarPacking)] <- 0
  })
  vsqfsort <- rbindlist(
    llply(qfails subs, function(i){
      coffrec <- subset(vsquarfail, vsquarfail$CombEntry == i)
      quartype <- paste(as.character(unique(na.omit(coffrec$QuarIssues))), collapse = ";")
    })
    quartype[quartype == ""] <- "Not available"
    techdescrip <- paste(as.character(unique(na.omit(coffrec$FormalID))), collapse =
    "; ")
    techdescrip <- gsub("^ +| +$( ) +", "\\1", techdescrip)
    techdescrip[techdescrip == ""] <- "Not available"
    quarpackcheck <- max(coffrec$QuarPacking)
    packcheck <- NULL
    packcheck[quarpackcheck == 1] <- "Yes"
    packcheck[is.na(packcheck)] <- "No"
    DateInsp <- min(coffrec$InspectDate)
    data.table(
      Entry = coffrec$Entry[1],
      LineNum = coffrec$LineNum[1],
      Description = coffrec$Description[1],
      Date = DateInsp,
      Origin = coffrec$Origin[1],

```

```

    Importer = coffrec$Importer[1],
    ImporterName = coffrec$ImporterName[1],
    Supplier = coffrec$Supplier[1],
    SupplierName = coffrec$SupplierName[1],
    TypeRisk = quartype,
    PackRisk = packcheck,
    FormalDescrip = techdescrip)
  })
)

# Cross tabulation on importer
impfail <- data.table(vegseed2[,
  list(ImporterCode =
as.character(Importer[match(ImporterName,ImporterName)]),
  PathFails = length(Result[Result == 1]),
  QtineFails = length(QFail[QFail == 1]),
  Inspections = length(Result[Result >= 0])),
  by = "ImporterName"]
impfail <- within(impfail, {
  PathFailRate <- PathFails/Inspections * 100
  QtineFailRate <- QtineFails/Inspections * 100
  ImportShare <- Inspections/sum(Inspections) * 100
})
# Sort in decreasing order of number of inspections and only display those with
# 'threshgenrep' or more inspections in total
impfail <- impfail[order(-Inspections)]
impfail2 <- impfail[Inspections >= threshgenrep]
implist <- unique(impfail2$ImporterName)

# For each importer that meets the reporting threshold, prepare
# reports and appropriate cross-tabulations
for (i in implist){
  # Cross tabulation on importer & supplier (importers with more than 50 containers)
  impsuppfail <- data.table(subset(vegseed2, vegseed2$ImporterName == i)[,
    list(ImporterName = i,
  ImporterCode =
as.character(Importer[match(i,ImporterName)]),
  SupplierCode =
as.character(Supplier[match(SupplierName,SupplierName)]),
  PathFails = length(Result[Result
== 1]),
  QtineFails = length(QFail[QFail ==
1]),
  Inspections = length(Result[Result
>= 0])),
  by = "SupplierName"]
  impsuppfail <- impsuppfail[order(-Inspections)]
  impsuppperf <- impsuppfail[Inspections >= threshstats]
  # Ensures table dimension no larger than 20 items
  suppthresh = threshstats

```

```

while(nrow(imp pupperf) > 20){
  suppthresh = 2 * suppthresh
  imp pupperf <- imp pupperfail[Inspections >= suppthresh]
}
imp pupperfailsmall <- imp pupperfail[Inspections < suppthresh]
imp pupperf <- rbindlist(list(imp pupperf,
  if(nrow(imp pupperfailsmall) > 0){
    if(sum(imp pupperfailsmall$Inspections) > 0){
      list(paste("Other suppliers (fewer than", suppthresh, "consignments)",
        i,
        as.character(vegseed2$Importer[match(i,vegseed2$ImporterName)]),
        "Not applicable",
        sum(imp pupperfailsmall$PathFails),
        sum(imp pupperfailsmall$QtimeFails),
        sum(imp pupperfailsmall$Inspections)))} })))
imp pupperf <- within(imp pupperf, {
  PathFailRate <- PathFails/Inspections * 100
  QtimeFailRate <- QtimeFails/Inspections * 100
  SupplierShare <- Inspections/sum(Inspections) * 100
})
setcolorder(imp pupperf, c("ImporterName", "ImporterCode", "SupplierName",
  "SupplierCode", "PathFails", "QtimeFails", "Inspections",
  "PathFailRate", "QtimeFailRate", "SupplierShare"))

# Cross tabulation on importer & description (importers with more than 50
containers)
impdescripfail <- data.table(subset(vegseed2, vegseed2$ImporterName == i))[
  list(ImporterName = i,
    ImporterCode =
as.character(Importer[match(i,ImporterName)]),
    PathFails = length(Result[Result
== 1]),
    QtimeFails = length(QFail[QFail
== 1]),
    Inspections =
length(Result[Result >= 0])),
  by = "Description"]
impdescripfail <- impdescripfail[order(-Inspections)]
impdescripperf <- impdescripfail[Inspections >= threshstats]
# Ensures table dimension no longer than 20 items
descripthresh = threshstats
while(nrow(impdescripperf) > 20){
  descripthresh = 2 * descripthresh
  impdescripperf <- impdescripfail[Inspections >= descripthresh]
}
impdescripfailsmall <- impdescripfail[Inspections < descripthresh]
impdescripperf <- rbindlist(list(impdescripperf,
  if(nrow(impdescripfailsmall) > 0){
    if(sum(impdescripfailsmall$Inspections) > 0){

```

```

      list(paste("Other seed descriptions (fewer than", descripthresh,
"consignments)"),
      i, as.character(vegseed2$Importer[match(i,vegseed2$ImporterName)]),
      sum(impdescripfails$PathFails),
      sum(impdescripfails$QtimeFails),
      sum(impdescripfails$Inspections))})))
impdescriperf <- within(impdescriperf, {
  PathFailRate <- PathFails/Inspections * 100
  QtimeFailRate <- QtimeFails/Inspections * 100
  ItemShare <- Inspections/sum(Inspections) * 100
})
setcolorder(impdescriperf, c("ImporterName", "ImporterCode", "Description",
  "PathFails", "QtimeFails", "Inspections",
  "PathFailRate", "QtimeFailRate", "ItemShare"))

# Cross tabulation on importer & country of origin (importers with more than 50
containers)
impcountryfail <- data.table(subset(vegseed2, vegseed2$ImporterName == i)[,
  list(ImporterName = i,
  ImporterCode =
as.character(Importer[match(i,ImporterName)]),
  PathFails = length(Result[Result
== 1]),
  QtimeFails = length(QFail[QFail
== 1]),
  Inspections =
length(Result[Result >= 0])),
  by = "Origin"])
impcountryfail <- impcountryfail[order(-Inspections)]
impcountryperf <- impcountryfail[Inspections >= threshstats]
# Ensures table dimension no longer than 20 items
countrythresh = threshstats
if(nrow(impcountryperf) > 20){
  countrythresh = 2 * countrythresh
  impcountryperf <- impcountryperf[Inspections >= countrythresh]
}
impcountryfailsmall <- impcountryfail[Inspections < countrythresh]
impcountryperf <- rbindlist(list(impcountryperf,
  if(nrow(impcountryfailsmall) > 0){
    if(sum(impcountryfailsmall$Inspections) > 0){
      list(paste("Other countries (fewer than", threshstats, "consignments)"),
      i,
      as.character(vegseed2$Importer[match(i,vegseed2$ImporterName)]),
      sum(impcountryfailsmall$PathFails),
      sum(impcountryfailsmall$QtimeFails),
      sum(impcountryfailsmall$Inspections))})))
impcountryperf <- within(impcountryperf, {
  PathFailRate <- PathFails/Inspections * 100
  QtimeFailRate <- QtimeFails/Inspections * 100
  ItemShare <- Inspections/sum(Inspections) * 100

```

```

})
setcolorder(impcountryperf, c("ImporterName", "ImporterCode", "Origin",
                             "PathFails", "QtineFails", "Inspections",
                             "PathFailRate", "QtineFailRate", "ItemShare"))

# Prepare reports for each importer
dateselector <- subset(vegseed2, vegseed2$ImporterName == i)
mindate = min(dateselector$Date)
maxdate = max(dateselector$Date)
doctitle = paste("Biosecurity Inspection Performance Report:", stri_trans_totitle(i))
abnsubtitle = paste("ABN:", as.character(impsuppperf$ImporterCode[1]))
rmarkdown::render(input = file.path(HOME, "Biosecurity Inspection Performance
Report - 6 October 2016.Rmd"),
                  output_format = "pdf_document",
                  output_file = paste("Biosecurity Performance Report, ", i, '_',
as.character(impsuppperf$ImporterCode[1]), '_', Sys.Date(), ".pdf", sep="),
                  output_dir = file.path(HOME, "Reports"))
}

```

B.2. RMarkdown script for generating reports from transformed data

```

---
title: "`r doctitle `"
subtitle: "`r abnsubtitle `"
author:
- 'Compliance-Based Inspection Trial for Selected Vegetable Seeds for Sowing'
- `r paste("Report date:", format(Sys.Date(), "%d %B %Y"))`
- `r paste("Dates covered by this report:", format(mindate, "%d %B %Y"), "to",
format(maxdate, "%d %B %Y"))`
fontsize: 11pt
classoption: landscape
papersize: a4paper
geometry: margin = 2cm
---
```{r, echo=FALSE}
suppressWarnings(suppressPackageStartupMessages(library(ggplot2)))
suppressWarnings(suppressPackageStartupMessages(library(stringr)))
suppressWarnings(suppressPackageStartupMessages(library(xtable)))
library(knitr)
library(markdown)
library(rmarkdown)
library(rJava)
library(data.table)
library(plyr)
library(stringr)
library(stringi)
library(lubridate)
library(gridExtra)
library(grid)

```

```
library(ggplot2)
library(xtable)
library(reshape2)
library(pander)
```

```
```
```

Purpose

This report is designed to help you understand how you can improve your compliance with Australia's biosecurity requirements as part of the [compliance-based inspection trial for selected vegetable seeds for sowing](<http://www.agriculture.gov.au/import/goods/plant-products/risk-return/trial-peat-vegetable-seeds>) (under tariff code 1209.91.00) being conducted by the [Department of Agriculture and Water Resources](<http://www.agriculture.gov.au/>) (the department).

This is first report sent to you as part of this trial by the department. It shows your compliance with biosecurity requirements across all seeds, both eligible and ineligible for the trial, imported under the tariff code 1209.91.00. Future reports will only provide information for eligible seeds where your broker enters the AQIS Commodity Code **LSTD** when lodging consignments.

Ensuring your goods meet biosecurity requirements will enable faster (and less costly) clearance of your goods on arrival and reduce the number of inspections you experience at the border as part of the trial. The department wants to ensure goods brought into Australia are practically free from contamination with biosecurity risk material, such as live insects, soil, plant pathogens, foreign seeds, bark or other plant material -- all of which have potential to introduce exotic pests and diseases into Australia. See the department's import conditions database [**BICON**](<https://bicon.agriculture.gov.au/BiconWeb4.0>) for the full list of requirements for your vegetable seeds for sowing.

Your recent biosecurity inspection performance

```
```{r, echo=FALSE}
Compute average failure rate for graphs
avgfail <- impfail2$PathFailRate[match(i,impfail2$ImporterName)]

Number of inspection failures
nofails <- impfail2$PathFails[match(i,impfail2$ImporterName)]

Change decimal presentation
specify_decimal <- function(x, k) format(round(x, k), nsmall=k)

Supplier performance charts
if (nrow(impsupperf) > 1){
 show.supptext0 <- FALSE
 if (nrow(impsupperf) > 2){
 show.supptext1 <- FALSE
```

```
if (max(impsuppperf$PathFails) <= 1){
 show.suppfig <- FALSE
 if (max(impsuppperf$PathFails) == 0){
 show.supptabalt0 <- TRUE
 show.supptabalt1 <- FALSE
 } else {
 show.supptabalt0 <- FALSE
 show.supptabalt1 <- TRUE
 } } else {
 show.suppfig <- TRUE
 show.supptabalt0 <- FALSE
 show.supptabalt1 <- FALSE
} } else {
 show.suppfig <- FALSE
 show.supptabalt0 <- FALSE
 show.supptabalt1 <- FALSE
 show.suptext1 <- TRUE
} } else {
 show.suptext0 <- TRUE
 show.suptext1 <- FALSE
 show.supptabalt0 <- FALSE
 show.supptabalt1 <- FALSE
 show.suppfig <- FALSE
}

Description performance charts
if (nrow(impdescripperf) > 1){
 show.descriptext0 <- FALSE
 if (nrow(impdescripperf) > 2){
 show.descriptext1 <- FALSE
 if (max(impdescripperf$PathFails) <= 1){
 show.descripfig <- FALSE
 if (max(impdescripperf$PathFails) == 0){
 show.descriptabalt0 <- TRUE
 show.descriptabalt1 <- FALSE
 } else {
 show.descriptabalt0 <- FALSE
 show.descriptabalt1 <- TRUE
 } } else {
 show.descripfig <- TRUE
 show.descriptabalt0 <- FALSE
 show.descriptabalt1 <- FALSE
 } } else {
 show.descripfig <- FALSE
 show.descriptabalt0 <- FALSE
 show.descriptabalt1 <- FALSE
 show.descriptext1 <- TRUE
 } } else {
 show.descriptext0 <- TRUE
 show.descriptext1 <- FALSE
 }
```

```

show.descriptabalt0 <- FALSE
show.descriptabalt1 <- FALSE
show.descripfig <- FALSE
}

Country performance charts
if (nrow(impcountryperf) > 1){
 show.countrytext0 <- FALSE
 if (nrow(impcountryperf) > 2){
 show.countrytext1 <- FALSE
 if (max(impcountryperf$PathFails) <= 1){
 show.countryfig <- FALSE
 if (max(impcountryperf$PathFails) == 0){
 show.countrytabalt0 <- TRUE
 show.countrytabalt1 <- FALSE
 } else {
 show.countrytabalt0 <- FALSE
 show.countrytabalt1 <- TRUE
 }
 } else {
 show.countryfig <- TRUE
 show.countrytabalt0 <- FALSE
 show.countrytabalt1 <- FALSE
 }
 } else {
 show.countryfig <- FALSE
 show.countrytabalt0 <- FALSE
 show.countrytabalt1 <- FALSE
 show.countrytext1 <- TRUE
 }
} else {
 show.countrytext0 <- TRUE
 show.countrytext1 <- FALSE
 show.countrytabalt0 <- FALSE
 show.countrytabalt1 <- FALSE
 show.countryfig <- FALSE
}

...

```

This section shows the percentage of inspections for which non-compliances (such as incorrect declaration of goods, packaging failures or the presence of biosecurity risk material) have been identified during border inspections. Failure rates are shown by the suppliers used, the goods description entered by your broker and the seeds' country of origin to help you identify any sources of concern. ``r if(show.suppfig | show.descripfig | show.countryfig){ "The tables in the appendix provide more detailed information about your biosecurity performance." }`

## Supplier performance

```

```{r conditional_suppfig, eval = show.suppfig, echo=FALSE, fig.height = 6.5,
fig.width = 9.5}

```

```
# Supplier performance charts
```

```
impsuppperf$SuppAIMS <- paste0(stri_trans_totitle(impsuppperf$SupplierName),"
(", impsuppperf$Inspections,"))
```

```
impsupplot <- ggplot(data = impsuppperf, aes(x = reorder(SuppAIMS, -
PathFailRate),
```

```
          y = PathFailRate, fill = PathFailRate)) +
  geom_bar(stat="identity", position=position_dodge()) +
  xlab("Supplier") + ylab("Inspection failure rate (%)") +
  scale_x_discrete(labels = function(x) str_wrap(x, width = 70)) +
  scale_y_continuous(limits = c(0, NA)) +
  scale_fill_gradient2(mid='darkblue', high='red', space='Lab') +
  coord_flip() +
  guides(fill = FALSE) +
  geom_hline(yintercept=avgfail) +
  labs(title = "Inspection failures by source supplier") +
  theme(plot.title = element_text(size=16), axis.text.y = element_text(size = 11),
axis.title.y = element_text(size = 12))
```

```
impsupfootnote <- paste("Notes: Suppliers are ordered from lowest to highest
failure rate. Only suppliers used for at least", suppthresh, "line items shown. The
number of line \nitems associated with the supplier are indicated in brackets after
supplier name. Duplicate or similar supplier names may appear in the list \nbecause of
how the broker entered the consignment into the Agriculture Import Management
System (AIMS). The black vertical line \nindicates your organisation's average
inspection failure rate.")
```

```
impsupchart <- arrangeGrob(imsupplot, bottom = textGrob(imsupfootnote, x
= 0, hjust = 0, vjust=0.5, gp = gpar(fontface = "italic", fontsize = 11)))
```

```
grid.draw(imsupchart)
```

```
...
```

```
`r if(show.supptabalt0){"Your organisation's main suppliers recorded no inspection
failures over the period covered by the report. The table below shows the number of
inspections performed relating to each supplier."}`
```

```
```{r conditional_supptabalt, eval = show.supptabalt0, echo=FALSE}
```

```
impsupptable <- imsuppperf[, .SD, .SDcols = c(3, 4, 7)]
```

```
impsupptable$SupplierName <- stri_trans_totitle(imsupptable$SupplierName)
names(imsupptable) <- c("Supplier", "AIMS Identifier", "Inspections")
```

```
pander(imsupptable, 'Inspections by source supplier', justify = 'lcc', style =
"multiline", use.hyphening = TRUE, split.cells = c("60%", "20%", "20%"), split.table
= 130)
```

```
...
```

```
`r if(show.supptab1){paste("Your organisation only had main suppliers that
recorded at most one inspection failure over the period covered by the report. The
table below shows you how well these suppliers performed.")}`
```

```
```{r conditional_supptab1, eval = show.supptab1, echo=FALSE}
```

```
impsupptable <- imsuppperf[, .SD, .SDcols = c(3, 4, 5, 7, 8)]
impsupptable$SupplierName <- stri_trans_totitle(imsupptable$SupplierName)
impsupptable$PathFailRate <- specify_decimal(imsupptable$PathFailRate, 1)
names(imsupptable) <- c("Supplier", "AIMS Identifier", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")
```

```
pander(imsupptable, 'Inspection outcomes by source supplier', justify = 'lcccc', style
= "multiline", use.hyphening = TRUE, split.cells = c("50%", "20%", "10%", "10%",
"10%"), split.table = 130)
```

```
```
```

```
`r if(show.supptext1){paste("Your organisation had only one supplier relating to at
least", threshstats, "consignments over the period covered by the report. The table
below shows you how well this supplier performed.")}`
```

```
```{r conditional_supptext1, eval = show.supptext1, echo=FALSE}
```

```
impsupptable <- imsuppperf[, .SD, .SDcols = c(3, 4, 5, 7, 8)]
impsupptable$SupplierName <- stri_trans_totitle(imsupptable$SupplierName)
impsupptable$PathFailRate <- specify_decimal(imsupptable$PathFailRate, 1)
names(imsupptable) <- c("Supplier", "AIMS Identifier", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")
```

```
pander(imsupptable, 'Inspection outcomes by source supplier', justify = 'lcccc', style
= "multiline", use.hyphening = TRUE, split.cells = c("50%", "20%", "10%", "10%",
"10%"), split.table = 130)
```

```
```
```

```
`r if(show.supptext0){paste("Your organisation had no suppliers from which you
received at least", threshstats, "consignments of vegetable seeds over the period
covered in this report.")}`
```

```
Seed description
```

```
```{r conditional_descripfig, eval = show.descripfig, echo=FALSE, fig.height = 6.5,
fig.width = 9.5}
```

```
impdescripperf$DescripAIMS <-
paste0(stri_trans_totitle(impdescripperf$Description), " (",
impdescripperf$Inspections, ")")
impdescriplot <- ggplot(data = impdescripperf, aes(x = reorder(DescripAIMS, -
PathFailRate),
```

```

      y = PathFailRate, fill = PathFailRate)) +
    geom_bar(stat="identity", position=position_dodge()) +
    xlab("Seed description") + ylab("Inspection failure rate (%)") +
    scale_x_discrete(labels = function(x) str_wrap(stri_trans_totitle(x), width = 70)) +
    scale_y_continuous(limits = c(0, NA)) +
    scale_fill_gradient2(mid='darkblue', high='red', space='Lab') +
    coord_flip() +
    guides(fill = FALSE) +
    geom_hline(yintercept=avgfail) +
    labs(title = "Inspection failures by seed description") +
    theme(plot.title = element_text(size=16), axis.text.y = element_text(size = 11),
    axis.title.y = element_text(size = 12))

```

impdescripfootnote <- paste("Notes: Seed descriptions are ordered from lowest to highest failure rate. Only descriptions used for at least", descripthresh, "line items shown. The number \nof line items associated with the seed descriptions are indicated in brackets after the description. The black vertical line indicates your \norganisation's average inspection failure rate.")

```

impdescripchart <- arrangeGrob(impdescripplot, bottom =
textGrob(impdescripfootnote, x = 0, hjust = 0, vjust=0.5, gp = gpar(fontface = "italic",
fontsize = 11)))

```

```

grid.draw(impdescripchart)

```

```

...

```

```

`r if(show.descriptabalt0){"The main descriptions used by your organisation had no
inspection failures over the period covered by the report. The table below shows the
number of inspections performed relating to each seed description."}`

```

```

```{r conditional_descriptabalt0, eval = show.descriptabalt0, echo=FALSE}

```

```

impdescriptable <- impdescripperf[, .SD, .SDcols = c(3, 6)]
impdescriptable$Description <- stri_trans_totitle(impdescriptable$Description)
names(impdescriptable) <- c("Seed Description", "Inspections")

```

```

pander(impdescriptable, 'Inspections by seed description', justify = 'lc', style =
"multiline", use.hyphening = TRUE, split.cells = c("70%", "30%"), split.table = 130)

```

```

...

```

```

`r if(show.descriptabalt1){paste("The main descriptions used by your organisations
had at most one inspection failure over the period covered by the report. The table
below shows you the failure characteristics of the seed descriptions you used."})`

```

```

```{r conditional_descriptabalt1, eval = show.descriptabalt1, echo=FALSE}

```

```

impdescriptable <- impdescripperf[, .SD, .SDcols = c(3, 4, 6, 7)]
impdescriptable$PathFailRate <- specify_decimal(impdescriptable$PathFailRate, 1)

```

```

impdescriptable$Description <- stri_trans_totitle(impdescriptable$Description)
names(impdescriptable) <- c("Seed Description", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")

pander(impdescriptable, 'Inspection outcomes by seed description', justify = 'lccc',
style = "multiline", split.cells = c("55%", "15%", "15%", "15%"), split.table = 130)

...

`r if(show.descriptext1){paste("Your organisation used only one seed description
relating to at least", threshstats, "consignments over the period covered by the report.
The table below shows you the failure characteristics of this seed description.")}`

```{r conditional_descriptext1, eval = show.descriptext1, echo=FALSE}

impdescriptable <- impdescripperf[, .SD, .SDcols = c(3, 4, 6, 7)]
impdescriptable$PathFailRate <- specify_decimal(impdescriptable$PathFailRate, 1)
impdescriptable$Description <- stri_trans_totitle(impdescriptable$Description)
names(impdescriptable) <- c("Seed Description", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")

pander(impdescriptable, 'Inspection outcomes by seed description', justify = 'lccc',
style = "multiline", split.cells = c("55%", "15%", "15%", "15%"), split.table = 130)

...

`r if(show.descriptext0){paste("Your organisation had no seed description which your
broker used for at least", threshstats, "consignments of vegetable seeds over the period
covered in this report.")}`

Seed country of origin

```{r conditional_countryfig, eval = show.countryfig, echo=FALSE, fig.height = 6.5,
fig.width = 9.5}

# Country of origin charts
impcountryperf$OriginAIMS <- paste0(stri_trans_totitle(impcountryperf$Origin), " (",
impcountryperf$Inspections, ")")

impcountryplot <- ggplot(data = impcountryperf, aes(x = reorder(OriginAIMS, -
PathFailRate),
y = PathFailRate, fill = PathFailRate)) +
  geom_bar(stat="identity", position=position_dodge()) +
  xlab("Country of origin") + ylab("Inspection failure rate (%)") +
  scale_x_discrete(labels = function(x) str_wrap(stri_trans_totitle(x), width = 70)) +
  scale_y_continuous(limits = c(0, NA)) +
  scale_fill_gradient2(mid='darkblue', high='red', space='Lab') +
  coord_flip() +
  guides(fill = FALSE) +
  geom_hline(yintercept=avgfail) +

```

```

    labs(title = "Inspection failures by country of origin") +
    theme(plot.title = element_text(size=16), axis.text.y = element_text(size = 11),
axis.title.y = element_text(size = 12))

    impcountryfootnote <- paste("Notes: Countries of origin are ordered from lowest to
highest failure rate. Only descriptions used for at least", countrythresh, "line items
shown. The number \nof line items associated with the country of origin are indicated
in brackets after the country label. The black vertical line indicates your
\norganisation's average inspection failure rate.")

    impcountrychart <- arrangeGrob(impcountryplot, bottom =
textGrob(impcountryfootnote, x = 0, hjust = 0, vjust=0.5, gp = gpar(fontface =
"italic", fontsize = 11)))

    grid.draw(impcountrychart)

  ...

  `r if(show.countrytabalt0){"Your organisation's main source countries recorded no
inspection failures over the period covered by the report. The table below shows the
number of inspections performed relating to each country of origin."}`

  ```{r conditional_countrytabalt0, eval = show.countrytabalt0, echo=FALSE}

 impcountrytable <- impcountryperf[, .SD, .SDcols = c(3, 6)]
 impcountrytable$Origin <- stri_trans_totitle(impcountrytable$Origin)
 names(impcountrytable) <- c("Seed Country of Origin", "Inspections")

 pander(impcountrytable, 'Inspection outcomes by seed country of origin', justify = 'lc',
style = "multiline", split.cells = c("70%", "30%"), split.table = 130)

 ...

 `r if(show.countrytabalt1){paste("Your organisation's main source countries recorded
at most one inspection failure over the period covered by the report. The table below
shows the inspection performance for your vegetable seeds by country of origin."})`

  ```{r conditional_countrytabalt1, eval = show.countrytabalt1, echo=FALSE}

  impcountrytable <- impcountryperf[, .SD, .SDcols = c(3, 4, 6, 7)]
  impcountrytable$PathFailRate <- specify_decimal(impcountrytable$PathFailRate, 1)
  impcountrytable$Origin <- stri_trans_totitle(impcountrytable$Origin)
  names(impcountrytable) <- c("Seed Country of Origin", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")

  pander(impcountrytable, 'Inspection outcomes by seed country of origin', justify =
'left', style = "multiline", split.cells = c("55%", "15%", "15%", "15%"), split.table =
130)

  ...

```

```
`r if(show.countrytext1){paste("Your organisation used only one source country  
relating to at least", threshstats, "consignments over the period covered by the report.  
The table below shows the inspection performance for this country.")}`
```

```
```{r conditional_countrytext1, eval = show.countrytext1, echo=FALSE}
```

```
impcountrytable <- impcountryperf[, .SD, .SDcols = c(3, 4, 6, 7)]
impcountrytable$PathFailRate <- specify_decimal(impcountrytable$PathFailRate, 1)
impcountrytable$Origin <- stri_trans_totitle(impcountrytable$Origin)
names(impcountrytable) <- c("Seed Country of Origin", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")
```

```
pander(impcountrytable, 'Inspection outcomes by seed country of origin', justify =
'lccc', style = "multiline", split.cells = c("55%", "15%", "15%", "15%"), split.table =
130)
```

```
```
```

```
`r if(show.countrytext0){paste("Your organisation had no source country from which  
you received at least", threshstats, "consignments of vegetable seeds over the period  
covered in this report.")}`
```

```
## Inspection failures where biosecurity risk material found
```

```
```{r, echo=FALSE}
```

```
quarfaillist <- subset(vsqfsort, vsqfsort$ImporterName == i)
nofailures <- nrow(quarfaillist)
```

```
```
```

```
`r if(nofailures > 1){paste("Details of the biosecurity risk material found in your  
vegetable seed consignment are available for", nofailures, "consignments that failed  
inspection over the period covered by this report. The table below provides more  
detail about these consignments, including the types of risks detected.")}`
```

```
`r if(nofailures == 1){"Details of the biosecurity risk material found in your vegetable  
seed consignment are available for one consignment that failed inspection over the  
period covered by this report. The nature of risks detected in this consignment is  
shown in the table below."}`
```

```
`r if(nofailures == 0 && nofails > 0){"Over the period covered by this report, details  
of any biosecurity risk material found in inspections at the border are unavailable."}`
```

```
`r if(nofailures == 0 && nofails == 0){"Over the period covered by this report, none  
of your consignments were found to contain biosecurity risk material from inspections  
at the border."}`
```

```
```{r, echo=FALSE}
```

```

if(nofailures > 0){
 quarfaillist <- quarfaillist[order(Entry, LineNum)]
 quarfaillist <- within(quarfaillist, {
 EntryLineNum <- paste(Entry, LineNum, sep = "--")
 SupplierName <- stri_trans_totitle(SupplierName)
 Description <- stri_trans_totitle(Description)
 })
 quartable <- quarfaillist[, .SD, .SDcols = c(13, 3, 9, 10, 11, 12)]
 names(quartable) <- c("AIMS Entry--Line Number", "Goods Description", "Supplier
Name", "Types of Risks Detected", "Packaging Issue?", "Organism/s: Specification to
Genus (where available)")

 pander(quartable, 'Consignments with biosecurity risk material', justify = 'cccccc',
style = "multiline", use.hyphening = TRUE, split.cells = c("15%", "15%", "17%",
"19%", "10%", "24%"), split.tables = 130)
}

...

Further information

For more information or advice, please contact the Department of Agriculture and
Water Resources via:

Email: <imports@agriculture.gov.au>

Phone: 1800 900 090 (and follow the prompts)

`r if(show.suppfig | show.descripfig | show.countryfig){"# Appendix: Detailed
biosecurity performance information"}`

`r if(show.suppfig | show.descripfig | show.countryfig){"This appendix provides more
detailed information in tabular form of your recent inspection performance by source
supplier, seed description and seed country of origin. These tables are ordered
according to the number of inspections (from largest to smallest) which correspond to
the relevant attribute. Tables are only shown here where figures are presented in the
main part of the document."}`

`r if(show.suppfig){"## Supplier performance"}`

```{r conditional_supptab, eval = show.suppfig, echo=FALSE}

impsupptable <- impsuppperf[, .SD, .SDcols = c(3, 4, 5, 7, 8)]
impsupptable$SupplierName <- stri_trans_totitle(impsupptable$SupplierName)
impsupptable$PathFailRate <- specify_decimal(impsupptable$PathFailRate, 1)
names(impsupptable) <- c("Supplier", "AIMS Identifier", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")

```

```

pander(impstable, 'Inspection outcomes by source supplier', justify = 'lcccc', style
= "multiline", use.hyphening = TRUE, split.cells = c("50%", "20%", "10%", "10%",
"10%"), split.table = 130)

...

`r if(show.descripfig){"## Performance by seed description"}`

```{r conditional_descriptab, eval = show.descripfig, echo=FALSE}

impdescriptable <- impdescripperf[, .SD, .SDcols = c(3, 4, 6, 7)]
impdescriptable$PathFailRate <- specify_decimal(impdescriptable$PathFailRate, 1)
impdescriptable$Description <- stri_trans_totitle(impdescriptable$Description)
names(impdescriptable) <- c("Seed Description", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")

pander(impdescriptable, 'Inspection outcomes by seed description', justify = 'lccc',
style = "multiline", split.cells = c("55%", "15%", "15%", "15%"), split.table = 130)

...

`r if(show.countryfig){"## Performance by country of origin"}`

```{r conditional_countrytab, eval = show.countryfig, echo=FALSE}

impcountrytable <- impcountryperf[, .SD, .SDcols = c(3, 4, 6, 7)]
impcountrytable$PathFailRate <- specify_decimal(impcountrytable$PathFailRate, 1)
impcountrytable$Origin <- stri_trans_totitle(impcountrytable$Origin)
names(impcountrytable) <- c("Seed Country of Origin", "Inspection Failures",
"Inspections", "Inspection Failure Rate (%)")

pander(impcountrytable, 'Inspection outcomes by seed country of origin', justify =
'lccc', style = "multiline", split.cells = c("55%", "15%", "15%", "15%"), split.table =
130)

...

```

B.3. R script for analysing import consignment data

This code is used to analyse import consignment data (inspections and documents) and to investigate behaviour change under the trial for selected vegetable seeds (AQIS commodity code LSTD) and peat (FERT).

This code was written by Dr Jason Whyte. The code is 44 pages long, and, due to the confidential nature of the data it analyses, it is only available to DAWE staff upon request to CEBRA.

Appendix C: Semi-Structured Interview Questions for Importers

C.1. Phase I interview

General information about the importer and customs broker communication

1. How long have you been importing peat used for fertiliser, soil conditioner or potting mix/permitted vegetable seeds (those which do not require an import permit) into Australia?
2. Do you use in-house customs brokers, external customs brokers or a combination of both for clearing your goods through customs and quarantine checks?

Only in-house/Only external/In-house and external

3. Have you changed your customs brokers over the previous 12 months for clearance of peat/permitted vegetable seeds? If so, what was the reason?
4. How long have you used the current customs broker?
5. Thinking about the customs broker you have used most often in the past 12 months, for a typical consignment of peat used for fertiliser, soil conditioner or potting mix/permitted vegetable seeds:
 - a) At what stages of the importing process do you and the customs broker communicate?
 - b) Could you describe what information is typically relayed to you by your customs broker? (Prompt: What information about the status of clearing customs and quarantine are you told? What information about the costs of clearing customs and quarantine are you told?)

Assessing usual behaviour and supplier communication on pathway before trial commencement

6. What are the main countries of origin of your peat/permitted vegetable seeds?
7.
 - a) Over the previous 12 months how many different suppliers of peat/permitted vegetable seeds have you used?
 - b) Over the past 12 months, have you changed suppliers? If so, what was the reason?
 - c) Can you list the names of your regular suppliers of choice? (list up to 5)
8. How often do you tend to import peat/permitted vegetable seeds into Australia? (e.g. three shipments per week)
9. What is the size of a typical peat/permitted vegetable seeds consignment you bring into Australia? (e.g. six FCL containers, 20 000 seed packets)

10. Thinking about the supplier you have used most in the past 12 months:

- a) How frequently do you speak with them about Australian biosecurity requirements?
- b) How often and under what circumstances do you discuss the results of quarantine inspections with them?
- c) In the past 12 months, have you been made aware of any changes to production processes, quality assurance procedures or transportation arrangements instigated by this supplier?

Awareness of Changes to inspection protocols for peat/permitted vegetable seeds for sowing.

11. Thinking specifically about peat/permitted vegetable seeds:

- a) Are you aware that the quarantine clearance methods changed/are due to change in July 2016?
Yes/No [if no, interviewer explains changes, and skips to a question about how the importer typically receives their information – Q 10]
- b) Can you briefly describe what you understand to be the changes that were introduced?
- c) How did you become aware of these changes in inspection protocols?
- d) Do you have any feedback about how the Commonwealth Government could improve the way it communicated these protocol changes?

12. a) In general, how do you find information about changes to quarantine procedures in Australia?

- b) Do you have any feedback for the Department as to how it could improve communication with your organisation?

Use of feedback information via reporting system (vegetable seeds only)

13. Are you aware if your organisation received an email from the Department summarising your organisation's inspection records on the vegetable seeds pathway over the past (two) years? (Yes/no; If no, we need to be able to provide that information to them on the spot or via email)

14. a) Regarding this report, does it contain information useful for your operations? Yes/No

- b) Could you describe what information you find useful about it and why?

- c) What, if any, information in the report did you find surprising?
- d) How do you believe the report could be improved to be more useful to your organisation?

Other comments

- 15. Are there any other comments you would like to make about the changes in inspection rules, the rules themselves or how the rule-changes were implemented?

Conclusion of interview

We would like to ask you similar questions in approximately 6 months' time

C.2. Phase II interview

Trial participation

- 1. a) Could you please confirm if you are now participating in the trial? By participating, we mean that your broker is using the relevant AQIS Commodity Code (FERT/LSTD) for eligible lines when lodging consignments with the Department of Agriculture and Water Resources. [Yes/No/don't know]
- b) [If yes] Could you describe some of the main factors behind why you are keen to take part in the trial?
- c) [If no] Could you describe some of the main factors behind why your organisation has decided not to participate in the reduced-inspection trial?

Customs broker communications

- 2. a) Since we last spoke, has your customs broker reported changes in the way your goods have cleared quarantine? [Yes/No]
- b) [If yes] Could you describe the changes you have noticed?
- 3. a) Over the past six months, have you and your customs broker changed how you communicate? [Yes/No]
- b) [If yes] Could you describe how the way you communicate has changed in terms of when this happens and what information you discuss?

c) [If yes] What prompted you and your customs broker to make these changes?

Assessing changes on pathway during trial period

4. In xxx 2016 when we first spoke, you noted that you tend to import around (x consignments per week) of peat/permitted vegetable seeds into Australia.

a) Since then, have you changed how frequently you import these products into Australia? (if yes, details in comment box; if no, skip to Q5)

b) What prompted you to make these changes to your operations?

5. In xxx 2016, you noted that your shipments of peat/permitted vegetable seeds into Australia consisted of (x seed packets/y FCL containers).

a) Since then, have you changed your typical shipment size? (if yes, details in comment box; if no, skip to Q6)]

b) What prompted you to make these changes to your operations?

6. In xxx 2016, you noted that your main countries of origin for your shipments of peat/permitted vegetable seeds into Australia consisted of (x, y and z).

a) Since the start of the trial, have you made any changes to your source countries? [Yes/No]

Prompts: Added new countries/dropped some countries; changed the relative shares of the countries of origin

[If yes, record details in comment box; otherwise skip to Q7]

b) What prompted you to make these changes to your operations?

7. When we first spoke with you, you noted that your organisation used y regular suppliers for peat/permitted vegetable seeds that you import into Australia.

a) Since the start of the trial, have you changed your regular supplier/s? [Yes/No]

Prompts: started using a new regular supplier or discontinued using a previously regular source; increased/decreased use of particular suppliers

[If yes, details in comment box; otherwise skip to Q8]

b) What prompted you to make these changes to your operations?

The next few questions relate to your supplier you use most frequently for peat/permitted vegetable seeds. We will refer to this organisation as your principal supplier.

8. Since we last spoke, have you discussed the new biosecurity inspection protocols for peat/permitted vegetable seeds with your principal supplier?
[Yes/No]
[Why/why not?]
9. Since we last spoke, has your principal supplier has advised any changes that have been made to:
 - production processes for your peat/permitted vegetable seeds?
 - testing/auditing procedures for your peat/permitted vegetable seeds?
 - transportation arrangements for your peat/permitted vegetable seeds?[If yes to any of these options, ask the following sub-questions]:
 - i) Could you describe what the changes were?
 - ii) What were the changes aimed at achieving in the end product and what prompted them? (e.g. raising product quality or reducing the likelihood of a particular biosecurity risk being present)
 - iii) Who instigated the change? [Importer (own organisation)/Supplier/Transport company/Other organisation in product supply chain]

Changes in costs of compliance

10. [Ask only if participating in the trial, skip to Q11 if not]
 - a) Since the start of the trial, have any of your consignments of peat/permitted vegetable seeds been cleared without needing a physical inspection by quarantine officers? Yes/No (skip to Q11 if no)
 - b) How were you made aware of this? (e.g. customs broker told them, shorter time in storage, data report from the Department)
 - c) For those lines/consignments that qualified for a reduced rate of inspection, have you noticed any change in the fees you have paid for biosecurity clearance? If so, what changes have you noticed?
 - d) [For vegetable seeds only] Previous discussions have noted that importers tend to bring in shipments with multiple lines under the one quarantine entry. Could you describe how you and/or your broker have dealt with consignments where some lines were subject to an inspection at the border while others are cleared on documents?

Prompts: options could involve splitting the consignment and taken part earlier than the rest of the delivery; taking the whole consignment for

inspection and the inspector noting which lines were to be inspected and which not

11. a) For a consignment of peat/permitted vegetable seeds that required a physical inspection, how long would the consignment typically take to clear customs and quarantine/biosecurity checks?

(NB. Clarify this is the time taken from the time it arrived at the border to when you received the consignment) Looking for answer of x days/weeks

- b) [Ask only if participating in the trial, otherwise skip to part c]

If not subject to a physical inspection, how long does a typical consignment take to clear customs and quarantine?

- c) For a typical consignment of peat/permitted vegetable seeds, what is the average daily storage/demurrage charges you incur?

12. a) For consignments subject to a physical inspection, what transport and handling costs do you usually incur in getting the consignment:

i) from port of entry to the inspection point or quarantine-approved premise?

ii) from the inspection point/QAP to your depot facilities?

- b) [Ask only if participating in the trial, otherwise skip to Q13] For consignments that avoid having a physical inspection, what transport costs do you usually incur in getting the consignment from the port of entry to your warehouse?

13. a) As part of the physical inspection process, are some of your goods destroyed or made unsuitable for sale? [Yes/No] [if no skip to Q14]

- b) [If yes] What is the value to you of those unsaleable or destroyed goods for a typical consignment?

14. a) Is your organisation involved with booking the times of physical inspections with the Department of Agriculture and Water Resources? [Yes/No] [if no, skip to Q15]

- b) Typically, how long does this take for a consignment?

15. a) Do you or your customs broker usually attend the physical inspections of your goods? Importer/Customs broker

b) [If importer] For a typical consignment, how much time do you spend attending an inspection?

c) [If customs broker] For a typical consignment, how much does your customs broker charge you for attending an inspection on your behalf?

Vegetable seeds questions – certificates (Q16) and feedback report (Q17)

16. As part of the trial for vegetable seeds, the department required that an ISTA, NAL or seed analysis certificate be provided on eligible lines, regardless of their weight, to demonstrate the seed had been tested for purity offshore.

a) Before the trial commenced in August 2016, what proportion of your lines of permitted seeds under 10 kg would have been purity tested offshore? And for seed lots 10 kg or greater?

b) For a typical vegetable seed line, could you advise (or estimate) how much offshore purity testing costs (or would cost) your organisation?

c) How much extra time does offshore purity testing add to how long it takes to a seed shipment to arrive in Australia?

d) For a typical vegetable seed line, could you advise (or estimate) how much onshore purity testing costs your organisation for a typical seed line?

Prompt: Ask for >10 kg lots if required

e) How much time does onshore testing add to the time a shipment takes to clear biosecurity/quarantine checks in Australia?

17. Referring now to the quarterly email report your organisation receives from the Department:

a) Are you using this email report in the decisions you make in your organisation? [Yes/No]

b) [If yes] How are you using this information in your organisation?

c) Do you have any feedback about the way the department provides this information to?

Other comments

18. a) Have you experienced any issues with the roll-out of the protocols and their implementation by the Department? [Yes/No]
- b) [If yes] Could you please describe what they were and how they affected your organisation?
19. In the past six months, have you encountered a situation where the Department or a Departmental officer communicated to you in a way that was particularly clear and effective? If yes, could you describe the most recent situation and how this affected your operations?
- b) Over the past six months, have you encountered a situation where communication from the Department was poorly explained or otherwise unclear? If yes, could you describe the most recent situation and how this affected your operations?
20. Are there any other comments you would like to make about the changes in inspection rules, the rules themselves or how the rule-changes are being/were implemented?

Appendix D: Semi-Structured Interview Questions for Customs Brokers

D.1. Phase I interview

Exposure to trial pathways

1. How many importers do you clear goods for that bring:
 - i) peat used for fertiliser, soil conditioner or potting mix;
 - ii) permitted vegetable seeds for sowing which do not require an import permit;into Australia?

Experiences with importers

Thinking about the main peat/permitted vegetable seeds client you have provided customs broking services for over the past 12 months:

2. What is their company name and what products do they import?
Note: We do this for cross-referencing records. Any information you supply in this context will not be relayed to DAWR or your client.
3. Thinking about this client, for a typical consignment of peat/permitted vegetable seeds:
 - a) At what stages of the importing process do you communicate with them?
 - b) Could you describe what information you relay to them at each stage of the importing process?
4. How often does your main client tend to import peat/permitted vegetable seeds into Australia? (e.g. three shipments per week)
5. What would you say would be the typical size of your peat/permitted vegetable seeds consignments being brought into Australia by your main client? (e.g. six FCL containers, 20 000 seed packets)

Awareness of trial protocols and procedures

6. Thinking specifically about peat/permitted vegetable seeds:
 - a) Are you aware that the quarantine clearance methods for that specific product changed/are due to change in July 2016?
Yes/No [if no, interviewer explains changes, and skips to a question about how the importer typically receives their information – Q 7]
 - b) Can you briefly describe what you understand to be the changes that were introduced?
 - c) How did you become aware of these changes in inspection protocols?

- d) Do you have any feedback about how the Commonwealth Government could improve the way it communicated these protocol changes?
7. a) In general, how do you find information about changes to quarantine procedures in Australia?
- b) Do you have any feedback for the Department as to how it could improve communication with your organisation?
8. a) Could you describe what information, if any, you have passed on to your main client regarding changes to inspection protocols?
- b) What level of awareness do you believe your main client has about the new clearance procedures for their goods?
- c) Could you explain why you believe that?

Use of AQIS Commodity Code

Part of this trial involves using the AQIS Commodity Code (ACC) to distinguish between different categories of products below the level of the tariff code.

9. a) Before the start of this trial, did your broking software already include the AQIS Commodity Code field? Yes/No
- b) Did you receive enough information from the Department as to how to enter the AQIS Commodity Code field for the two pathways and to what products they related? Yes/No
- c) Could you please tell me what the ACC code for peat/permitted vegetable seeds is for the trial?
- d) Do you have any feedback for the department as to how they could improve advice around the use of the AQIS Commodity Code in future? (Including additional information required to use the ACC)

Other comments

10. Are there any other comments you would like to make about the changes in inspection rules, the rules themselves or how the rule-changes are to be/ are being implemented?

Conclusion of interview

We would like to ask you similar questions in approximately 6 months' time

D.2. Phase II interview

Trial participation

1. a) Could you please confirm if you have clients participating in the trial? By participating, we mean that you are using the relevant AQIS Commodity Code (FERT/LSTD) on lodging eligible lines with the Department of Agriculture and Water Resources. [Yes/No]

b) [If yes] Could you describe some of the main factors behind why your importer client decided to take part in the trial?

c) [If no] Could you describe some of the main factors behind why your importer client has decided not to participate in the reduced-inspection trial?

Customs broker communications with importers

2. a) Since we last spoke, have you observed changes in the way your clients' peat/permitted vegetable seeds shipments have cleared quarantine? [Yes/No]

b) [If yes to a)] Could you describe the changes that you have observed with clearing quarantine?

Prompts: issues around changes to time taken/costs incurred

c) [If yes to a)] Have you reported these changes to your clients? [Yes/No] If yes, how?

Assessing changes on pathway during trial and importer behaviour

Thinking about the main peat/permitted vegetable seeds client you have provided customs broking services for, over the past 12 months (organisation name from previous interview):

3. Since we last spoke, have you noticed changes as to how frequently they import these products into Australia? (if yes, details in comment box; if no, skip to Q4)
4. Since we last spoke, have you noticed a change in how much peat/permitted vegetable seeds it brought in with a typical shipment? (if yes, details in a comment box; if no, skip to Q5)
5. Since the start of the trial, have you noticed any other changes in the way your main client sources peat/permitted vegetable seeds (e.g. a different country of origin or different suppliers)? Yes/No (if yes, details in comment box, if no, skip to Q6)

Use of AQIS Commodity Code

As discussed last time, this trial involves using the AQIS Commodity Code (ACC) to distinguish between different categories of products below the level of the tariff code.

6. a) Have you had discussions with your main client about the type of information you need from them to use the AQIS Commodity Code? [Yes/No]

b) Has your main client been able to supply you with that information readily? [Yes/No]
7. a) Across all your clients on the trial pathways, have you had any difficulties using the AQIS Commodity Code for eligible shipments? [Yes/No] (if no skip to Q8)

b) If yes, could you describe the most recent difficulty and how it was resolved?

Changes in costs of compliance

8. Since the start of the trial, has your main client had any consignments of peat/permitted vegetable seeds cleared without needing a physical inspection by quarantine officers? [Yes/No]
9. a) For your main client's consignments that required a physical inspection, how long would the consignment typically take to clear customs and quarantine/biosecurity checks?

(NB. Clarify this is the time taken from the time it arrived at the border to when you received the consignment).
Looking for answer of x days/weeks

b) [If answered yes to Q8] And how long does it take a typical consignment not subject to a physical inspection to clear customs and quarantine?

c) For a typical consignment of peat/permitted vegetable seeds, what is the average daily storage/demurrage charges your main client incurs?

10. a) For consignments subject to a physical inspection, what transport and handling costs does your client usually incur in getting the consignment:
 - i) from port of entry to the inspection point or quarantine-approved premise? and
 - ii) from the inspection point/QAP to their warehouse facilities?

b) [If answered yes to Q8] For consignments that avoid having a physical inspection, what transport costs does your main client usually incur?

c) [For vegetable seeds only] Previous discussions have noted that importers of vegetable seeds tend to bring in shipments with multiple lines under the one quarantine entry. Could you describe how you and/or your client have dealt with consignments where some lines were subject to an inspection at the border while others are cleared on documents?

Prompts: options could involve splitting the consignment and taken part earlier than the rest of the delivery; taking the whole consignment for inspection and the inspector noting which lines were to be inspected and which not

11. a) Does your organisation book the times of physical inspections with the Department of Agriculture and Water Resources on behalf of your importer clients? Yes/No [if no, skip to Q12]

b) For a typical consignment, how much time do you spend arranging the time of inspection for that consignment?

12. a) Do you typically attend the physical inspections of goods on your main client's behalf? [Yes/No] (if no, skip to Q13)

b) [If yes] For a typical consignment, how much time do you spend with quarantine officers undertaking the inspections?

c) Does your main client incur an additional fee for you attending an inspection on their behalf?

Other comments

13. a) Have you experienced any issues with the roll-out of the protocols and their implementation by the Department? [Yes/No]

b) [If yes] Could you please describe what they were and how they affected your organisation?

c) In terms of the most recent incident, could you describe how this affected the importer client?

14. a) In the past six months, have you encountered a situation where the Department or a Departmental officer communicated to you in a way that was particularly clear and effective? If so, could you describe the most recent situation and how this affected your operations?
- b) Over the past six months, have you encountered a situation where communication from the Department was poorly explained or otherwise unclear? If so, could you describe the most recent situation and how this affected your operations?
15. Are there any other comments you would like to make about the changes in inspection rules, the rules themselves or how the rule-changes are being/were implemented?

Appendix E: Operational Staff Interview Template

General information about officer experience

1. a) What is your current role in the Department of Agriculture and Water Resources? (assess documents / perform inspections at the border)
- b) How long have you been working for the department assessing documents and/or performing inspections?
- c) Does your role involve supervising others or leading a team that performs these types of functions?
2. Approximately how many entries of:
 - i) permitted vegetable seeds (under tariff code 12.09.9100);
 - ii) peat (under tariff code 27.03.0000);would you estimate you have performed document assessments/inspections for over the past 12 months?

Awareness of changes to document assessment/inspection process/procedure

3. a) In general, what sources of information do you use to find out what you need to do or verify when performing a document assessment or inspection activity of an entry/line?
Prompt: written advice in systems (e.g. BICON), instructional materials or people/verbal advice
[If people/verbal is given in the answer then follow up question is:] How do you know that the information/ source used was current or valid?
- b) How do you find out or are made aware when processes or procedures *change* for a commodity that requires a different documentation assessment or inspection?
Prompt: change to inspection technique, rate, equipment, or change to BICON content, IML work instruction, conversations with brokers.
- c) What suggestions would you make to others in the department that could improve how advice is provided to you and your colleagues about changes to processes and procedures for document assessment or inspecting activities?
Prompt: could refer to regular or ad-hoc communication and training/development activities
4. Thinking specifically about the CBIS trial for peat/permitted vegetable seeds:
 - a) Are you aware that new processes/procedures for clearing these commodities were introduced in August 2016? Yes/No [if no, interviewer explains changes, and skips to a question about communication with importers/customs brokers – Q 5]
 - b) Can you briefly describe what the eligibility requirements are for the trial? [Yes/No] If no, what sources of information might you use to determine eligibility requirements?
 - c) Can you briefly describe what you understand to be the changes that were introduced for documentation requirements and physical inspections?
 - d) When did you become aware of these changes?

e) How did you become aware of these changes in document assessment and inspection processes/procedures?

f) Since June last year, when the first industry advice notice was provided to industry, has your awareness of the trial changed? Yes/No

g) [If yes] Could you describe what has helped improve your awareness and understanding of what the trial entailed? *Prompt: could check if the tagging profile has assisted with identifying eligible entries? Maybe a customs broker or importer told them about it, it could have been official documentation, BICON Warnings and Information Notices etc.*

h) Do you have any comments about the internal communication and/or training regarding this trial ?

Communication with biosecurity system stakeholders

5. [Only ask this question if interviewee answered Yes to 4 a) – that they were aware of the reduced-inspection trial] Thinking specifically about the peat and selected vegetable seeds as part of the reduced-inspection trial:

a) Based on your experience, do you believe importers and their customs broker representatives were aware of changes in documentation and clearance requirements at the start of the trial? [If yes/No, why did they believe this] *Prompt: the types of enquiries they had from stakeholders about participation in the trial; the issues (or lack of) with entries.*

b) Have you noticed a change in the importer/brokers behavior or awareness of the CBIS trial?

c) Over the course of the trial, have you liaised with importers or their customs broker representatives to clarify documentation or inspection requirements? [If yes, how many times has this occurred over the course of the trial?]

d) For the most recent instance where you needed to discuss changes with an importer or broker of peat/vegetable seeds for sowing, could you describe the nature of the change, the advice you provided to the broker or importer and the outcome of the discussion?

e) Based on your experience, what suggestions would you give to others in the department to improve the roll-out of the trial?

Vegetable seed-specific issues

6. [Only ask inspectors with experience in dealing with vegetable seeds] Previous discussions have noted that vegetable seed importers have tended to bring in shipments with multiple lines under the one AIMS entry.

a) Could you describe how importers and/or brokers have typically dealt with consignments where some lines were subject to an inspection at the border while others are cleared on documents?

Prompts: options could involve splitting the consignment and taking part of the consignment earlier than the rest of the delivery; taking the whole consignment for inspection and the inspector noting which lines were to be inspected and which not, inspecting the entire consignment based on broker feedback?

b) Could you describe how you inspect the consignments of seeds presented to you for inspection compared to seeds that are ineligible for the trial?

Prompt: what happens with mixed lines, at what stage do they use dashboard, how do they use their judgement,

c) Have you noticed any other changes in the way that importers and customs brokers are presenting selected vegetable seeds for sowing for inspection?
Yes/No

d) Could you describe what changes you have observed?

e) Have you noticed a change in the documents submitted for eligible vegetable seeds imported in <10kg lots? [Yes, No; If yes, please explain]

Other comments

7. Are there any other comments you would like to make about the changes in inspection rules for *peat/selected vegetable seeds for sowing*, the rules themselves or how the rule changes were implemented within the department?

Appendix F: Qualitative Analysis of Interviews

The interview questionnaires were designed to elicit answers to a broad set of predetermined questions, as described in Appendices C, D and E. These questions were informed by previous research conducted in CEBRA Project 1304C to ensure the data collected would have some relevance to the aims of this project. Specifically, the questions sought to provide information and demonstrate a framework for assessing, evaluating and improving processes associated with the roll-out of compliance-based inspection protocols through a proof-of-concept field trial.

The interviews were designed to be semi-structured, creating a research setting that does not limit how interviewees are able to respond to the questions (Diefenbach, 2009). In turn, interviewers can use cues and prompts to gather as much data or more detailed data centred around the original set of research questions (Creswell, 2003).

The data analysis phase in a qualitative study typically begins during the data collection phase – in this case, during the semi-structured interviews. During the interview process, interviewers naturally form preliminary impressions of the data, which may be adjusted or confirmed as the interview process progresses. In a research setting like the one for this trial, where there were multiple interviewers, this crossover between data collection and data analysis includes group reflections and communication during the interview process. As noted in Chapter 4, a number of ongoing implementation issues were identified in this way.

A fourth researcher (coder) was engaged to conduct the final qualitative analysis of the data, which included collating and organising transcribed data for analysis using NVivo 11 Pro, a computer-assisted qualitative data analysis software package (QSR International, 2015). The transcribed interviews were imported into NVivo to be ‘coded’ and subsequently analysed further.

In qualitative research, coding refers to the process of identifying or ‘tagging’ blocks of text that convey a unique meaning (code) across interviews (Bazeley and Jackson, 2013). Coding recontextualises data which, in this case, moves the frame of analysis from the interviews to the emerging patterns or codes that link the interviews. This allows the data to be grouped and considered according to codes rather than individual interviews, thus enabling further understanding of which themes (or codes) are significant with respect to the wider project.

There is no single, correct way to code qualitative data. It was important to consider and agree on an approach to coding that was appropriate for the aims of this project.⁹⁰ Since the tasks of interviewing, transcribing and coding were split across the project team, but only one researcher would undertake the coding, it was decided to reach a consensus within the team on how to approach the coding and subsequent analysis of the complete set of interview data. This process comprised an initial set-up stage and a subsequent coding-analysis stage. The first stage comprised:

- a series of meetings of the whole CEBRA project team to reflect on the interview process, including preliminary impressions of the interview data;
- independent familiarisation with the research questions and aims of the larger study by the coder;
- familiarisation of the coder with key secondary literature;

⁹⁰ For a more detailed discussion of approaches to coding data, see Chapter 1 of Saldaña (2016).

- immersion in a small subset of the transcribed interviews – both typical and atypical – by the coder;
- clarification of the transcribed text, particularly where meaning was unclear, with those who conducted the interviews;⁹¹
- identification of themes emerging from the data by the coder;
- testing and validation of these themes against the broader project aims with the whole CEBRA project team;
- classification of codes into a coding hierarchy, connecting broad themes to related sub-themes; and
- a series of meetings to reflect on the validity or usefulness of the emerging themes to the objectives of the field trial with the whole CEBRA project team.

This process was iterative and concurrent and resulted in a set of codes the research team agreed reflected the data collected, arranged and connected by theme. This included a set of *a priori* themes that the interviews were designed to elicit, and second set of themes that emerged from the interviews.

Once identified, the research team then agreed broad definitions for each code, which were captured in a reference code book. This step ensured that as far as possible the research team all understood and agreed the meaning of each code to be applied, and that codes were mutually exclusive, that is, there was no overlap in meaning between codes that could lead to misinterpretation later in the analytical process.⁹² It also provided the coder with a greater degree of confidence that the codes identified would be applied with a higher degree of reliability and accuracy in relation to the rest of the trial.⁹³

During the subsequent coding-analysis phase, the coder continued to engage with the wider CEBRA project team to:

- refine and rearrange codes as required; and
- ensure ambiguities and meanings that relied upon a greater and deeper knowledge of the biosecurity system, trial design and/or interview process were clarified.

Each interview was coded, validated against the code book, and re-coded (where required) at least twice. In doing so, the validity and meaning of the codes and ensuing themes were also refined. The result of this second stage was a set of interrelated themes and sub-themes – as they emerged from coding the transcribed interviews – that are analysed and discussed in several parts of this report.

The final step of the analysis is the ‘writing-up’ phase, where the project team discussed how the findings for this project were to be presented with the department.

⁹¹ Transcription is not an objective activity. For a discussion of the ways in which transcribed data can influence and affect the final analysis, see Poland (2002) and Meadows and Dodendorf (1999).

⁹² It is important to note here that the codes, not transcribed data, are mutually exclusive, since multiple codes can be and were applied to a single block of text.

⁹³ For a discussion of the challenges and mitigation strategies when coding is done by a single coder, see Campbell *et al.* (2013).

*Interpretation and presentation of qualitative findings*⁹⁴

The approach to analysing interview data for this project aimed to preserve the voice of the stakeholders and department staff members interviewed. This technique provides a transparent connection between the raw data collected – the interviewees’ experiences and perspectives – and the interpretation of this data (that is, the findings) presented (Drisko, 1997). Where possible, the analysis and interpretation of the interview data draws upon verbatim quotes to illustrate stakeholder attitudes and actions being discussed.⁹⁵

The project team does not contend that these interviews provide an objective and complete reflection of *all* stakeholders participating in the peat and vegetable seed pathways. Instead, the data gathered provides an in-depth insight into the perceptions and experiences of this specific group of importers, customs brokers and departmental staff who are considered to be information-rich cases.

In determining what insights to include in this report,⁹⁶ the approach followed throughout this analysis has been to test the insights against the following question:

If this set of perceptions and experiences gained through the interviews are valuable, what are the most useful data, and the most compelling implications of the evidence gathered?

Naturally, given the context of these interviews, the project team has focused on usefulness and implications as it relates to:

- the outcomes of the trial on these two plant-products pathways;
- how they may inform trials of inspection interventions in future; and
- understanding stakeholder behaviour, with respect to maximising biosecurity compliant behaviour and optimising resource allocation on inspection protocols.

⁹⁴ The approach adopted in undertaking this analysis sought to maximise the validity and reliability of the findings, where validity is understood as ‘being sound, just and well-founded’. For a discussion of validity, see Whittenmore *et al.* (2001).

⁹⁵ To protect interviewees’ privacy, any quotes that might lead to an interview participant being identified have not been used.

⁹⁶ This is because all insights cannot be exhaustively explored in a summary report of this nature.

Appendix G: Data Overview, Data Manipulation and Data Cleaning Procedures

G.1. Features of the AIMS and Incident databases

Information from two departmental databases – AIMS and Incident – was used as part of assessing the outcomes from the trial in terms of participation (Chapter 5), potential behaviour changes (Chapter 6) and regulatory cost savings (Chapter 7). In addition, AIMS output was also useful in identifying some of the implementation issues associated with the trial, as discussed in Chapters 4 and 5.

The two databases contain different, but linked, information. AIMS data contains all the relevant information referred by the ICS maintained by the Department of Home Affairs, including characteristics such as:

- the (AIMS) entry code and line number of the consignment, which jointly provide a unique identifier for imported goods;
- details on the importer, customs broker and supplier of the goods;⁹⁷ and
- the method of entry – primarily by air or sea – and the port of entry into Australia for the goods.

There are also fields specific to AIMS that relate to the directions applied by Biosecurity Operations Division staff members, such as document assessments and inspections, and the outcomes of those directions. In addition, there are several free-text comment fields that enable additional information relating to the consignments and directions to be recorded by biosecurity operational staff members.

If an inspection officer discovers an anomaly on a physical inspection, such as possible biosecurity risk material, the goods are often referred for specialist testing by the department's plant pathologists or entomologists. Information from this additional testing phase, such as the nature of what insect or disease was found and whether it is already present in Australia, is captured in the Incident database. Information recorded in this system is much more structured, with check-boxes to describe specific categories and fewer free-text fields to complete.

The merged AIMS and Incident databases⁹⁸ provide a rich source of information to analyse trial outcomes.⁹⁹ However, like most administrative data sources, a significant amount of data cleaning was necessary before the project team could proceed to analyse the data in a manner deemed appropriate for our purposes. There was also the need to accommodate complications such as duplicate records and records with missing fields that could signify critical information regarding the trial. The different ways in which regions and individual officers used the free-text fields made it incredibly challenging to determine some outcomes – even using advanced text-processing capabilities in the R programming language. The remainder of this

⁹⁷ For some goods, the customs broker lodging the consignment in the ICS may also provide details of the producer.

⁹⁸ A known issue with the merging process is that records are often merged based on the AIMS entry number, rather than the combination of the AIMS entry number and line number. This can mean information from the Incident database can inadvertently be applied across all lines of a multi-line AIMS entry, even though the information may only pertain to one of those lines.

⁹⁹ See Chapter 4.1 of Rossiter *et al.* (2016) for a more extensive discussion of the possible uses for this information, including risk-profiling and monitoring biosecurity operations.

appendix describes the data manipulation, cleaning and classification processes that the project team employed. For the reasons outlined above, this should not be considered a definitive schema for record classification; instead, this is very much “the art of the possible” given the inherent limitations of current data-collection procedures.

G.2. Cleaning and classifying biosecurity administrative data

The first step in determining what happened to the particular goods where an ACC was applied was to create a unique identifier by merging the AIMS entry code with the line number. (This construct is henceforth referred to as a “CombEntry” case in the diagrammatic representations that follow.)

The next step was to determine the outcome of inspection directions for all cases, including situations when an inspection direction was not applied or was not relevant, by creating the inspection indicator variable “InspIndic”. Figure 10 shows schematically how this process was performed, using the regular expression (“regex”) capabilities in R. This in turn allowed the classification checks to catch variants and ignore capitalisation. Note that this approach was applied to all rows.

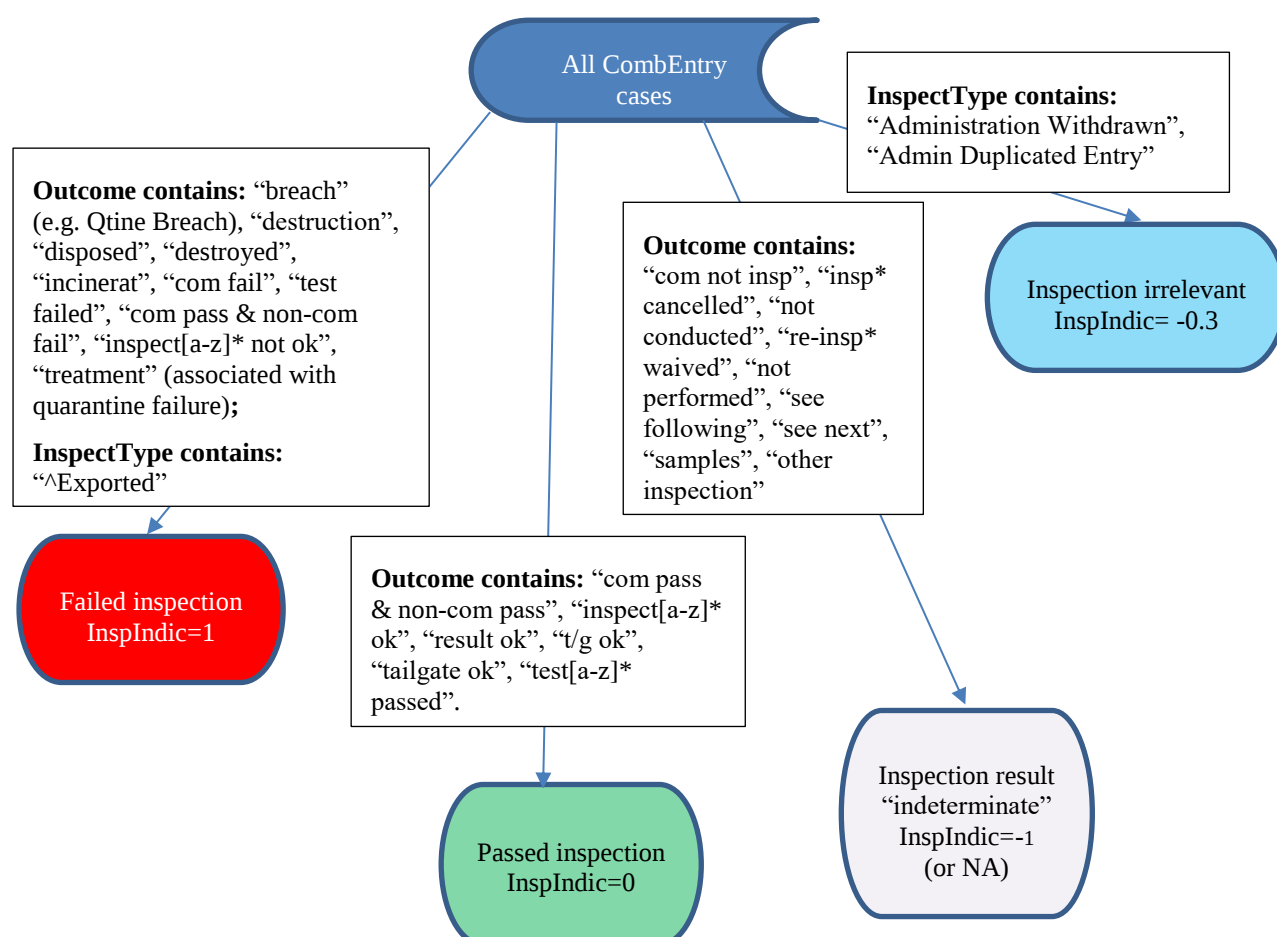


Figure 10. Preliminary processing of merged AIMS and Incident data to determine inspection outcomes (applied to both LSTD and FERT data).

Notes: The ^ and * symbols have particular meaning in text processing in R. The symbol ^ is used to select cases where the line starts with the text that follows that symbol, while the “wild card” * indicates to select all cases matching an expression, allowing for one or more subsequent alphabetic characters. For example, “inspect[a-z]*” captures inspect, inspection and inspected as variants.

As part of the first stage of record filtering, shown in Figure 11, we defined the “max operation” applied to the record – consisting of one or more rows of data – for a particular CombEntry case. This took the numerical maximum over the InspIndic column for all rows of the record, ignoring NA values.¹⁰⁰ This allowed us to determine whether a given line had failed inspection (by taking the maximum value 1), passed inspection (the value 0) or determine that an inspection was not required for administrative reasons (the value -0.3).

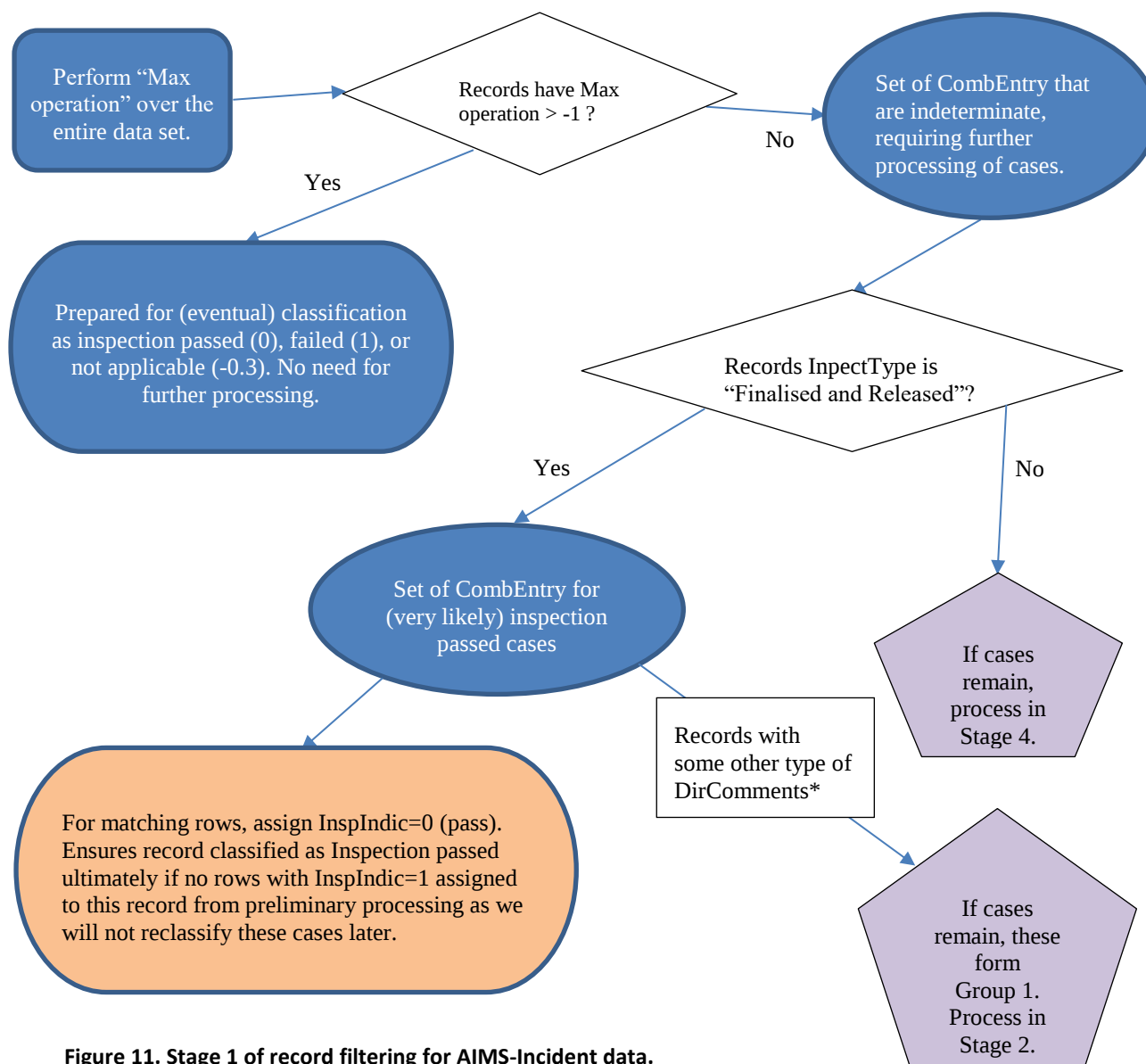


Figure 11. Stage 1 of record filtering for AIMS-Incident data.

Notes: * Other Direction Comments (DirComments) usually relate to additional onshore sampling or testing requirements; this is particularly common for vegetable seeds for sowing. Comments that would indicate this include: “intensive inspection to verify”, “unpack and inspect[a-z]* to verify and reconcile lines”, “full unpack and inspection of the seed and packaging”, “random sample to be drawn from each lot”, “test in accordance with ISTA procedures at a Department of Agriculture and Water Resources approved laboratory”, “to be tested at Sample Submissions”.

¹⁰⁰ The “max operation” returned the value “-Inf” if all entries associated with the entry were given “NA” values in the preliminary processing stage shown in Figure 10.

While this process classified most records, there remained many cases where an outcome was still required. The types of situations shown in Figure 11 were then subject to further filtering. In the second stage of filtering, shown in Figure 12, the cases nominated in Group 1 in the first stage of filtering were scrutinised. These records had additional direction comments that were processed to differentiate cases where the importer client saved inspection from those cases which remained indeterminate.

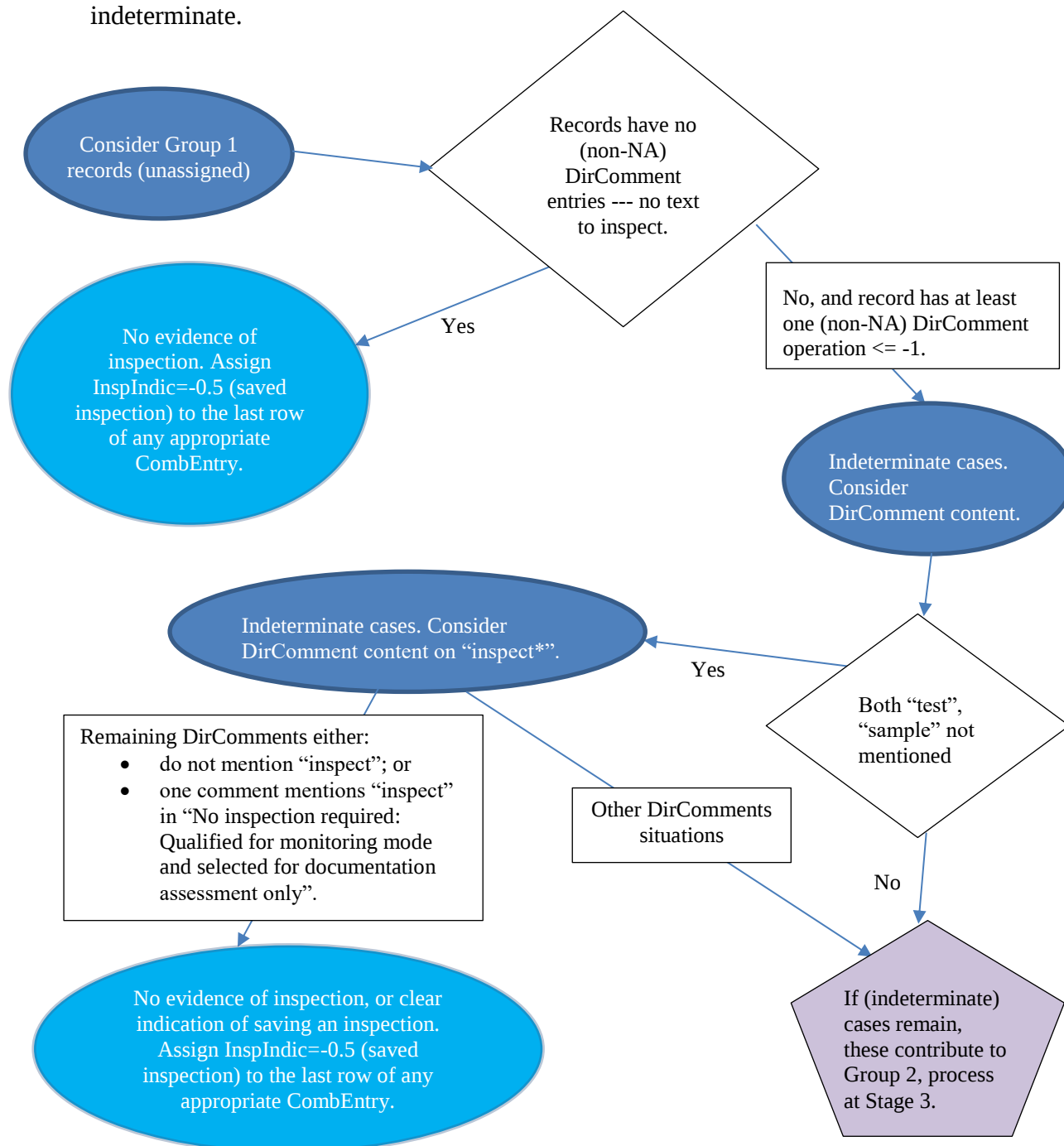


Figure 12. Stage 2 of record filtering for AIMS-Incident data.

By end of Stage 2 of record filtering, we had the most obvious "Finalised and Released" cases where inspection has either been saved or was otherwise not required. In Stage 3, shown below in Figure 13, we continue with attempts to classify remaining cases from Stage 2. Some records which save inspection have a

well-defined pattern in the direction comments field, which can be exploited to classify most remaining records.

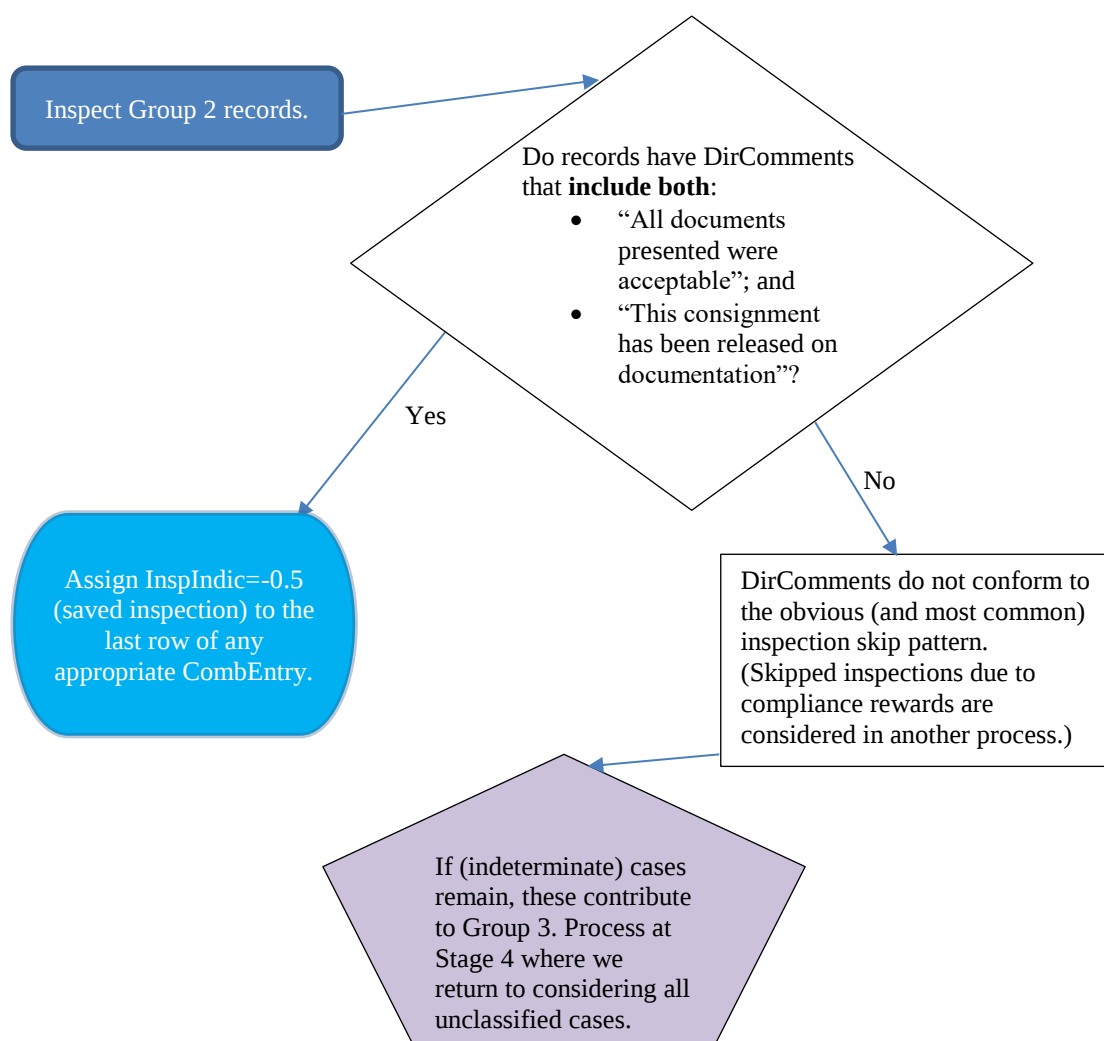


Figure 13. Stage 3 of record filtering for AIMS-Incident data.

The final stage of filtering – Stage 4 – returns to all the records remaining unclassified to date. Having considered cases with a “signature” that makes them relatively easy to isolate and classify, we had exhausted the most obvious means of classification. The vast majority of the records yet to be classified were from the two-year period immediately before the trial commenced;¹⁰¹ only eight records in total – four each on the vegetable seeds for sowing and peat pathways where the relevant ACC was applied – related to the trial period. These eight records were then subjected to a combination of pathway-specific string searches, which enabled all but two cases to be classified. These remaining records were then classified based on manual inspection of the entire record for the appropriate CombEntry values.

With all cases associated with the trial period classified, the project team was able to comment on the range of inspection outcomes, including those entries which may have saved inspection as a reward for a strong record of compliance.

¹⁰¹ Records relating to the pre-trial period were not further classified, since the trial was the main period of interest and because this last stage was a highly time-consuming process.

Appendix H: Guidance on Selecting CSP-1 Rule Parameters for Trial Pathways

As noted in Chapter 3, the project team drew on two different modelling approaches to inform which parameters to adopt for the two trial pathways. This appendix extends the discussion of considerations described in Chapter 3 to provide a more complete description of the methods used.

H.1. Markov-chain analysis to inform CSP rule parameter selection

H.1.1. Continuous sampling plans as Markov chains

The CSP-1 rule, like the CSP-2 and CSP-3 rules, can be expressed as a *Markov chain*, because the future ‘state’ of the rule is able to be expressed through knowledge of the current ‘state’ of the rule alone; for these rules, knowledge of past states that led to the current state are not required. Because of this representation, several theoretical properties can be derived using the theory of *stochastic processes*; specifically, the expected long-run (equilibrium) behaviour of importers with a given inspection failure rate can be examined based on the Markov chain’s *stationary distribution*.

We use these stationary distributions to compare two specific measures of interest to selecting the rule parameters, namely:

- how the long-run share of consignments saving inspection changes for importers with different inspection failure rates; and
- how the rate of *importer-specific* biosecurity risk material leakage varies according to failure rates.

It is worthwhile noting that the types of failures used to determine these quantities represent different aspects of the inspection process. As described in Chapter 3.2, “failure” in terms of the CSP-1 algorithm is determined by recording an “inspection not okay” outcome, consistent with the Q-ruler used for the CBIS. An inspection failure, however, includes a broader set of inspection issues than detecting a consignment contains biosecurity risk material.

If quarantine failures determined whether a consignment “failed” inspection for the purposes of the CSP-1 algorithm, the analysis of importer-specific failure rates would be much more straightforward. Specifically, average outgoing quality (AOQ) curves could be developed for different combinations of *CN* and *MF*, with the potential consequences of selecting different rule parameters compared using the maximum values of the AOQ curves – the average outgoing quality limit (AOQL). If a threshold AOQL could be set for a given pathway, based on the potential consequences of leakage, the choice of rule parameters would simplify to selecting between alternatives that did not exceed that threshold.

Ideally, the type of construct outlined above could form a useful strategy for modelling and selecting rule parameters for the CBIS and other schemes where quarantine failures are used to determine “failure” in the CSP family inspection algorithm. However, complications emerge given the use of inspection failures as the determinant in the CSP-1 rule. For many importers, quarantine failures tend to be a modest subset of all inspection failures in the department’s import data. A modelling approach that assumes all inspection failures are quarantine failures is likely to provide highly conservative results, which in turn may favour parameters that involve

greater intervention at the border. This would mitigate potential efficiency gains for the department and add unnecessarily to importers' costs. In addition, the department's import data suggests that the quarantine failure share differs significantly between importers.

Given heterogeneity in failures seemed to be a stylised fact of the two trial pathways, the project team used scenario analysis to illustrate the range of different possible benefits and consequences from selecting specific rule parameters. These scenarios were based on a range of "typical" cases suggested by the available import data. While AOQ curves were not formally adopted in the parameter investigation process, the concept of a "quality limit" still figures highly in the analysis.

Implicit in the theoretical analysis using the Markov-chain representation for the CSP-1 algorithm are assumptions that:

- the probability of failing inspection (through an inspection failure) is constant for a given scenario (e.g. 5 per cent). The scenarios investigated are designed to capture the different types of importers with failure rates representative of the range of values on a pathway. The rate of failing inspection is assumed to be independent of past (and future) inspection outcomes; that is, the probability of an importer failing their next inspection does not increase or decrease if the importer's last inspection was a failure.¹⁰² This is stronger than required to use the Markov-chain approach, but simplifies the analysis considerably and allows past inspection outcomes to be used to guide the department in choosing reasonable and defensible parameter values;
- the approach rate of biosecurity risk material (i.e. a quarantine failure) within the inspection failure classification represents a *thinning* of the inspection failure distribution. This assumption allows for analysing the leakage of biosecurity risk material implied by consignments that would be subject to release on compliant documentation alone; and
- biosecurity inspections at the border are not subject to decision errors by inspection staff. This is also a stronger assumption than is required to complete the modelling, but it allows for a clearer interpretation of the results.

In applying this framework, scenarios need to be chosen that are representative of the range of *importer-specific* inspection and quarantine failure rates recorded on the pathway, based on the department's import data under a mandatory inspection regime.

H.1.2. Representing trade-offs in competing objectives

The Markov-chain modelling approach is designed inform the department about potential benefits and risks from choosing alternative parameter combinations for the CSP-1 algorithm. It does not provide a definitive answer on what the parameter values should be on each pathway; rather, it provides a useful framework for assessing potential trade-offs associated with different continuous sampling plan parameter choices. Ultimately, the choice of rule parameters should be consistent with maintaining Australia's ALOP and guided by the department's assessment of the

¹⁰² This includes, among other things, that the importer does not behave strategically when they are in monitoring mode. This reflects the theoretical findings of Rossiter and Hester (2017) that identified it may be advantageous for firms to raise the approach rate of their consignments when in monitoring mode.

relative costs of leakage and the perceived benefits of saving inspections on the pathways of interest. Estimates of the expected cost of leakage will be informed by:

- scientific assessments of the likelihood of a biosecurity pest establishing and spreading, given the good's range of possible end-uses, where it is used and whether could be contained in or hosted by a particular good;
- scientific and economic assessments of the technical feasibility and costs associated with containment, eradication and other post-border management options for potential pests and diseases; and
- economic assessments of the potential temporary and longer-term impacts, including on the environment and Australian agricultural industries.

This type of investigation of trade-offs is akin to the “loss function” approach used in Rossiter and Hester (2017), where the biosecurity regulator seeks to minimise an objective function that weighs up the costs of inspecting consignments against the costs of leakage and accounts for their relative incidence. A distinct benefit of the Markov-chain approach is that sensitivity analysis can be used easily to account for the considerable uncertainty associated with some failure-rate inputs. In turn, the relative incidence of inspection and leakage will be affected by a stakeholder's response to the rules.

While not without caveats over some of the inherent assumptions, the Markov-chain approach offers some form of optimisation of parameters choices, providing a framework for department policy officers to better understand the implications of different rule parameter choices on outcomes of interest. The metrics used in assessing possible parameter values for the field trial acknowledges the trade-offs between the leakage rate and strength of incentives for compliance inherent in rules such as the CSP-1 algorithm. Consistent with the third parameter selection principle outlined in Chapter 3.2, consideration has been given to providing sufficient “rewards” for compliance by offering reasonable separation of the benefits for importers with low approach rates compared to those with higher approach rates. Ideally, such separation of rewards can help encourage system stakeholders to change their behaviour, such as through switching to more compliant suppliers to modifying processes to better manage the biosecurity status of their goods.

H.1.3. Scenario analysis for selected vegetable seeds

For the selected vegetable seeds for sowing pathway, the inspection and quarantine failure rate scenarios chosen for illustrating the Markov-chain approach are given in Table 7. For each of these scenarios, we calculated of the long-run share of consignments saving inspection and the rate of importer-specific biosecurity risk material leakage under a range of different parameter combinations for the clearance number and monitoring fraction as follows:

- CN = 6, 8, 10, 12 and 14; and
- MF = 0.1, 0.2, 0.25, 0.3 (one-third), 0.4 and 0.5.

For illustrative purposes, this subsection and the next shows graphical representations of the results for four parameter combinations only. The results for other parameter combinations are available from the authors upon request.

Table 7. Inspection and associated quarantine failure rates used for simulation exercises to inform CSP-1 rule parameters for vegetable seeds for sowing.

Scenario	Inspection failure rate (%)	Quarantine failure rate (%)
1	1	1
2	5	2
3	10	8
4	20	15
5	40	20
6	60	20

Figure 14 illustrates the long-run expected percentage of consignments saving inspection¹⁰³ by importers for the scenario inspection failure rates given in Table 7. This figure, together with more fulsome analysis across a range of potential *CN* and *MF* values, suggested that a CSP-1 rule with clearance number of 10 and monitoring fraction of 0.25 seems to strike an appropriate balance between providing sufficient rewards to importers with a strong compliance record and not being too generous regarding importers with inferior compliance track-records.¹⁰⁴

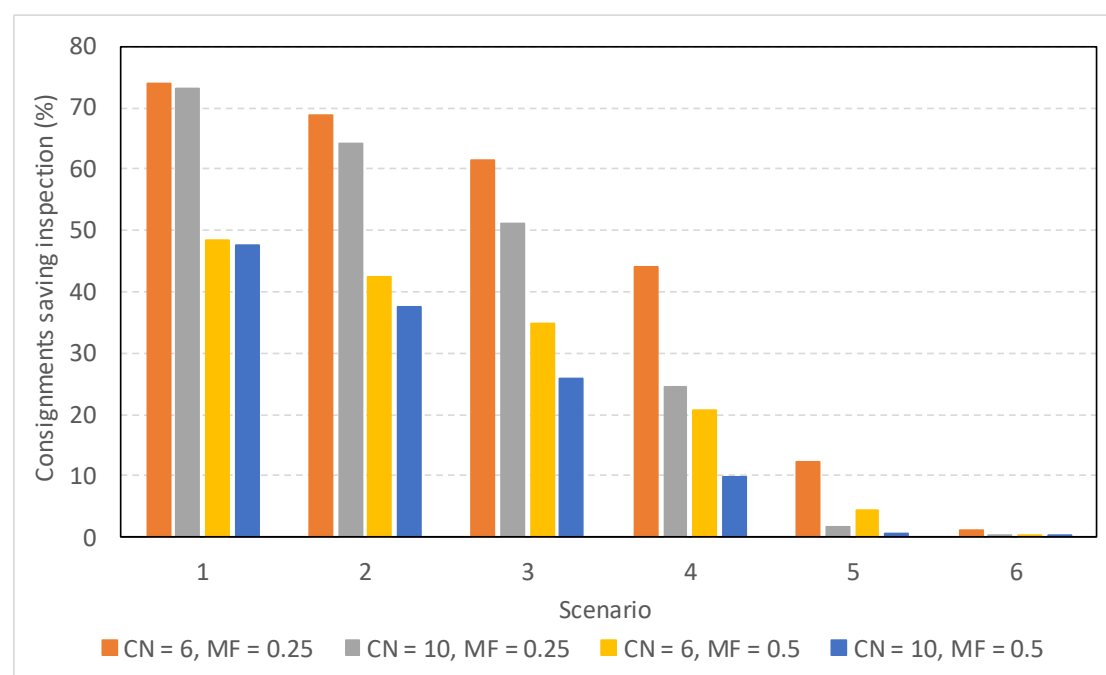


Figure 14. Long-run percentage of consignments saving inspections for given inspection failure rates and rule parameters under the Markov chain model for the CSP-1 algorithm (vegetable seeds scenarios).

To justify the choice of parameters, consideration must also be given to the likely rate of leakage of biosecurity risk material; that is, quarantine failures that would not be

¹⁰³ For the remainder of the report, reference to ‘saving inspections’ is used interchangeably with the phrases ‘not requiring an inspection’ or ‘being released on compliant documentation alone’.

¹⁰⁴ From an analytical perspective, if the inspection failure rate and the proportion of consignments saving inspection were represented as a continuous function, our aim is to ensure the function is relatively steep over the range of lower failure rates, such that very few inspections are saved by importers with higher inspection failure rates.

detected because an inspection for a given consignment did not occur. This metric reflects the department's main concern from not inspecting all consignments and relying more on other assurance measures, such as ISTA certificates or risk-management strategies employed by overseas suppliers. Under the recommended rule parameters ($CN = 10$, $MF = 0.25$), *importer-specific* leakage rates could exceed 4 per cent of total consignments imported (Figure 15). However, given relatively few importers have characteristics as extreme as suggested in Scenarios 3 and 4 from Table 7, this is unlikely to represent a significant amount of leakage for the department.

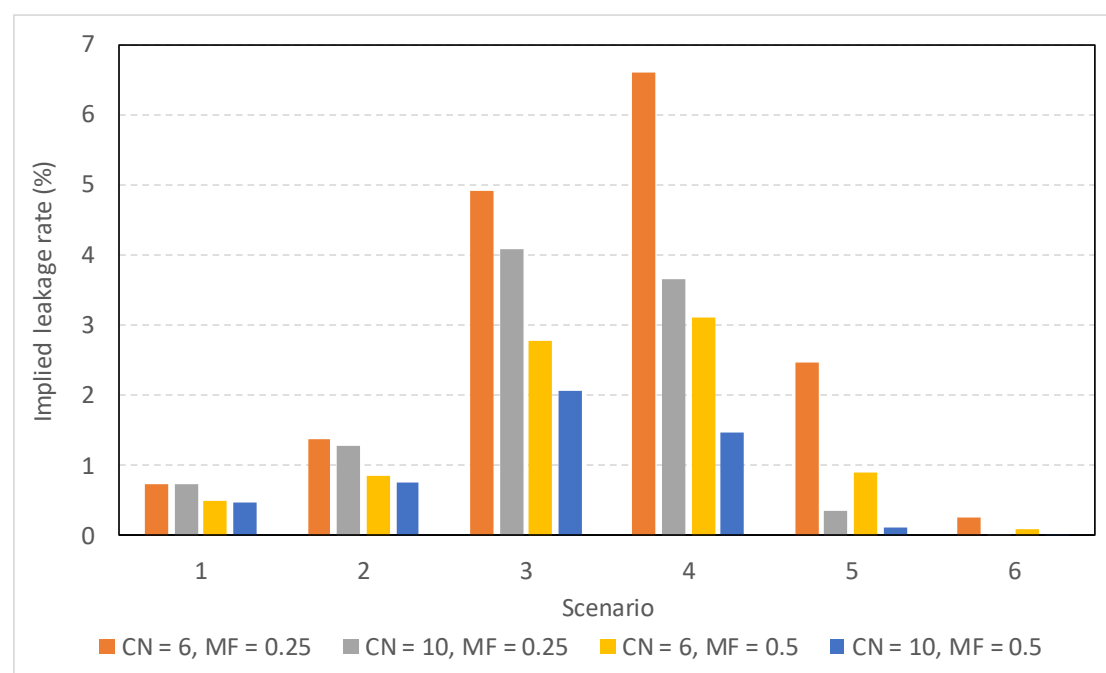


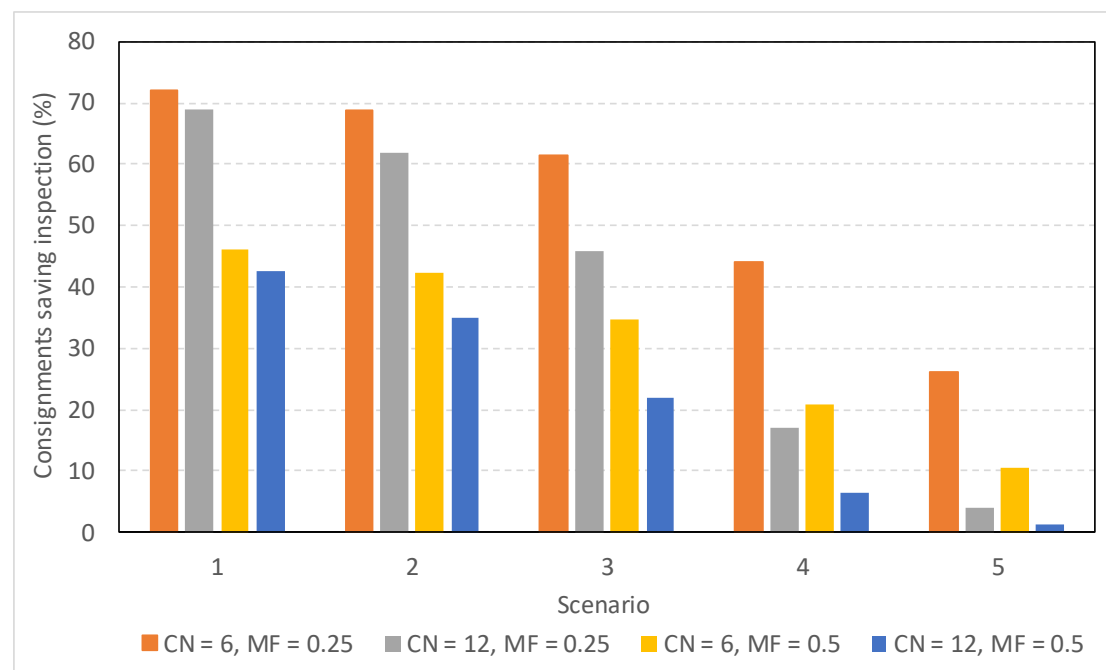
Figure 15. Long-run biosecurity risk material leakage percentage for given vegetable seeds scenarios and rule parameters under the Markov chain model for the CSP-1 algorithm.

H.1.4. Scenario analysis for pure peat

For the peat pathway, the inspection and quarantine failure rates chosen are for the Markov-chain analysis are given in Table 8. Figure 16 illustrates the long-run expected percentage of inspections avoided by importers for given inspection failure rates. This figure, together with more fulsome analysis of other potential CN and MF values, suggested that a CSP-1 rule with clearance number of 12 and monitoring fraction of 0.25 seems to strike an appropriate balance between providing sufficient rewards to importers with a strong compliance record and not being too generous regarding importers with inferior compliance track-records.

Table 8. Inspection and associated quarantine failure rates used for simulation exercises to inform CSP-1 rule parameters for peat.

Scenario	Inspection failure rate (%)	Quarantine failure rate (%)
1	2.5	1.5
2	5	2.5
3	10	4
4	20	4
5	30	5

**Figure 16. Long-run percentage of consignments saving inspections for given inspection failure rates and rule parameters under the Markov chain model for the CSP-1 algorithm (peat scenarios).**

Relative to the vegetable seeds pathway, the project team recommended a higher clearance number because of the higher implied leakage rate on the peat pathway in scenarios 1 to 3 that reflected “typical” behaviour on the pathway (Figure 17). The narrower range of inspection failure rates under the mandatory inspection system meant that a higher clearance number may be warranted to ensure greater separation between highly compliant and moderately compliant importers (Figure 16).

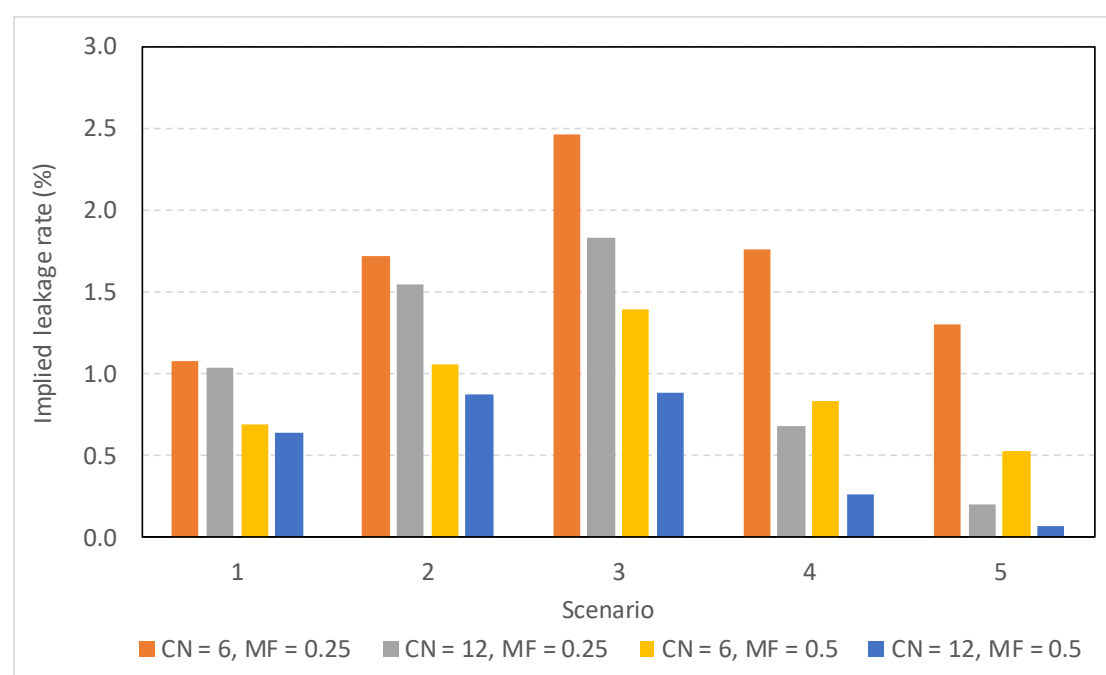


Figure 17. Long-run biosecurity risk material leakage percentage for given peat scenarios and rule parameters under the Markov chain model for the CSP-1 algorithm.

In the end, a clearance number of 10 was chosen for the peat pathway. Although a *CN* of 12 was preferred for peat, consistent rules across the two pathways in the trial was likely to be less confusing for communicating with stakeholders. Furthermore, a *CN* of 10 was within the range of values (between 5 and 10 inclusive) used at the time under the CBIS.

H.2. Simulation analysis to inform CSP rule parameter selection

ABARES (Arthur and Zhao, 2014) has developed a simulation-based approach and a series of metrics, extending previous work by ACERA (the predecessor to CEBRA), to assist Plant Import Operations Branch staff determine appropriate rule parameters for candidate pathways for the CBIS. As another input into how the rule parameters could be set for this trial, ABARES staff adapted this technique to accommodate the CSP-1 algorithm.¹⁰⁵

The simulation-based approach is a counterfactual analysis, drawing upon several years of AIMS and Incidents data and assuming a CSP-1 rule applied by importer was in place. Implicitly, this assumes importer behaviour does not change with the new rules, relative to the mandatory inspection regime under which the input information was collected. Furthermore, it takes the established pattern of inspection and quarantine failures as representative of future conduct by importers.¹⁰⁶ The analysis considers alternative clearance number and monitoring fraction combinations and simulates hypothetical outcomes under the CSP-1 algorithm. Given the randomisation inherent in monitoring mode of the CSP-1 algorithm, 100 simulations for each

¹⁰⁵ The ABARES modelling approach applies the department's business rules in a manner consistent with how CBIS is implemented under the Q-ruler. For the purposes of this trial, there are some differences in how the CSP-1 algorithm is applied, particularly around how documentation failures interact with inspection requirements.

¹⁰⁶ It could be argued that this assumption is as restrictive, if not more so, than those inherent in the Markov-chain analytical framework.

combination of parameters are generated, enabling average (median or mean) and quantiles of performance metrics to be reported.

To determine appropriate rule parameters for the pathways, department officers need to interpret performance metrics for alternative CSP rule parameters. The two metrics¹⁰⁷ considered as part of the analysis are:

- the ratio of the number of inspections performed to the number of inspection (or quarantine) failures detected. This represents a measure of inspection efficiency, in that a higher number implies frontline officers are inspecting a greater share of AIMS entries before failures of either type are detected. For this metric, a higher value is therefore somewhat less desirable. For alternative rule parameters, this can be benchmarked against the ratio for the mandatory inspection situation, which is the inverse of the failure rate expressed in decimal form; and
- the post-intervention compliance rate. This represents the ratio of the sum of inspection passes and failures that are intercepted (and hence made rectified before crossing the border) to the total number of AIMS entries on the pathway. The simulated post-intervention compliance rate will lie between one minus the failure rate (as would hypothetically be the case of no inspections and no behaviour change) and one (under mandatory inspection). A higher value is preferable under this measure.

These numerical criteria on their own only provide a guide for potential parameter choices, similar to the Markov-chain approach outlined earlier, and could be improved upon through considerations linked to the “loss function” approach.

The post-intervention compliance measure embodies a trade-off between the number of inspections conducted on the pathway and leakages of biosecurity risk material. All other things held constant, a higher clearance number or monitoring fraction would be expected to raise median measures of post-intervention compliance reported in the simulation analysis.

The trade-offs are less clear for the inspections per detection measure, as this measure seems to be influenced by when failures occur, rather than the total number of failures. When seeking to choose rule parameters on pathways with relatively few failures, it could be more instructive to consider the average inspection rate on a pathway rather than measuring inspection effectiveness. This is also considered in ABARES’ analysis, as is the ability of the chosen rule parameters to provide significant separation in rewards to encourage behaviour change.

ABARES analysed the recommended rule parameters for vegetable seeds ($CN = 10$, $MF = 0.25$) and peat ($CN = 12$, $MF = 0.25$) and proposed two alternative parameter pairs that resulted in low leakage rates in the counterfactual analysis and provided sufficient differentiation in inspection rates across the range of typical failure rates to

¹⁰⁷ While ABARES’ analysis includes other model outputs, we use these two metrics, as they were the ones that Plant Import Operations Branch staff members had focused on in at the time decisions were being made about the rule parameters.

encourage positive behaviour change. The two alternatives for each pathway investigated by ABARES were:

- vegetable seeds for sowing – i) $CN = 15$, $MF = 0.3$; ii) $CN = 30$, $MF = 0.1$; and
- peat – i) $CN = 20$, $MF = 0.3$; ii) $CN = 30$, $MF = 0.4$.

For both alternative cases, the clearance number suggestions were significantly larger than existing guidance under the CBIS pathways. As such, this may have complicated implementation and communication of these rules.¹⁰⁸ Furthermore, having a very large clearance number would almost certainly be perceived by importers as a “large” penalty for failing an inspection in isolation. Such thought processes could undermine incentives designed to promote changes in the import-supply chain consistent with reducing the likelihood of biosecurity risk material being present in consignments. As such, there was agreement among project team members that the amended recommended parameters for both pathways ($CN = 10$ and $MF = 0.25$) were broadly appropriate and consistent with maintaining Australia’s ALOP.

¹⁰⁸ Furthermore, the volume of imports may not support some significantly higher CN values, as it could take an importer years to qualify for monitoring mode and see any rewards or benefits. Given the time-limited nature of the trial, this was a significant consideration for the project team in determining appropriate clearance number values for the trial.

Appendix I: Assessing Stakeholder Behaviour Changes and Regulatory Cost Savings on the Pure Peat Pathway

Chapters 6 and 7 illustrated the methods used to assess stakeholder behaviour change during the trial and quantify regulatory cost savings accruing to importers as a result of saving inspection for the selected vegetable seeds pathway. On both pathways, there was no significant evidence of behaviour change in response to the trialled protocols and the compliance-cost savings were relatively small. For completeness, the results for the pure peat pathway are presented in this appendix.

I.1. Peat pathway stakeholder behaviour during the trial

I.1.1. Inspections saved during the trial phase

Only two importers in the trial received the benefits of compliance-based intervention on the pathway at the border, with ten line entries in total being released on compliant documentation alone. However, according to the inspection records of importers participating in the trial, it is likely that more inspections should have been saved. For example, one major importer towards the end of the trial brought in 43 consecutive consignments using the “FERT” AQIS Commodity Code where an inspection failure was not recorded.¹⁰⁹ If the trial protocols were working as envisaged, the importer could have expected between 20 and 29 consignments (inclusive) to be released on compliant documentation alone (with a probability of greater than 0.95); however, only two consignments saved inspection in practice.¹¹⁰

I.1.2. Changes in consignment size and/or frequency

Interviews with stakeholders suggested there was no change in the size of consignments or the frequency of bringing in peat to Australia. One importer noted that there are seasonal patterns in their importing of peat, with more frequent shipments in the second half of the calendar year, but this had not changed with the new protocols.

Figure 18 shows the before and during trial boxplots of the distribution of consignment weights on a quarterly basis for one importer participating in the trial. The pattern of no significant change in the distribution of consignment size appears to be confirmed in this case, with the p-value of the Kolmogorov-Smirnov for equality of distributions being 0.090 (to three decimal places).

¹⁰⁹ While a few documentation failures were recorded by this importer, the dashboard was configured so documentation issues did not affect an importer’s eligibility to save inspections once the required compliant documentation was provided.

¹¹⁰ This statement is not without caveats, since a document assessment officer made the comment in AIMS “[n]ot 100% peat so does not qualify for the CBIS trial” against one entry. It cannot be easily determined how this would have been handled in the dashboard system without further information not held within the system.

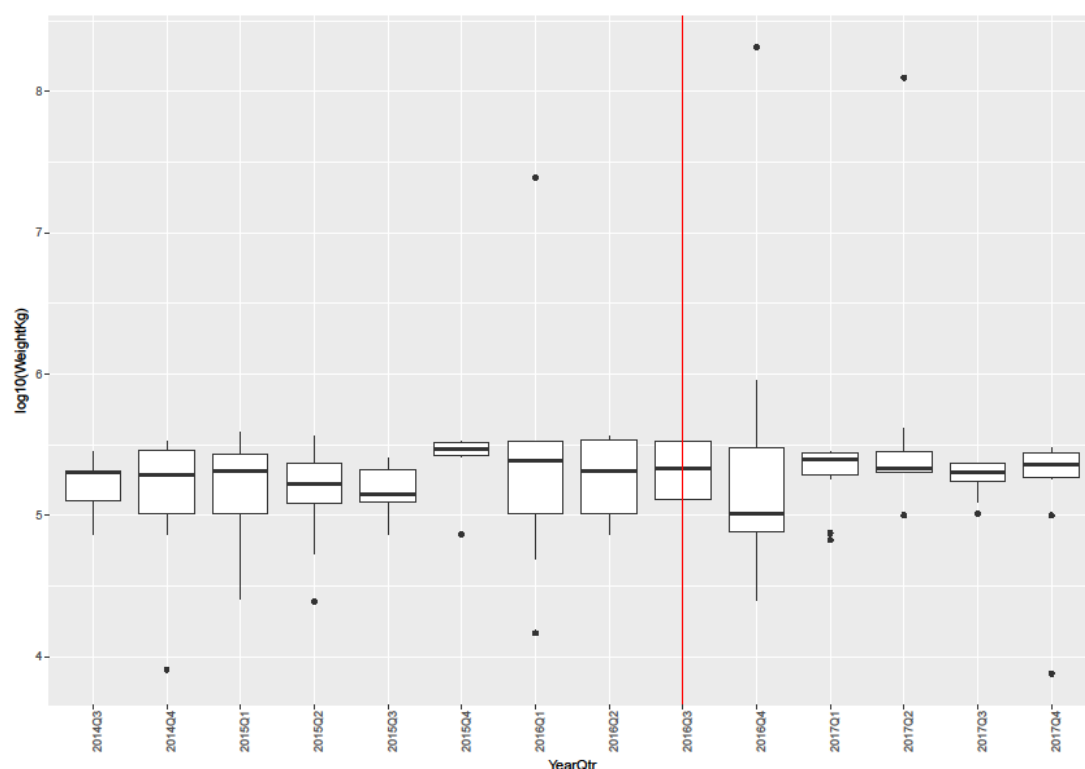


Figure 18. Boxplots of the distributions of consignment weights for peat, before and during the trial for a given importer

Note: The red line on the chart indicates the quarter (September quarter 2016) when the trial formally commenced and separates the pre-trial and trial periods.

Figure 19 seems to suggest that there has been a noticeable increase in the time taken between consecutive arrivals of peat shipments in the trial period. Since this may be affected by the change in eligibility during the trial, as well as more general difficulties separating peat from other products brought in under the same tariff code in the pre-trial period, this comparison should be treated with caution.

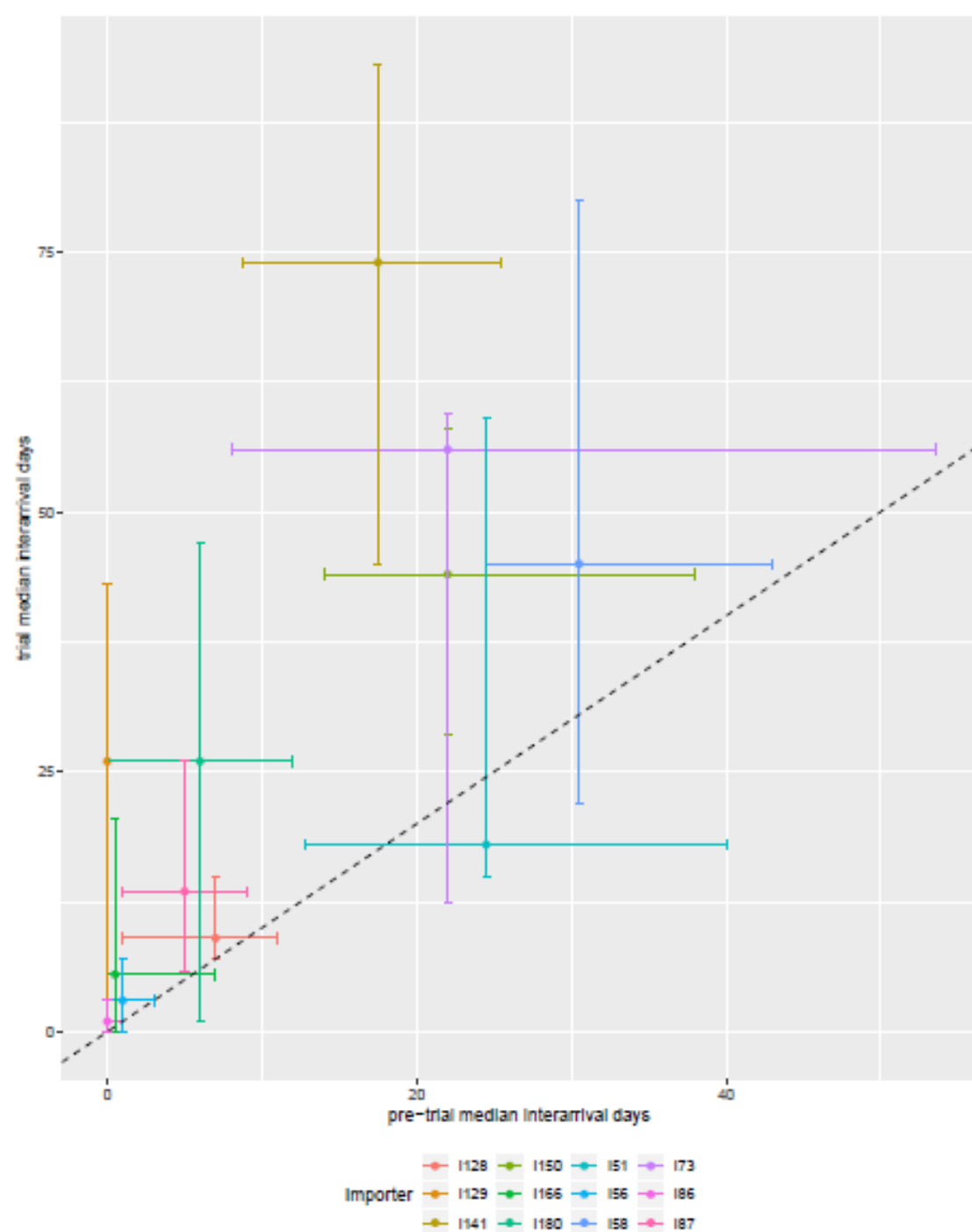


Figure 19. Inter-arrival times for peat, before and during the trial for a number of importers. Bars show the range of values from first to third quartile of inter-arrival times; the dashed lines indicates equality of pre-trial and trial median inter-arrival times.

Note: Importers are restricted to those with a minimum of five inspections in both pre-trial and trial periods.

1.1.3. Patterns in supplier and source country choices

From stakeholder interviews in CEBRA Project 1304C, it was established that relatively few businesses were significant importers of peat into Australia. Furthermore, these businesses tended to be in vertically integrated relationships, having long-established ties with one or a few overseas suppliers. As such, it was envisaged at the start of this trial that changes in suppliers or source countries would

be unlikely to occur. This was confirmed as part of the second round of interviews, where only one interviewee noted they were trialling a new supplier, which reflected motivations unrelated to the new protocols.

Figure 20 shows the network diagrams for the suppliers and countries of origin for one of the larger importers in the trial; the left-hand panel shows the network before the trial and the right-hand panel is for the trial period. For the importer labelled I128 shown in the figure, one supplier (labelled S60) and a paired country of origin (labelled C1) that was used before the trial are not used during the trial period; only supplier S56 who uses source country C9 is common to the pre-trial and trial periods. Rather than indicating a change in supplier arrangements, it could be that the other supplier and source country may be for coir or another product brought in under the HS tariff code 2703.00.00. This demonstrates the difficulty in separating out different products between the pre-trial and trial phases for the comparison.

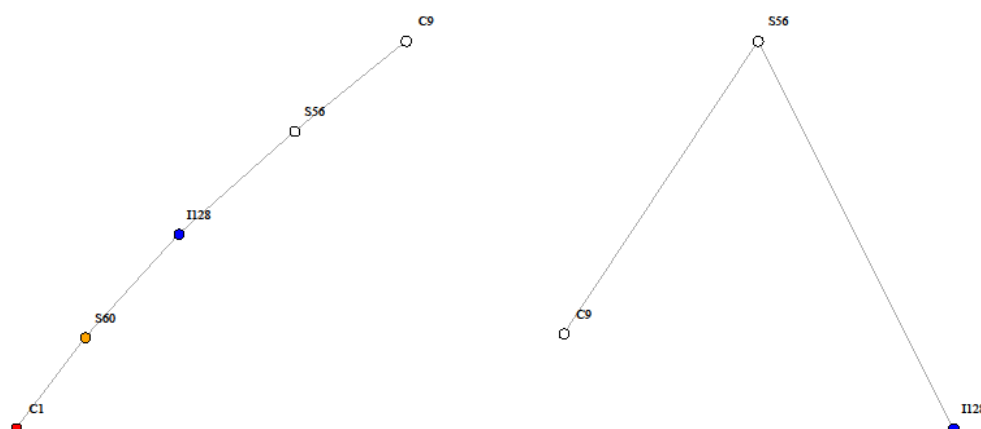


Figure 20. Network diagrams for the suppliers and source countries for a given importer, before (left-hand panel) and during (right-hand panel) the trial

I.1.4. Biosecurity risk mitigation procedures

Two importers interviewed identified upstream process and procedure improvements that would help improve biosecurity outcomes, though these seemed to be unrelated to the trial. One importer noted that one of their suppliers had moved to a fully enclosed facility, which meant raw ingredients would not be left outside. In turn, this would reduce the potential for contamination of the peat with foreign materials, including insects, in this stage of peat production. Another importer explained that

they were undertaking production process improvements and were taking steps to record errors more systematically.¹¹¹

I.1.5. Pathway composition patterns

The peat pathway was dominated by a few major importers before the trial commenced. According to discussions with importers, this largely reflects peat being a relatively low-value commodity where there are a few large, established producers. Figure 21 suggests this pattern has remained largely the same during the trial period, with only a few smaller importers taking part in the trial. Because of changes in eligibility during the trial period and the difficulty associated with separating peat from coir and other products under the same tariff code before the trial's commencement, assessments of changes in pathway composition should be treated with caution.

¹¹¹ Since peat importers were not provided with biosecurity performance reports as part of the trial, this type of systematic recording could be aided by the department proactively providing information to stakeholders.

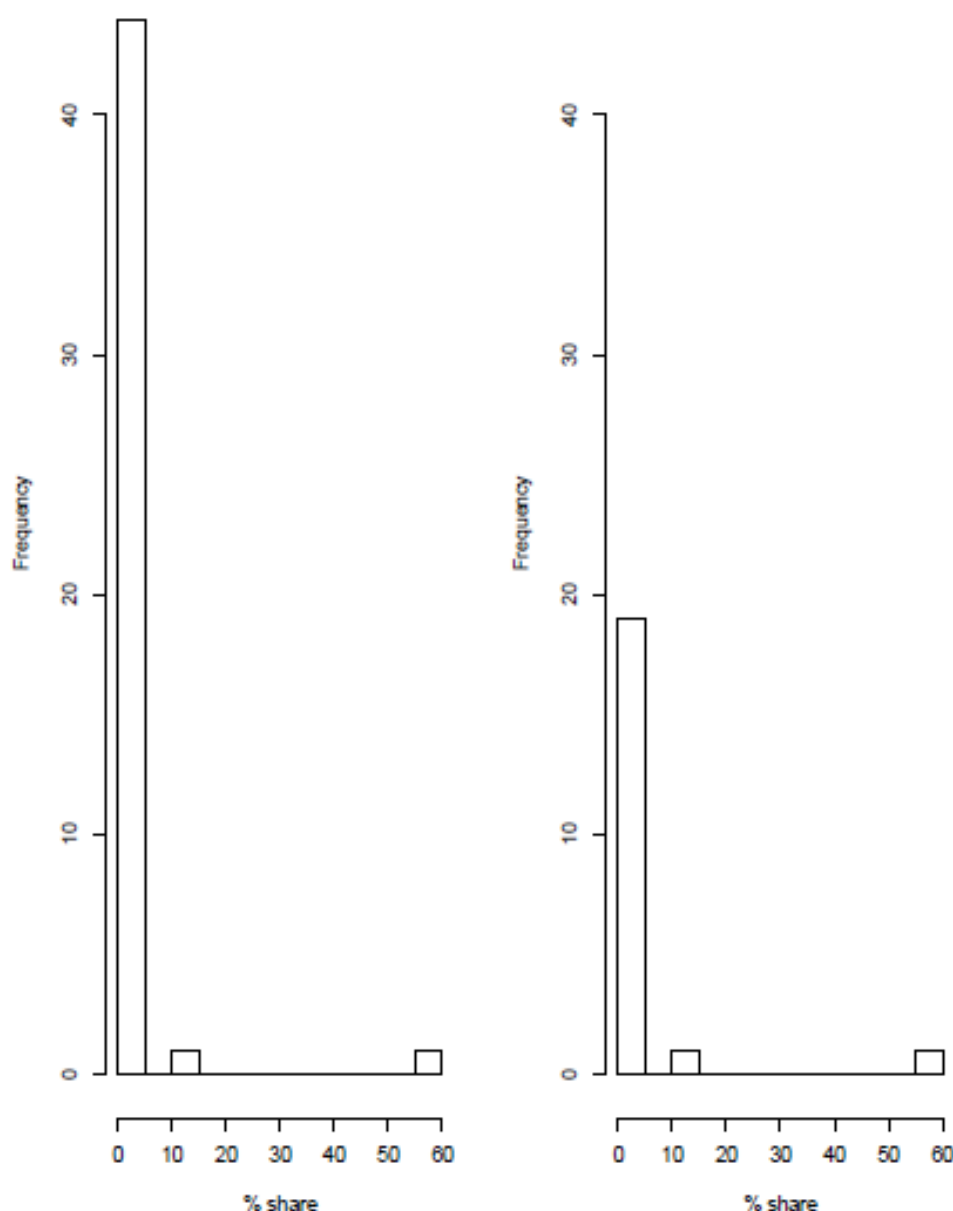


Figure 21. Importer composition changes for the peat pathway, during the trial period: left-hand panel is for all importers; right-hand panel is only trial participants.

I.2. Regulatory cost savings for the peat pathway

Table 9 shows an indicative per-consignment compliance cost saving of around \$325 if an inspection is not required because of past strong compliance, with transport-related costs providing the largest overall saving for importers.¹¹² As ten consignments avoided inspection throughout the trial, \$3 250 is the estimated savings in compliance costs by stakeholders over the course of the trial. More details

¹¹² To put this estimate in context, peat importers interviewed in CEBRA Project 1304C noted that costs related to biosecurity clearance can comprise up to ten per cent of the landed cost of a full-container load of peat.

about the intelligence used to develop of indicative estimates of the cost components is provided below.

Direct inspection costs

Comments made by importers and brokers indicate the tailgate inspection process is normally very quick for peat, with one broker suggesting 90 per cent of tailgate inspections for their client were completed in 15 minutes or less. Another importer suggested the inspection time for their consignments is usually in the order of 5 minutes. As such, the indicative costing has used the up-to-15 minutes benchmark to arrive at a cost estimate.

Inspection attendance costs

Importers and brokers who participated in the second round of interviews noted that a transport driver usually attends the inspection on behalf of the importer. For one firm, a representative from their warehouse attends, because their premises is also an Approved Arrangement site.

Table 9. Indicative estimated per-consignment savings on compliance costs for pure peat

Cost Component	Estimate (\$)	Basis for calculation
Direct inspection costs	50	2017-18 rate for up to 15 minutes of inspection services at an out-of-office location during regular business hours.
Inspect attendance costs	60	A driver or warehouse representative attending the inspection for one hour.
Inspection booking opportunity costs	15	10 minutes for an importer, broker or logistics operator to fill in the booking form. No allowance is given for rescheduling the inspection.
Cost of goods destroyed/being made unsaleable	0	The sample taken for inspection is small relative to the size of a container of peat and is of negligible cost.
Storage cost savings	0	Most shipping companies offer a number of free days for the container and very rarely is this limit breached.
Transport cost savings	200	Average cost based on importer interviews to send a container from the wharf to the inspection depot (Approved Arrangement site).
Total	\$325	

Notes: Costs rounded to the nearest \$5 per component. Time-based rates are based on the Victorian Government's Time-Cost Calculator and include an allowance for on-costs.

Given a third party tends to be involved at the inspection, the importers and brokers had limited insight into the time taken. The benchmark estimate in Table 9 is based on a one-hour allowance for the inspection reported by one importer.¹¹³

Inspection booking opportunity costs

In many cases, a transport (freight forwarding) company does the inspection booking, meaning those interviewed could not comment on the time it takes to complete booking requirements. Our benchmark estimate of 10 minutes comes from one importer interviewed who does the inspection booking themselves.

Cost of goods destroyed/being made unsaleable

Typically, the tailgate inspection involves only very small samples being cut from bales, amounting to less than one litre. Table 9 ascribes negligible value to the unsaleable peat taken during an inspection, consistent with an importer's comment that the portion taken is "too small for a dollar value to be attached to it". This also reflects that peat is a bulky, low-value product.

Storage cost savings

The few importers who noted some consignments were released on compliant documentation alone suggested that the time saving was between a few hours to one day. Based on other comments made during the interview, this may reflect the relatively good availability of inspection staff at Approved Arrangement sites and the straightforward requirements of the physical inspection.

In Table 9, we have used a value of zero for storage cost savings. This is based on importers having access to several "free days" attached to the use of containers, on which they may occur storage or demurrage charges if there is a backlog for inspections or a container is required to be washed. However, access to "free days" was not universal among those interviewed; in some situations, storage or demurrage charges could run into a few hundred dollars a day. The range of outcomes may reflect different charging models applied by ports and shipping countries that may mean sometimes these charges are "visible", while at other times they are built in to an established pricing schedule.

Transport cost savings

As noted earlier, transshipment costs seemed to deliver the largest proportion of compliance cost savings for peat. Interviewees indicated that transport from the wharf to the inspection site typically cost them between \$120 and \$200, with \$200 the most common response among interviewees. Some stakeholders noted that the transport costs typically depend on the shipment size (i.e. the number of containers), with one importer noting that transport from the wharf to the inspection site could exceed \$1 000 in some circumstances.

¹¹³ The difference in costs for the inspection attendance component between Tables 6 (page 75) and 9 reflects the assumed difference in skill level (and therefore implied wage rate inclusive of on-costs) of the person who attends the inspection. For the vegetable seeds pathway, the broker – classified as a *skilled* worker – attends the inspection, whereas the driver or warehouse representative attending the peat inspections has been classified as an *unskilled* worker for the purpose of calculating time-based opportunity costs for the peat pathway.

