Final Report

Implementation of Recommendations from the Avocado Nursery Voluntary Accreditation Scheme Review

Project leader:

John McDonald

Delivery partner: Nursery & Garden Industry Australia

Project code: AV16013

Project:

Implementation of Recommendations from the Avocado Nursery Voluntary Accreditation Scheme Review – AV16013

Disclaimer:

Horticulture Innovation Australia Limited (Hort Innovation) makes no representations and expressly disclaims all warranties (to the extent permitted by law) about the accuracy, completeness, or currency of information in this Final Report.

Users of this Final Report should take independent action to confirm any information in this Final Report before relying on that information in any way.

Reliance on any information provided by Hort Innovation is entirely at your own risk. Hort Innovation is not responsible for, and will not be liable for, any loss, damage, claim, expense, cost (including legal costs) or other liability arising in any way (including from Hort Innovation or any other person's negligence or otherwise) from your use or non-use of the Final Report or from reliance on information contained in the Final Report or that Hort Innovation provides to you by any other means.

Funding statement:

This project has been funded by Hort Innovation, using the avocado research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Publishing details:

ISBN 978 0 7341 4396 9

Published and distributed by: Hort Innovation

Level 8 1 Chifley Square Sydney NSW 2000

Telephone: (02) 8295 2300

www.horticulture.com.au

© Copyright 2018 Horticulture Innovation Australia

Content

Summary	4
Keywords	4
Introduction	5
Methodology	6
Investigate the feasibility of transition of operational, resource and administrative protocols from ANVAS to NIASA	6
Draft ANVAS as an adjunct to the NIASA guidelines	6
Develop resourcing and administrative protocols	7
Broad stakeholder consultation and ratification	7
Other intelligence gathering	8
Outputs	9
A functional new ANVAS program endorsed by AAL and NGIA	9
Full documentation of programs covering the administration, procedures and protocols, resourcing and funding needs of the new ANVAS	9
Industry communication article summarising the project and delivering industry awareness.	9
Outcomes	10
Monitoring and evaluation	11
Recommendations	13
Intellectual property, commercialisation and confidentiality	13
Acknowledgements	13
Appendices	14
Appendix 1. NIASA Appendix 13 – Requirements for high health avocado production	15
Appendix 2. NIASA Appendix 5 – Production nursery checklist	46
Appendix 3. NIASA High Health Avocado Accreditation. Administration and Resourcing Plan for ANV. Certification	AS 74
Appendix 4. ANVAS Guidelines mapped against NIASA Guidelines and other Scheme documentation	89
Appendix 5. Addressing ANVAS technical requirements within the NIASA Guideline	104
Appendix 6. Revised Application Form for NIASA Accreditation	124
Appendix 7. Your Levy at Work article and fact sheet	127
Appendix 8. Avocado Nursery Diseases fact sheet	131

Summary

The first step in minimising biosecurity risk to the establishment of new avocado plantings is the sourcing of healthy tree stock.

The Avocado Nursery Voluntary Accreditation Scheme (ANVAS), administered by Avocados Australia Ltd (AAL), has been Australia's leading accreditation scheme for the production of disease tested and true to type avocado trees for supply to the Australian avocado industry for the past four decades. The scheme establishes requirements for avocado production nurseries that are designed to minimise the risk of infestation of nursery stock with diseases that pose a significant threat to commercial avocado producers.

In 2013, the avocado industry requested a thorough review of ANVAS through Hort Innovation as the currently utilised guidelines for ANVAS had not been subject to review since 1996. The review was undertaken, and considered the current ANVAS framework and ways to best protect against risks created by existing and potentially new pathogens, and to build on improvements in supporting accreditation frameworks and production and testing technologies. A component of the ANVAS has included best practice nursery production procedures that also apply to the nursery production industry as a whole.

The Australian nursery production industry is represented by the Nursery & Garden Industry Australia (NGIA), who also administer a best practice nursery production scheme - the Nursery Industry Accreditation Scheme Australia (NIASA). The review considered matters of synergies between the two schemes and an administrative and delivery framework that could support reduced duplication and improvement across both schemes to deliver the best possible product to industry customers. In short, the review recommended that the Australian avocado industry should consider transition of ANVAS technical nursery production practices and consideration of emergent needs into NIASA under its modern and more flexible best practice quality management system.

In producing and delivering an improved scheme under this project, recommendations made as part of the Hort Innovation review have been carefully considered, and in association with AAL, leading avocado scientists, and ANVAS production nurseries, the NGIA has mapped synergies and identified gaps between both ANVAS and NIASA and has produced an expanded avocado nursery production module that deals specifically with modern day avocado production challenges and risks to deliver the best possible stock to industry customers.

NIASA 'High Health Avocado Production' requirements now form part of a revised NIASA Guideline. Requirements are included as an appendix to the Guideline, with audit criteria also added to NIASA's production nursery audit checklist. Upgrades to the NIASA's advanced on-line audit tool, the National Audit Portal (NAP), to accommodate the additional requirements have also been completed.

The NIASA best practice framework provides a foundation that allows for continual improvement within the system. Updates and improvements to avocado production procedures will be oversighted by a combined AAL/NGIA Authorised Oversight Committee with technical support provided, where requested, by a Technical Expert Panel comprised of members of AAL, NGIA and leading avocado scientists.

Transition of technical ANVAS requirements for avocado production nurseries to new NIASA high health avocado requirements will begin on 1 January 2019, with final transition to be achieved by 1 January 2020. ANVAS accreditation will still be managed and promoted by AAL to its members. Production nurseries will be required to provide evidence of NIASA High Health Avocado Production accreditation to support their application.

Keywords

avocado; high health; best practice; nursery; quality; diseases; accreditation; avocado sunblotch viroid; phytophthora; ANVAS; NIASA.

Introduction

ANVAS was first developed in 1977-78, following a particularly damaging season of abnormally high rainfall in 1974 resulting in significant tree losses in Queensland and New South Wales as a result of drowning, Phytophthora root rot, and other fungal diseases causing root rot decline.

The scheme required participating avocado production nurseries to implement a range of nursery practices known to prevent, or minimise, infestation of propagated plants with Phytophthora and other fungal root pathogens. A revision in 1996 saw inclusion of measures to support avocado sunblotch viroid avoidance. Participation in the scheme has been voluntary and any production nursery operator who met the requirements of the scheme guidelines could apply for accreditation under the scheme.

In 2013, the avocado industry requested a thorough review of ANVAS through Hort Innovation (AV13020, the Review of the Avocado Nursery Voluntary Accreditation Scheme), as the guidelines for ANVAS had not been amended since 1996 and as such were out of accord with emergent pathogens and new technologies.

The review considered all aspects of the scheme including technical, administrative and resourcing processes to ensure it could remain an essential part of the avocado industry's approach to improved gains in productivity through disease avoidance.

The review obtained input from key stakeholders in the Scheme, including representatives of the production nursery sector, avocado growers, the peak Industry bodies, researchers, Industry consultants and nursery accreditation inspectors. The stakeholder environment remained uniformly supportive of the continuity of ANVAS aims and the review highlighted ways in which ANVAS could best be improved to meet emerging challenges to industry productivity.

Key recommendations of the review to be considered for the ANVAS under this project included:

- Mapping and gapping of the ANVAS current and emergent operational, resource and administrative protocols for overall nursery inspections against those of NIASA, and where appropriate, amendment to meet the nationally endorsed processes developed by NIASA.
- Mapping of the ANVAS guidelines for sampling ANVAS nurseries and specified pathogen detection against those of NIASA, and where appropriate, substantial replacement by those of NIASA, and ASBVd testing and tree registration method re-evaluation to incorporate more strategic sampling techniques and contemporary detection and reaction processes.
- > Inclusion of other prohibited and high-risk fungal plant pathogens.
- > Development of specific avocado production guidelines as an adjunct to NIASA to reflect the above.
- Development of a framework and the potential members of an expert panel able to inform deliberations on changes to processes ranging from new technologies, reacting to emergent problems and strengthen the processes of appeals and dispute resolution.
- > Development of agreed processes for compiling information from ANVAS nurseries to benefit avocado market intelligence and horticultural research, e.g. figures for the numbers of trees being planted, what varieties and rootstocks, when and where they are being sold.
- > Investigation of labelling protocols in nurseries to be added to the ANVAS-specific guidelines.
- > Investigation of trueness-to-type sampling and testing protocols.
- > Upgrading the electronic auditing platform currently used for all NIASA audits to recognise a business seeking an audit under NIASA plus ANVAS as well as developing the electronic compliance checklist within the auditing platform.

The purpose of this project has been to consider and translate review recommendations into the NIASA best practice and continual improvement framework to support ongoing efforts to provide an accredited source of disease tested and true to type avocado trees to commercial avocado industry members.

Methodology

Delivery of the project was undertaken in stages, described best as falling within five broad categories.

Investigate the feasibility of transition of operational, resource and administrative protocols from ANVAS to NIASA

The transition of the Nursery Production Farm Management System programs, including NIASA, from State and Territory Nursery & Garden Industry organisations to NGIA management and administration in early 2016 was assessed to determine if NIASA under the new administrative model could provide a stable platform for operation of the scheme.

On confirmation that the new administration model could support transition, a technical and administrational review of the ANVAS guidelines was then undertaken against the current NIASA guidelines and its supporting administration framework in consideration of extension of the scheme to include commodity specific initiatives such as ANVAS. The review considered key recommendations provided within Hort Innovation report AV13020 - 'Review of the Avocado Nursery Voluntary Accreditation Scheme (ANVAS)'.

The method used to conduct the review was to initially review each requirement included within the ANVAS guidelines then 'map' the requirement against NIASA Scheme documents. Where NIASA was found to include provision to address or generally address a requirement, a reference was made to the relevant NIASA document and specific section. Comment was provided as an 'outcome' of the process.

NIASA documents were then examined in detail in order to determine where potential changes may need to be made and the general scope of those changes. Each document was addressed separately, as was each section of the document. Examination included analysis of potential conflicts in achieving a transition of the ANVAS criteria.

Where conflicts or 'gaps' were noted relevant comment was provided on transition solutions.

Draft ANVAS as an adjunct to the NIASA guidelines

Building on the investigation of NIASA as a stable platform for ANVAS, and completion of scheme mapping and gap analysis between the ANVAS and NIASA, guidelines were drafted to address avocado/ANVAS specific criteria to be included as a 'High Health Avocado Production' appendix to the NIASA Guidelines.

Qualified scientific experts from the Queensland Department of Agriculture and Fisheries (QDAF) were engaged to investigate and inform technical aspects of the project, and further research was undertaken to provide solutions for Hort Innovation Review recommendations not currently incorporated into the existing ANVAS Guidelines. These included research and recommendations on current and emerging avocado pests, and best practice methods to minimise the risk of infestation of propagated avocado plants. Importantly, the Avocado sunblotch virus (ASBVd) testing methods, and root pathogen sampling methods, were re-evaluated to incorporate more strategic sampling techniques and contemporary detection and reaction processes.

A statistical analysis was undertaken on pest inspection and sampling methods to determine rates that would ensure that inspection and sampling was to be undertaken at rates that would provide an appropriate level of confidence in identifying pest infestation at or below a statistically and commercially acceptable prevalence level. A number of options were identified for consideration and costing was undertaken for each solution.

AAL was consulted on draft guidelines, and decisions made on desirable solutions. An 'Expert Technical Panel' of AAL, NGIA and scientific experts was also established to provide input into the consultation process.

Based on the agreed guidelines, an audit checklist was developed and added as an inclusion to NIASA's existing Nursery Production audit checklist. High Health Avocado Production specific criteria were considered and included as a new section to the checklist.

Upgrades to the NGIA's Nursery Production Farm Management System National Audit Portal (NAP) were undertaken to accommodate auditing of High Health Avocado Production requirements to capture audit data in the field and generate the audit report for the businesses.

Develop resourcing and administrative protocols

'Rules' for administration and delivery of NIASA High Health Avocado Production accreditation were developed in consideration of AAL ANVAS accreditation and NIASA accreditation processes and documented with a 'NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification'. The Plan required a documented process for establishment of a collaborative arrangement between AAL and the NGIA in delivering mutually beneficial outcomes to the Australian avocado industry.

Criteria addressed in the Plan included:

- combined scheme administration requirements incorporating relevant suppliers of administrative services, scheme ownership, scheme relationships (including decision making and expert technical support) and scheme promotional matters;
- > fees and charges;
- accreditation processes; and
- > transitional arrangements.

The Plan also identified relevant resourcing needs and related requirements including:

- > suppliers of goods and services;
- estimates of business costs; and
- > indicative cost estimate summaries.

Broad stakeholder consultation and ratification

Peak Industry Bodies

High level consultation between NGIA (as the industry body representing commercial production nurseries) and AAL (representing commercial avocado producers) was undertaken throughout each stage of the project. Respective industry Board/ National Governance Committee members were also briefed on project progress.

Ratification of final project documents was sought through the NGIA National Governance Committee and AAL through their established authorisation process.

Nursery Production Businesses

Preliminary consultation with an ANVAS production nursery facilitated the completion of a first draft NIASA appendix on 30 November 2017 after completion of mapping and gap analysis of the two schemes. Consultation included a visit to an avocado production nursery in early October, followed by face to face discussion with AAL to discuss results shortly thereafter.

Further draft project documents were distributed to production nurseries in May 2018 with consideration of any suggestions raised.

Final exposure drafts were provided to all ANVAS production nurseries between 17 July and 24 July 2018 and final comments sought. Consultation with current ANVAS production nurseries on the final exposure draft of the appendix was undertaken to ensure no significant impediments to implementation, with production nurseries still maintaining strong support for the transition.

Scientific Experts

Investigation of the inclusion of other prohibited and high-risk fungal plant pathogens was undertaken through the QDAF, in consultation with experts from the Queensland Alliance for Agriculture and Food Innovation (QAAFI).

Personnel determined the most up to date information on avocado pathogens and their biology, detection and pathogenicity. This work allowed the inclusion of best management practices for additional pathogens into the scheme, with monitoring protocols and action on detection provided based on the seriousness of the pathogen, with Group 1 being the most serious (prohibited) pathogens based on impact to avocado industry purchasers should they be present. ASBVd testing methods were re-evaluated to incorporate more strategic sampling techniques and contemporary detection and reaction processes. QDAF, in consultation with QAAFI personnel

brought to the project the most up to date information on ASBVd including the biology, detection and pathogenicity. This allowed consideration of a range of options in relation to ASBVd sampling and testing based on modern production nursery challenges, cost of implementation and statistical analysis.

Other intelligence gathering

Investigation of random genetic sampling of rootstock

Investigation of insertion of random genetic sampling into the guidelines was investigated as part of this project. Web searches and consultation with avocado scientific experts within QDAF and QAAFI was undertaken to determine whether these services were established and available within Australia or abroad.

QAAFI was consulted to determine whether rootstocks, varieties etc. could be made available to establish some baseline sequence/genome data and confirmed that varieties could be made available.

It was confirmed that specialist companies within Australia were equipped to provide this service however setting up the service would require further investment in research, method development and establishment of appropriate genetic variety libraries.

Identify a method for production nurseries in confidence to provide figures for research and future purposes

In-confidence collection of production nursery data on production rates and final destinations of planting material for research and industry forecasting purposes was investigated. It was determined that collection of this information for the intended purpose was not possible within NIASA due to privacy and confidentiality conditions included as part of the NIASA Terms and Conditions. This information is not required by NGIA in order to implement the scheme.

Estimated annual production numbers are captured during audit as part of new High Health Avocado Production requirements for sampling purposes and recorded within the audit checklist (whether a business produces 30,000, 60,000, 90,000, 120,000 or more than 150,000 plants a year). This is an indicative estimate of production through the scheme, however from a whole of industry perspective it is unclear what proportion of trees are produced through ANVAS and supplied to avocado growers as opposed to how many are not.

A solution to provide for the capture of relevant information, that could further the interests of the avocado industry, is that AAL consider requiring relevant information to be provided on application for ANVAS accreditation (using the AAL ANVAS application form) following a production nursery demonstrating it has met the technical requirements for accreditation for NIASA High Health Avocado Production.

This mechanism is provided, for consideration by AAL in ANVAS application requirements, within section 1.2.4 *Accreditation* of the NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification.

Investigation of methods for durable varietal and rootstock labelling

Some investigation was conducted by QDAF scientists on possible methods for durable rootstock labelling. Investigation considered durable tags and other alternatives including microchipping. Consideration was given on the NIASA best practice accreditation framework, cost and benefit in the inclusion of this additional requirement.

It was determined that the NIASA framework provides for the accreditation of production nurseries rather than certification of individual plants, however inclusion of additional tagging requirements over and above standard requirements of durable marking of pots typically applied as standard practice was not outside of the scope of what could be achieved. Consultation with ANVAS nurseries on willingness to continue with a revised ANVAS scheme clearly identified an imperative on reduction, or minimisation, of cost. Costing of options provided through QDAF, for tagging alone, were found to be in excess of cost per tree in implementing existing requirements and, as a result, further investigation was not undertaken.

Outputs

The outputs of this project include:

A functional new ANVAS program endorsed by AAL and NGIA

A functional new ANVAS program has been delivered in accordance with Review recommendations. Technical business requirements are provided as a new appendix to NIASA - APPENDIX 13 Requirements for high health avocado production (see Appendix 1 to this report).

Further, the NIASA 'Production Nursery Audit Checklist', which is represented as Appendix 5 to NIASA, has been updated to include a new section, Section 12, which deals specifically with high health avocado production audit requirements over and above general requirements already included within NIASA (see SECTION 12 of Appendix 2 to this report). Electronic audit checklists based on the checklist have been loaded into the NGIA's National Audit Portal (NAP) to allow in-field audit data collection and preparation of audit reports.

Transition of nursery production requirements for the development of the Appendix was undertaken by mapping and 'gapping' elements of each scheme. Firstly, by comparing specific requirements of ANVAS against those included within NIASA (see Appendix 4), then by verifying compatibility of the schemes by assessing each requirement of NIASA against ANVAS in order to determine best fit solutions for incorporation of ANVAS requirements (see Appendix 5). Avocado specific procedures that did not fit within the NIASA Guidelines were incorporated into the NIASA High Health Avocado Production appendix. Critical elements related to high health avocado production that were existing NIASA requirements included within the main body of the Guidelines were also referenced within the Appendix.

The NIASA High Health Avocado Production appendix and checklist supporting delivery of the technical requirements of ANVAS were then ratified for inclusion into the NIASA Guidelines by the NGIA National Governance Committee on 7 August 2018. Final AAL endorsement and ratification of the NIASA High Health Avocado Production appendix occurred on 22 August 2018.

Full documentation of programs covering the administration, procedures and protocols, resourcing and funding needs of the new ANVAS

NIASA governance and administration documents were investigated and found to be compatible with those required for delivering the scheme as a collaborative arrangement between NGIA and AAL, with the exception being a minor modification of the NGIA's NIASA application for accreditation form to include provision for an interested business to seek NIASA High Health Avocado Production accreditation in addition to that required for general NIASA Production Nursery accreditation (see Appendix 6.).

'Rules' for administration and delivery of NIASA High Health Avocado Production accreditation as part of a collaborative arrangement between NGIA and AAL were developed in consideration of AAL ANVAS accreditation and NIASA accreditation processes and documented with a 'NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification'. The plan also addresses resourcing requirements of the new scheme.

The plan was ratified by the NGIA National Governance Committee on 7 August 2018. Final AAL endorsement of the plan was confirmed on 28 August 2018. The NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification is included as Appendix 3.

Industry communication article summarising the project and delivering industry awareness.

Industry communication articles were developed for release at critical stages of the project, those being:

- > after commencement of the project, to highlight initiation of the project and potential project benefits; and
- > for release at the conclusion of the project, to confirm project initiation and to provide potential and current accredited system users with general information on avocado nursery diseases, and information on links to assess further scheme information.

Initial exposure of the program to highlight initiation of the project and potential project benefits was undertaken

through 'Your Levy at Work' and the article 'Benefits of biosecurity for bananas, avocados' (see Appendix 7).

A project Fact Sheet titled 'Avocado Nursery Diseases' will be uploaded to the Nursery Production FMS website at <u>http://nurseryproductionfms.com.au/pests-diseases-weeds/</u> on project completion. This fact sheet will be available to all persons, including avocado producers, and not limited to members of NGIA. A copy of the fact sheet is included as Appendix 8.

Outcomes

The outcomes of this project are:

Decreasing losses to field and production nursery productivity through disease avoidance and management in ANVAS accredited production nurseries, and improvements in nursery crop physiology and pest management of avocado plants in the production nursery and transport environment.

In the establishment of a new high health avocado production scheme under this Hort Innovation project, and in consideration of ANVAS requirements and recommendations made by the previous Hort Innovation ANVAS review, avocado production nurseries are now provided an opportunity to greatly benefit from modern best practice nursery production procedures. These procedures have been documented within a new High Health Avocado Production appendix to NIASA and summarised in the production nursery checklist (see Appendix 1 and Appendix 2).

The NIASA best practice framework focusses strongly on prevention and monitoring for problems - in addition to steps taken in disease avoidance. Identifying problems early provides the best opportunity to correct those issues, minimise losses and increase productivity. To achieve these aims, this project has provided guidance and requirements for regular above and below ground plant part monitoring documented within the NIASA High Health Avocado appendix. Supporting resources have also been produced including a new Avocado Nursery Disease Fact Sheet (see Appendix 8) to assist in the process.

It is clear that improvement in commercial field production of avocado fruit relies on improvement in the production of quality nursery stock source materials. This project has highlighted the benefit of establishment of mutually beneficial arrangements between peak industry bodies who contribute to outcomes within the same horticultural production supply chain. Through collaboration with AAL as the customer representative, customer requirements and expectations are now clearly identified.

Improving productivity through a national partnership between ANVAS and NIASA enabled by the development and ratification of durable, transparent and mutually advantageous production nursery accreditation policy and procedures without the need to duplicate resources.

The documentation of a 'NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification' (see Appendix 3), endorsed by the NGIA and AAL, establishes the basis for an ongoing national partnership in delivery of the ANVAS and NIASA High Health Avocado Production standards.

Prior to establishment of this agreed arrangement, both schemes were run independently despite significant commonality in a number of scheme requirements. These were clearly identified as part of 'mapping' and 'gapping' undertaken as part of this project (see Appendix 4 and Appendix 5) - the consequence of this being - that increased costs of accreditation borne by a production nursery could result in either increased cost to the consumer and/or increased uncertainty in maintaining accreditation in either of both schemes. Further, for auditing purposes, an increased reliance on NGIA through engagement of its auditing services saw increased reliance on the services of third parties. The NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification, as an outcome of this project, demonstrates a clear delineation of roles and responsibilities under the shared arrangement with no duplication of resources and establishes a mechanism for ongoing consultation and improvement in the long term.

ANVAS will begin to follow recognised continuous quality improvement processes and in future, be more reactive to progressive and emergent industry needs.

The Nursery Production Farm Management System, including NIASA, is a recognised quality improvement scheme that provides a set of guidelines that ensure an accredited plant production business can operate according to industry best management practice and commits to a continuous improvement cycle (Plan, Do, Check & Review).

As documented within the agreed NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification, an Authorised Oversight Committee including both NGIA and AAL representatives has been established for the new scheme arrangements. Further, a 'Technical Expert Panel' was established to provide technical support to the Authorised Oversight Committee where requested. This arrangement allows ongoing and shared decision making to support and be reactive to emergent industry needs. Further, the NIASA Guidelines are updated at least annually, to allow for significant flexibility in the incorporation of new requirements.

Monitoring and evaluation

Monitoring and evaluation of the project was conducted in accordance with Hort Innovations agreed approach (specified in the executed Research Agreement), that is, through monitoring and evaluation of milestones detailing achievement criteria and deliverables. On all occasions, milestone reports evidencing achievement criteria and deliverables were accepted without amendment. Table 1 - Milestone and deliverable criteria below details project milestones, deliverables and outcomes delivered during the project period.

Milestone Number	Due Date	Milestone Description	Achievement Criteria (Based on outputs and outcomes)	Outcome
101	30/08/2017	Agreement Sig	gned. IP Arrangements in place.	The project was established on 28/08/2017.
102	30/11/2017	Draft Materials Developed	 Evaluation of the current durability of NIASA given new federal funding regime. Project ceases if NIASA is determined to be no longer the appropriate ANVAS vehicle. Current ANVAS Guidelines (1996) mapped against NIASA Guidelines <u>against the requirements coming from the ANVAS Review.</u> Draft gap guidelines developed and circulated for feedback from AAL and NGIA. Feedback obtained within a reasonable timeframe incorporated into secondary draft guidelines to be presented to the members of the national Governance Committee on a progressive basis. 	Report submitted 30/11/2018 and accepted without amendment. Confirmation of durability of NIASA supported ongoing project outcomes. Mapping and gapping of existing programs facilitated production of draft materials.
103	30/05/2018	Final Materials Developed	 Draft ANVAS as an adjunct to NIASA guidelines developed from 101 and 102 utilised to determine resource needs for operating ANVAS as an adjunct to NIASA. ANVAS Resource Plan circulated for comment from AAL and where there is a need for combined feedback, to NGIA. Panel of potential suppliers of goods and services underpinning the ANVAS as an adjunct to NIASA guidelines will be developed as part of budget planning. All feedback incorporated into a holistic set of draft guidelines (with ANVAS as an adjunct to NIASA) made available for any further 	Report submitted 28/05/2018 and accepted without amendment. Drafting 'ANVAS' as an adjunct to NIASA highlighted critical resourcing needs for the project. Establishment and agreement on a

Table 1 - Milestone and deliverable criteria

Hort Innovation - Final Report: Implementation of Recommendations from the Avocado Nursery Voluntary Accreditation Scheme Review

Milestone	Due Date	Milestone	Achievement Criteria (Based on outputs and	Outcome
Number		Description	outcomes)	
Number 104	30/07/2018	Description Final Documents Developed and available	outcomes) comment from AAL and channelled through to NIASA Committee members. Any additional feedback incorporated into next iteration. ✓ Any remaining need to change ANVAS as an adjunct to NIASA Guidelines as determined by the NIASA Committee incorporated into the final set of guidelines and made available to AAL. Presentation of the ANVAS Guidelines (2018) to AAL Board members and current ANVAS accredited nurseries. A revised ANVAS will be finalised up to the completion of Stage 1 activities (ie. development of a revised ANVAS resourcing plan, development of the partnership/combined administration protocols including; ANVAS- specific NIASA module, outline of mechanism for in-confidence collection of nursery data on production rates and final destinations of	draft resourcing plan clarified and addressed scheme resourcing requirements. Report submitted 30/07/2018 and accepted without amendment. Initial project mapping and gapping facilitating production of draft scheme documentation allowed ongoing consultation with project stakeholders and continual improvement in project deliverables.
			planting material for research and industry forecasting purposes, recommendation of an authorised ANVAS oversight panel & validation and ratification of the revised ANVAS as an adjunct to NIASA by AAL & the National Governance Committee (replacing the National NIASA Accreditation and Certification Committee)). All necessary reports complying with Horticulture Innovation Australia's requirements received and approved by Horticulture Innovation Australia Ltd.	Ratification of new scheme documentation and requirements has occurred prior to project completion.
190	30/08/2018	Final Report Re and final State	ceived by Horticulture Innovation Australia ment of Receipts and Expenditure received.	Report and statement of expenditure submitted 30/08/2018

Recommendations

The following recommendations are made in relation to ongoing maintenance and continual improvement of project outcomes.

In relation to ongoing maintenance and continual improvement of existing project resources:

1. As is often the case with the delivery of any new system, testing of the system through implementation by production nurseries will provide opportunities for consideration of further improvement to the scheme after project completion.

It is recommended that both AAL and NGIA maintain records of feedback provided by scheme users and customers for the project's Authorised Oversight Committee's ongoing consideration and decision.

- 2. It is recommended that NGIA continue to work with NIASA Accredited businesses, and encourage new business uptake after final project completion.
- It is recommended that AAL consider the NIASA Requirements for High Health Avocado Production Appendix as a platform to further improve outcomes for industry members through consideration of inclusion of beneficial outcomes of relevant ongoing avocado production nursery pest and disease research and development initiatives.

In relation to outcomes of investigation sought under this project:

4. Scope for incorporation of random genetic testing of rootstock type into the NIASA system was investigated under this project and it was determined that further research and development was required.

Should it be decided that investment in research to establish appropriate sampling and testing methods and an appropriate genetic rootstock library is warranted, it is recommended that the NIASA high health avocado production framework provides sufficient flexibility to accommodate those inclusions.

5. A mechanism has been identified to allow AAL to capture relevant in-confidence production nursery data on production rates and final destinations of planting material for research and industry forecasting purposes, achieved through a requirement to include that information as part of the application for ANVAS accreditation.

It is recommended that AAL consult with current ANVAS production nurseries in order to seek their views on a willingness to provide commercial in confidence nursery production information, the scope of the information that could be sought, and its intended use. Alternatively, the data sought could be included as non-mandatory within the AAL ANVAS application for accreditation.

Intellectual property, commercialisation and confidentiality

No project IP, project outputs, commercialisation or confidentiality issues to report.

Acknowledgements

Development of the NIASA Requirements for the High Health Avocado Production Appendix under this project was undertaken by NGIA Technical Assistant Grant Telford and John McDonald (NGIA National Biosecurity Manager) with significant input from Dr Andrew Manners (Senior Entomologist, Department of Agriculture and Fisheries) and Dr Ken Pegg (Emeritus Plant Pathologist, Department of Agriculture and Fisheries).

This project also benefited greatly from expert guidance and input provided by John Tyas (CEO - AAL) and Dr Andrew Geering and Dr Elizabeth Dann (Queensland Alliance for Agriculture and Food Innovation), and ANVAS accredited production nurseries.

Appendices

Appendix 1. NIASA Appendix 13 – Requirements for high health avocado production.

- Appendix 2. NIASA Appendix 5 Production nursery checklist.
- Appendix 3. NIASA High Health Avocado Accreditation Administration and Resourcing Plan for ANVAS Certification.
- Appendix 4. ANVAS Guidelines mapped against NIASA Guidelines and other Scheme documentation.
- Appendix 5. Addressing ANVAS technical requirements within the NIASA Guideline.
- Appendix 6. Revised Application Form for NIASA Accreditation.
- Appendix 7. Your Levy at Work article.
- Appendix 8. Avocado Nursery Diseases fact sheet.

Appendix 1. NIASA Appendix 13 – Requirements for high health avocado production

APPENDIX 13 REQUIREMENTS FOR HIGH HEALTH AVOCADO PRODUCTION

A.13.1 Introduction

Nursery production of 'high health' avocado plants is recognised within Australia as playing an important role in supporting the Australian avocado production industry.

Purchasers of avocado nursery stock require assurance that stock purchased meets an industry standard, is true to type, and that appropriate steps have been taken to reduce the chance of introduction of serious pathogens into the production environment.

The Avocado Nursery Voluntary Accreditation Scheme (ANVAS), administered by Avocados Australia Limited (AAL), is recognised as the Australian avocado industry's scheme to provide superior planting material to industry members.

The incorporation of 'high health' avocado nursery production requirements into NIASA is not intended to replace the ANVAS. The intention is to acknowledge steps taken by NIASA production nurseries that contribute to meeting ANVAS requirements and allow a business to apply to AAL for ANVAS accreditation.

In order for a production nursery to be eligible to apply to AAL for ANVAS accreditation, the production nursery **must** be:

- NIASA accredited; AND
- implement the requirements specified within this Appendix; AND
- be found at audit to have implemented the procedures within this Appendix to a **Satisfactory** standard; AND
- hold and maintain NIASA High Health Avocado Production Accreditation as evidenced by a current NIASA Certificate of Accreditation for High Health Avocado Production.

A.13.2 Materials used in plant production

A.13.2.1 Water

Water is managed in accordance with requirements provided in NIASA Section 1.1.1 Water.

Key requirements for High Health Avocado production – Water.

- Water that is obtained from town suppliers, bores free of surface run-off or clean roof catchments does not require disinfestation.
- Other sources of water must be disinfested using an approved NIASA disinfestation procedure.
- Subsequent storage of water requires facilities and procedures to be established and implemented that do not allow for contamination by untreated water, soil, plant debris, dust and animal movement.

A.13.2.2 Growing media/propagating media

Growing media is managed in accordance with requirements provided in NIASA Section 1.1.2 Growing media/propagating media.

APPENDIX 1 - NIASA Appendix 13 - Requirements for high health avocado production

Key requirements for High Health Avocado production – Media.

- Growing media/propagating media that is sourced from a NIASA accredited growing media supplier does not require additional pathogen testing and treatment prior to use.
- Growing media/propagating media that is sourced from a non-NIASA accredited growing media supplier requires pathogen testing and treatment prior to use.
- Growing media/propagating media prepared on-site which includes components that pose a risk
 of contamination, for example river sand, must be disinfested using an approved NIASA
 disinfestation procedure.
- Growing media/propagating media must be stored in a manner to prevent contamination prior to use.

A.13.2.3 Seed, budwood and scion material

Use of infected propagation material can result in infection of propagated plants.

Steps must be taken to minimise the risk of sale of propagated plants that are infected with Group 1 and 2 viroids and other pathogens.

See SCHEDULE 1 for information on Group 1 and 2 viroids and non-viroid pathogens.

A.13.2.3.1 Seed

Minimising the risk of Group 1 viroid infection from seed

In order to minimise the risk of sale of propagated plants infected by Group 1 viroids, seed must be sourced from:

- 1. An area or a place that has been declared free of Group 1 viroids, as evidenced by a government phytosanitary certificate or government area freedom declaration; **OR**
- 2. from trees ('multiplication trees') that have been tested and found to be free of Group 1 viroids; **OR**
- 3. propagated plants must be in-line tested prior to consignment and found free of Group 1 viroids.

See section A.13.4 Testing for the presence of Group 1 viroids in multiplication trees or propagated plants.

Further information

- Testing of multiplication trees for Group 1 viroid infection prior to material use minimises the risk of infected plants being produced and detected well into the production cycle and batches of plants using an infected source material being rejected for certification.
- In-line testing is required where a plant is to be propagated using nurse seed for clonal rootstock, or seed used directly as rootstock, or includes budwood or scion material from a multiplication tree that has not been tested for Group 1 viroid infection.
- Trees that are infected with avocado sunblotch viroid (a serious Group 1 viroid) do not always show symptoms of infection. Seed collected from infected trees that do not show symptoms of infection poses a greater risk of disease transmission to propagated plants.

Minimising the risk of Group 1 and Group 2 non-viroid pathogen infection from seed

Phytophthora cinnamomi (*Phytophthora*), a serious Group 1 non-viroid pathogen, can enter wind-fallen fruit through prolonged ground contact and grow into the seed.

To address the risk of *Phytophthora* infection, it is recommended that seed to be used for plant propagation should <u>either</u> originate:

1. from fruit that is collected while still attached to the tree;

Further information

- Care must also be taken to prevent seed decay from fungi belonging in the *Botyrosphaeriaceae* (a Group 1 non-viroid pathogen), the *Colletotrichum* species complexes (Group 2 non-viroid pathogens), or the *Rhizoctonia solani* complex (a Group 2 non-viroid pathogen). Therefore, only take seed from fruit that is free from symptoms of disease.
- Only select material that is present at a height greater than 100cm from the ground surface. This will reduce the risk of infection by *Phytophthora* (a Group 1 non-viroid pathogen) from contamination by rain splash from the soil surface.

OR

2. be heat treated prior to use in a way that addresses the risk of infection.

Further information

- Treatment is by immersion in hot water at 50°C for 30 minutes to eliminate any infection by *Phytophthora*. Temperature control must be precise as seed will lose viability at 52°C. Poor germination may occur if overheating occurs.
- It is recommended that after seed extraction and heat treatment, seed is immediately cooled by immersing in clean, cold water.
- Chemical dips are not a suitable disinfestation method as they do not eradicate pathogens that may be present within the seed.

Extracting and storing seed

Seed is best extracted when fruit is hard green, which will also remove the soft seed coat. Seed from immature fruit can cause the newly emerged leaves to be white and malformed (albinism). Using ripe (ready to eat) fruit makes the seed coat very difficult to remove.

It is recommended that prior to storing, seed is treated with an approved registered fungicide and placed in clean bags. If seed must be stored and heat treated, heat treat seeds prior to planting after storage is completed.

Further information

 Remove the seed coat (seed husk), if present, to increase the speed and percentage of germination, especially if seed is to be cold stored. The maximum time recommended for cold storage is 5 months at 4.4°C and 12 months at 9°C.

A.13.2.3.2 Budwood and scion material

Minimising the risk of Group 1 viroid infection from budwood and scion material

As with seed, budwood or scion material must be sourced from:

- 1. an area or a place that has been declared free of Group 1 viroids, as evidenced by a government phytosanitary certificate or government area freedom declaration; **OR**
- 2. from trees ('multiplication trees') that have been tested and found to be free of Group 1 viroids; **OR**
- 3. propagated plants must be in-line tested prior to consignment and found free of Group 1 viroids.

See Section A.13.4 Testing for the presence of Group 1 viroids in multiplication trees or propagated plants.

Further information

- Testing of multiplication trees for Group 1 viroid infection prior to material use minimises the risk of infected plants being detected well into the production cycle and batches of plants using an infected source material being rejected for certification and destroyed.
- In-line testing is required where a plant is to be propagated using seed as a nurse seed for clonal rootstock, or seed used directly as rootstock, or includes budwood or scion material, from a multiplication tree that has not been tested for Group 1 viroid infection.

Collection of budwood or scion material

When collecting material:

- Material is to be collected from healthy young trees that have been visually inspected and found free of pest and disease symptoms and have been sprayed with an appropriate registered fungicide prior to collection. Observe withholding periods prior to material collection.
- Material should not be taken from water stressed trees, or wet trees wet material increases the possibility of wound infection by Botryosphaeriaceae and Colletotrichum species.
- Only select material that is present at a height greater than 100cm from the ground surface. This will reduce the risk of infection from Phytophthora from contamination by rain splash from the soil surface.
- Material with brown bark, internal browning or abscised buds should not be collected.
- Secateurs, or other tools used to collect material must be regularly disinfested (see Section A.13.3 Disinfestation and hygiene). Disinfect secateurs between trees, by wiping with a disposable cloth dampened with a 70% methylated spirits solution in water to prevent spread of disease. If trees have not been indexed for viroids it is recommended that secateurs are disinfected with sodium hypochlorite (1% for 30 seconds).

Further information

• It is recommended that collection of material occurs early in the morning of the same day as grafting, or late afternoon of the day before grafting when the material will not be desiccated by heat and wind as it is being cut.

- A common practice is to take grafting material from quiescent, terminal, mature growth on young trees.
- Each scion should have at least one good bud near the terminal end, with no axillary buds in the basal portion which can be a problem when matching cambium during grafting.
- After cutting, place the scion wood in a small cooler box containing an icepack, or wrap in a damp cloth or damp newspaper and place in a plastic bag to prevent water loss. While grafting in the nursery, budwood should be kept in a box lined with wet cloth or newspaper and covered with a damp cloth to prevent desiccation.

Storage of budwood or scion material

For storing material:

- Smaller scion wood (50 to 70mm in length and 5 to 6 mm in diameter) selected for production nursery grafting is normally used soon after it is removed from the tree, however it can be kept for up to two weeks in a refrigerator at 5 to 7°C.
- Storage time may be extended if treated with a mild fungicide but ensure that wood is surface dry prior to storage and do not store for more than 2-3 months, depending on variety and health of scion wood at time of cutting risk of pathogen infection and poor plant vigour increases with storage time.
- Store in a sterile bag (polythene bags have been tested with good results) at 5.5°C.

Further information

• Because of respiration producing heat and moisture, it is recommended that no more than 50 scions should be stored in the same bag.

A.13.2.3.3 Records of collection of seed, budwood or scion material collected by the business

A *propagation material record* must be made and maintained for propagation material collected by the production nursery that includes:

- The date of collection and the name of the collector/s.
- Identification of the source block the material was collected from including the site address and a block name or code.
- Whether the block has been tested for Group 1 viroids in accordance with the Group 1 viroid testing procedure for multiplication trees (see Section A.13.4.1 Option 1 - Testing of multiplication trees for Group 1 viroids).
- The type of material collected (for example, seed, budwood or scion material).
- Identification of the material type to the cultivar level.
- A code that will be used to trace use of the batch of propagation material throughout the propagation process.

The *propagation material record* **must** provide sufficient information to allow traceback to a batch of infected source material should a Group 1 viroid be detected in propagated plants.

Two examples of a propagation material record are provided in SCHEDULE 2: EXAMPLE RECORD SHEETS.

A.13.2.3.4 Records of seed, budwood or scion material NOT collected by the business

The production nursery must maintain a record of any propagation material received from source material suppliers.

A *propagation material record (source material supplier)* must be made and maintained for each batch of propagation material received that has not been collected by the production nursery that includes:

- The date of receipt of the material.
- Identification of the origin of the material including business name and address.
- Any location data on the source of the material including whether the material has been sourced from a place where Group 1 viroids are not known to occur as evidenced by a government phytosanitary certificate or government area freedom declaration.
- The material type or types (seed, budwood or scion material).
- Identification of the material type to the cultivar level.
- A code that will be used to trace the propagation material used for each propagated plant throughout the propagation process.

Further information

- Seed should be heat treated if collected as wind fallen fruit (see Section A.13.2.3.1 Seed).
- Propagated plants using seed that is not collected from viroid tested multiplication blocks (see Section A.13.4.1 Option 1 - Testing of multiplication trees for Group 1 viroids) must be in-line tested for Group 1 viroids (see Section A.13.4.2 Option 2 - In-line testing of propagated plants for Group 1 viroids) except in the case where the material has been sourced from a place where Group 1 viroids are not known to occur as evidenced by a government phytosanitary certificate or government area freedom declaration.
- Similarly, for material that is budwood or scion material that is not collected by the business, propagated plants using that material must be in-line tested for Group 1 viroids (see Section A.13.4.2 Option 2 In-line testing of propagated plants for Group 1 viroids) except in the case where the material has been sourced from a place where Group 1 viroids are not known to occur as evidenced by a phytosanitary certificate or area freedom declaration.

The propagation material record (source material supplier) must provide sufficient information to allow traceback to the source of infected material should a Group 1 viroid be detected in propagated plants.

Two examples of a *propagation material record* (Source Material Supplier) are provided in SCHEDULE 2: EXAMPLE RECORD SHEETS.

Key requirements for High Health Avocado production – Seed, budwood and scion material.

 Seed, budwood or scion material used for propagation must be sourced from an area that is confirmed as free of Group 1 viroids OR collected from Group 1 viroid tested multiplications trees OR propagated plants containing non-viroid tested material must be tested for Group 1 viroids prior to consignment in accordance with the approved procedure.

- Budwood and scion material should be collected from healthy trees that do not show symptoms of
 pests or disease and should not be taken from trees that are wet or show symptoms of water
 stress. Seed, budwood and scion material collected should be located more that 1m from the
 ground surface.
- Seed and budwood should be stored in clean bags under appropriate storage conditions.
- *Propagation material records* must be made and maintained that allow the identification of the origin, cultivar and viroid test status of propagation materials used for each propagated plant and provide sufficient information to traceback to the source of infected material should a Group 1 viroid be detected in propagated plants.

A.13.2.4 Labelling of materials and propagated plants

Propagation materials must be clearly labelled at collection or receipt and must maintain that label until use. The label must include a code that identifies and links the material to the *propagation material record* to allow tracing back to multiplication tree blocks or source material supplier should propagated plants be found to be infected.

Propagated plants must carry a label throughout the propagation process that includes:

- A code that links material used for its propagation to the propagation material record.
- The rootstock and/or scion material used.
- Whether the propagated plants include materials that have not been subject to viroid testing.

A.13.3 Disinfestation and hygiene

For the control of plant pathogens, disinfestation and hygiene procedures are paramount in any production nursery.

Disinfestation, or sanitation, means removing contamination from potentially infested items. Chemical disinfectants or detergents and heat treatments are still the most reliable methods for the control of most plant pathogens.

Hygiene means taking steps to prevent things from becoming contaminated where possible. Hygiene steps include avoiding contact of items with potentially infested surfaces, for example keeping hose nozzles and hand tools off the nursery floor.

A.13.3.1 Preparing disinfectant solutions

When preparing disinfectant or detergent solutions:

- Follow all label requirements and safety precautions when handling chemicals.
- Only use freshly prepared disinfectant solutions.

When using *chlorine* based chemicals, diluted chlorine solutions are particularly unstable and must be made up fresh daily. Use water for dilution with a pH of between 5.5 and 7.5. Undiluted chlorine must be stored out of direct sunlight in a cool room preferably below 28°C.

Quaternary ammonium compounds (QUAT) are incompatible with most cleaners and detergents and have a low tolerance to hard water (increasing with calcium carbonate (CaC0₃) above 120mg/L). As a biocide the added benefit of using a QUAT is the ability to leave a residual anti-microbial film on



surfaces. At concentrations greater than 1-10ppm they are regarded as highly toxic to some aquatic life forms.

Copper sulphate (CuSO₄) can be extremely toxic in water of low alkalinity and is ineffective at high pH. Use water for dilution with a pH of between 6.5 and 7.5. Its persistent nature makes it a good biocide however it can also be absorbed by soil and organic material. In working concentrations, it can also be lethal to some aquatic life forms.

The business must also:

- dispose of spent disinfectant solutions responsibly as per the product label.
- if handling and storing bulk chemicals (e.g. chlorine) complete a risk assessment and develop an 'Emergency Response Plan' document.

NOTE: Some QUATS are highly toxic to plants and care **MUST** be taken to select an appropriate product when treating near crops.

Further Information

- ✓ Hygiene & Sanitation of Working Surfaces in the Nursery (#2000/03)
- ✓ Hygiene in the Nursery Disinfecting Production Surfaces; cement, gravel, capillary mats and sand beds (#2000/05)

A.13.3.2 Disinfestation and hygiene procedures

A.13.3.2.1 Hand hygiene

High hygiene levels must be maintained in risk areas such as propagation, potting or staging operations.

The business must ensure that hands are washed thoroughly between operations using an approved hand disinfectant such as Sunlight soap, Savlon or Dettol antiseptic soap, or disposable gloves are used and changed between operations.

A.13.3.2.2 Footwear

Footwear disinfestation and hygiene is undertaken in accordance with requirements provided in NIASA Section 1.1.6 Footwear.

Further Information

- Care must be taken to address the risk of entry of potentially infested materials such as soil or plant material present on footwear being transferred onto the facility and then into production areas.
- On entry to the facility, footwear must be clean and must not carry excessive visible soil and/or plant material that could transfer pests and pathogens into the production areas. Excessively contaminated footwear must be scrubbed clean with a brush then treated with a suitable disinfectant or detergent solution prior to entry into the production area.
- The business may also install foot baths at all entrance points of production areas **OR** direct staff to change footwear and use only designated footwear in the production area.
- Alternatively, although not recommended, boot covers may be provided to contractors and visitors however these must be monitored, discarded and replaced should they show signs of damage.

APPENDIX 1 - NIASA Appendix 13 - Requirements for high health avocado production

A.13.3.2.3 Tools, knives and other instruments

Tool disinfestation and hygiene is undertaken in accordance with requirements provided in NIASA Section 1.1.5 Tools.

Cutting tools need to be treated at a minimum between batches of propagated plants, and as frequently as between trees when collecting material from multiplication trees. Cutting tools are disinfected by first cleaning off any surface residue then treated using a suitable disinfectant.

A.13.3.2.4 Equipment

All equipment, including trolleys, barrows and trays that come into contact with vegetative propagation material or inputs such as growing media should be routinely cleaned with a brush or pressure washer then treated with a suitable disinfectant or detergent.

A.13.3.2.5 Plant Containers (pots, bags and trays)

Containers are managed in accordance with requirements provided in NIASA Section 1.1.15 Containers.

However, for used containers, disinfestation using a hypochlorite solution may be used but is not recommended as a means of decontamination for high health avocado production. The preferred method for used container disinfestation is through the use of a heat treatment procedure. Steam is the best and most common heat source for disinfection. A temperature of 60°C for 30 minutes is most desirable, because as well as killing pathogens it will leave many beneficial micro-organisms.

Used containers, or new containers not stored in a way to prevent contamination, pose a significant risk of transfer of pathogens and if used, must be disinfested. When heat treatment is not used, used containers must be reasonably cleaned of waste material, including plant and media residue, prior to disinfection.

In addition, containers must provide for adequate drainage and the size of the container used must consider the vigour of the plant and the time that the plant will be occupying the container in order to minimise the risk of development of root disease and allow appropriate root development and prevent excessive root binding (see NIASA Section 2.7 Root binding).

A.13.3.2.6 Working surfaces

Working surface disinfestation and hygiene is undertaken in accordance with requirements provided in NIASA Section 1.1.4 Working surfaces.

Key requirements for High Health Avocado production – Disinfestation and hygiene.

- High hygiene levels must be maintained in risk areas such as propagation, potting or staging operations.
- Production/staging areas should be protected from contamination by ensuring staff entering an area have clean hands and footwear is clean and decontaminated where required.
- Tools, knives, other instruments, equipment and working surfaces must be cleaned and disinfected regularly.
- New clean containers need not be disinfected however used containers must be disinfested using heat, or reasonably cleaned of waste material and then disinfested with a fresh 4000 ppm (or 0.4%) hypochlorite solution for at least 20 minutes.

- Clean and disinfected containers must be stored above floor level to prevent soil, plant debris and drainage water contamination.
- Containers/bags must allow for adequate drainage and be of sufficient size and volume to prevent the development of root diseases and for adequate root development.

A.13.4 Testing for the presence of Group 1 viroids in multiplication trees or propagated plants

Where materials for propagation have not been sourced from a place where a government declaration of area freedom from Group 1 viroids is in place, plants must be tested for the presence of Group 1 viroids (see SCHEDULE 1) by testing of:

- multiplication trees that are used to provide seed, scion or budwood; OR
- propagated plants.

A.13.4.1 Option 1 - Testing of multiplication trees for Group 1 viroids

A.13.4.1.2 Requirements

Where the production business chooses to test for the presence of Group 1 viroids from multiplication trees, all multiplication trees within a multiplication tree 'block' must be tested prior to material (seed, budwood or scion material) collection and then again at least every 5 years since the previous test.

A 'block' is defined as a tree, or a group of trees, that is managed as one unit and is separated from other trees of the same type that may be present on the property by natural or artificial boundaries, for example by access tracks, roadways or fences.

The production nursery must make and maintain a Group 1 viroid *multiplication block record* for each multiplication block that includes:

- The name of the owner of the property on which the multiplication block is located.
- The property address.
- A unique name or code for the multiplication tree block to be used to identify and trace samples collected for testing, and to link to propagation material to be collected from the multiplication block.
- An aerial/satellite image identifying the location of the multiplication block on the source property with a GPS coordinate taken from the centre of the block.
- The type of trees present to cultivar level.
- The number of trees present in the multiplication block and the number of rows present and the number of trees per row.

An example of a *multiplication block record* is provided in SCHEDULE 2: EXAMPLE RECORD SHEETS.

A.13.4.1.3 Sample collection

Prior to sample collection, identify the multiplication tree to be sampled with a unique reference code. For example, use a GPS coordinate, or a row and tree number, or a unique number printed on a tag attached to the tree.

APPENDIX 1 - NIASA Appendix 13 – Requirements for high health avocado production



Collect eight (8) leaves evenly distributed around the tree to ensure a representative sample around the canopy - no two leaves should come from the same secondary branch.

For newly planted field trees (about 1m tall or less, 1-4 branches), if there are only 1-2 shoots, 2-3 leaves from each plant can be collected (at least one leaf from each shoot).

Leaves sampled must be:

- hardened off and mature, but not excessively old or damaged by insects, pathogens or wind; and
- wrapped in slightly moistened paper towels, tissues or similar material and placed in a zip-lock bag.

Leaves collected from a multiplication tree must not combined with leaves from other trees – each tree sampled must be packaged in its own separate bag.

Each bag should be sealed and labelled with the tree's unique reference code to ensure traceability back to the multiplication tree from which the leaves were sampled.

A.13.4.1.4 Sending samples

Samples must be despatched to an approved NIASA testing laboratory for analysis. Contact the NIASA accreditation provider for a list of approved testing laboratories.

Samples must be accompanied by the laboratory's request for testing form. Contact the testing laboratory for a copy of the laboratory's request for testing form and instruction on how to send samples.

Until such time as test results are returned by the testing laboratory, propagated plants produced using material from the multiplication block must be in-line tested for Group 1 viroids (see Section A.13.4.2 Option 2 - In-line testing of propagated plants for Group 1 viroids).

Further information

• On receipt of the samples the testing laboratory may combine a sub-sample of up to 100 leaves (representing 12 trees) for analysis. If the combined sample returns a positive result the laboratory will test a sub-sample from each of the relevant multiplication tree samples that were included in the combined sample.

A.13.4.1.5 Completing and maintaining records of testing

A copy of the laboratory request for testing form and sample testing results must be maintained by the business in association with the *multiplication block record*.

A.13.4.1.6 Action on receipt of a positive Group 1 viroid test result from multiplication trees

A copy of test results that show a positive detection must be sent by the production nursery to the NIASA accreditation provider without delay.

Should a positive test result be received from the testing of multiplication trees, the infected block must not be used as a source of propagation material until such time as the production nursery can demonstrate to the NIASA accreditation provider that the source of infection has been eliminated.

Legislative requirements and related biosecurity obligations for the disposition or disposal of the infected multiplication tree or trees may also apply.

Key requirements for High Health Avocado production – Testing of multiplication trees option.

- The production nursery must make and maintain a *multiplication block record* that captures key information about the multiplication block and trees to be tested.
- Each tree within the multiplication block must be sampled for testing for Group 1 viroids.
- Prior to sample collection each multiplication tree to be sampled must be given a unique reference code to allow traceback to the tree should a positive Group 1 viroid be detected.
- 8 leaves from each multiplication tree must be collected and must not be combined with leaf samples taken from other multiplication trees.
- Each tree sample must be labelled with the tree's unique reference code.
- Records must be maintained of testing and test results.
- Where a positive test result is received for a Group 1 viroid, the NIASA accreditation provider must be notified without delay and the infected block must not be used as source of propagation materials until such time as the production nursery can demonstrate that the source of infection has been eliminated.
- Multiplication trees within each multiplication tree block must be retested at least every 5 years.

A.13.4.2 Option 2 - In-line testing of propagated plants for Group 1 viroids

A.13.4.2.1 Requirements

Where plants are produced that contain source material that have not been sourced from a place where a government declaration of area freedom from Group 1 viroids is in place or have not been collected from Group 1 viroid tested multiplication trees, in-line testing of propagated plants for Group 1 viroids shall be undertaken at the rate specified within Table 1.

Table 1 - In-line testing sampling rate.

Estimated number of plants containing untested source materials produced per year	Proportion of plants to be sampled for testing	
	Approximate % of total	Actual sampling rate per batch of plants
<30,000	5%	1 in 20 plants
>=30,000	2%	1 in 50 plants
>=60,000	1%	1 in 100 plants
>=90,000	0.67%	1 in 150 plants
>=120,000	0.5%	1 in 200 plants
>=150,000	0.4%	1 in 250 plants

Plants must be sampled for testing shortly after the commencement of the hardening off phase of plant production and results of testing must be received prior to despatch.

A.13.4.2.2 Sample collection

Collect one (1) leaf from each plant to be sampled for testing.

Leaves sampled must be:

- undamaged by insects, pathogens or wind; and
- wrapped in slightly moistened paper towels, tissues or similar material.



Bags must be sealed and uniquely labelled to ensure traceability back to the plants sampled. Each containerised plant sampled must be marked with the unique bulk sample number.

A.13.4.2.3 Sending samples

Samples must be despatched to an approved NIASA testing laboratory for analysis. Contact the NIASA accreditation provider for a list of approved testing laboratories.

Samples must be accompanied by the laboratory's request for testing form. Contact the testing laboratory for a copy of the laboratory's request for testing form and instruction on how to send samples.

Until such time as the results of testing are received, plants must not be consigned for despatch.

A.13.4.2.4 Completing and maintaining records of testing

A copy of the laboratory request for testing form and sample testing results must be maintained by the business.

A.13.4.2.5 Action on receipt of a positive Group 1 viroid test result from in-line testing

A copy of test results that show a positive detection must be sent by the production nursery to the NIASA accreditation provider without delay.

Should a positive test result be received as part of in-line testing, follow up inspection and resampling must be conducted on plants present at the production nursery that contain the same source material represented within the bulk sample. Testing is to be conducted to confirm infection and determine the extent of infestation. Until such time as the source and extent of infection is identified, propagated plants produced at the production site must not be certified as meeting the requirements of NIASA High Health Avocado Production or ANVAS.

If test results indicate that infection may be linked to an isolated batch or source, further testing may be undertaken to confirm the extent of infection at the production nursery and the source site.

Propagated plants affected by the outbreak (the affected batch of plants and any other plants using the same source material) must be isolated from other plants, marked, and destroyed. The affected batch shall be destroyed by the business either by incinerating the plants or burying the plants to a depth of not less than 100cm.

A record of the destruction and disposal of the infected plants including the batch details, the number of plants destroyed, the destruction method and the destruction date, must be provided to the NIASA accreditation provider and maintained by the production nursery business.

Key points for High Health Avocado production – In-line testing for the presence of Group 1 viroids.

- Propagated plants must be tested and found free of Group 1 viroids prior to consignment.
- Plants that contain seed, budwood or scion material that has not been collected from Group 1 viroid tested multiplication trees must be tested through in-line sampling of propagated plants at the hardening off stage of plant production.
- 1 leaf from each plant to be sampled must be collected, with the number of plants to be sampled determined in accordance with rate specified based on the estimated annual production of the

APPENDIX 1 - NIASA Appendix 13 – Requirements for high health avocado production

production nursery business. 100 leaves (representing 100 plants) may be combined into one sample for testing.

- Records must be maintained of sampling, testing and test results.
- Where a positive test result is received for a Group 1 viroid, the NIASA accreditation provider must be notified without delay and propagated plants affected by the outbreak (the affected batch of plants and any other plants using the same source material) must be isolated from other plants, marked, and destroyed. A record of the destruction and disposal of the infected plants must be provided to the NIASA accreditation provider and maintained by the production nursery business.

A.13.5 Inspection and testing for the presence of Group 1 non-viroid pathogens in propagated plants

All plants must be regularly monitored for root, graft and foliar diseases.

An early indicator of infection can be identified through monitoring of both above ground and below ground plant parts.

Inspection for symptom expression on above ground plant parts should be conducted on propagated plants as part of good nursery practice, however a representative number of plants will require monitoring for disease expression on plant root systems.

Where suspicious symptoms are detected, samples must be sent for diagnostic testing to detect relevant Group 1 and Group 2 non-viroid pathogens.

A.13.5.1 Inspection requirements

Monitoring of propagated plants for pests and diseases should be conducted at least quarterly.

Quarterly monitoring and inspection of above ground plant parts continues throughout the production cycle, **however inspection of the below ground plant parts**:

- commences 6 months after the initial establishment of an individual plant, that being from the time of planting of seed to be used as rootstock for plants, or from the time of initiation of individual plants originally grown on nurse seed from clonal rootstock; and
- concludes when plants reach the 'hardening off' stage of production.

Below ground plant part monitoring is conducted on 'sentinel' plants established within the crop and on any other plant displaying symptoms consistent with root disease.

A.13.5.1.1 Establishing sentinel plants for root pathogen monitoring

The proportion of propagated plants to be monitored for below ground plant part health is based on the estimated number of plants produced by the production nursery per year.

At least 150 plants must be established as sentinel plants for root pathogen monitoring within the production nursery. It is recommended that sentinel plants are established in pots to allow easy inspection of roots and sampling where necessary. Sentinel plants may then be transferred into bags for the hardening off stage of production, when root health monitoring concludes, based on the production nursery's desired container type.

Sentinel plants are established based on the estimated annual production of the business in accordance with Table 2.

APPENDIX 1 - NIASA Appendix 13 – Requirements for high health avocado production

For example, for a business that has an estimated annual production rate of 100,000 plants per year, each new batch of plants should have at least 1 sentinel plant for every 600 plants propagated. For a business that has an estimated annual production rate of 40,000 plants per year, each new batch of plants should have at least 1 sentinel plant for every 200 plants propagated.

Number of everyode plants produced by the	Proportion of plants to be monitored as sentinel plants		
production nursery per year	Approximate % of total	Actual rate per batch of new plants	
<30,000	1.5%	1 in 50 plants	
>=30,000	0.50%	1 in 200 plants	
>=60,000	0.25%	1 in 400 plants	
>=90,000	0.17%	1 in 600 plants	
>=120,000	0.125%	1 in 800 plants	
>=150,000	0.10%	1 in 1000 plants	

Table 2 - Sentinel	plant establishment rate
--------------------	--------------------------

Sentinel plants should be evenly distributed through each batch and also be kept at a practical distance from walkways to allow for inspection without damaging surrounding plants.

Each sentinel plant must be given, and marked with, a unique sentinel plant number that is to be linked to the *crop monitoring record* (see Section A.13.5.1.4 Maintaining records of inspection).

A.13.5.1.2 Inspection procedure - Above ground plant parts

Begin each crop monitoring process in less high-risk areas such as hardened finished crops ready for despatch.

Enter each separate area with plant material growing and visually inspect for abnormal plant growth and pest and disease symptoms or weed growth. Pay close attention to crops around entry ways such as doors, gates, curtains, etc. and along main thoroughfares such as access roads, paths or laneways.

Within each batch of plants within each growing area, **closely examine at least 35 plants** for pest and disease symptoms.

Inspect the tops and undersides of leaves, branches and stems looking for any direct evidence of insects, mites or diseases. Inspect the length of stems and branches for insects, mites, and disease symptoms.

Make an effort to select those plants that appear less healthy for close up inspection. Use at least a 10x hand lens when examining abnormal growth. Damage resulting from leaf spot pathogens, insects, mites or suspected non-pathogenic sources should be recorded.

Monitor health of graft union by looking for excessive build-up of necrotic tissue around the graft union. Plants with such symptoms should be removed from the production area. Likewise, examine the stems of the same plant to assess if there are any necrotic lesions present.

Where suspicious symptoms are detected see Section A.13.5.2 Action on identification of symptoms of infection or infestation.

A.13.5.1.3 Inspection procedure - Below ground plant parts (Sentinel plants)

Remove each sentinel plant from its container and examine the root system. In general, greater than 90% of visible roots should be white, healthy feeder roots. Where the root system does not meet this requirement see Section A.13.5.2 Action on identification of symptoms of infection or infestation.

APPENDIX 1 - NIASA Appendix 13 - Requirements for high health avocado production

Where above ground plant parts or general root health suggests infection with a Group 1 or Group 2 pathogen, and the plant is not propagated using clonal rootstock, examine the external regions of seeds. Seeds should be free of necrotic lesions or sclerotes and rotting tissue.

Where the seed displays symptoms of infection see Section A.13.5.2 Action on identification of symptoms of infection or infestation.

Use disposable gloves or wash with hand sanitiser if moving on to another plant.

A.13.5.1.4 Maintaining records of inspection

The business must maintain a crop monitoring record that documents:

- the date that the activity was conducted;
- the person who conducted the activity;
- the activity type (sentinel plant inspection or above ground plant part monitoring);
- the crops monitored (for example "Propagation area 2 Bed 3");
- the scope of the monitoring (for example "all plants" or "35 plants" or "sentinel plants 1-10"; and
- the outcomes of the inspection (for example "no suspicious symptoms detected", or a description of the symptoms detected and the plant or plants that the symptoms were identified on, and the unique sample number or sample numbers if samples are collected).

An example of a crop monitoring record is provided in SCHEDULE 2: EXAMPLE RECORD SHEETS.

Key points for High Health Avocado production – Inspection requirements.

- Propagated plants must be regularly inspected for the presence of Group 1 pathogens.
- Above ground plants parts must be inspected at least quarterly. At least 35 plants within each batch within each production area must be closely examined for pest and disease symptoms.
- Below ground plant parts must be examined for disease symptoms at least quarterly commencing 6 months after individual plant establishment and until propagated plants reach the hardening off stage of production.
- Below ground plant parts are examined on sentinel plants established throughout the crop at a rate determined based on estimated annual nursery production and on any other plant displaying symptoms consistent with root disease.
- Records must be made and maintained of plant inspection and monitoring and any samples collected.

A.13.5.2 Action on identification of symptoms of infection or infestation

A.13.5.2.1 NIASA approved testing laboratories

Samples that are collected must be despatched to an approved NIASA testing laboratory for analysis. Contact the NIASA accreditation provider for a list of approved testing laboratories.

Samples must be accompanied by the laboratory's request for testing form. Contact the testing laboratory for a copy of the laboratory's request for testing form and instruction on how to send samples.

APPENDIX 1 - NIASA Appendix 13 – Requirements for high health avocado production

A.13.5.2.2 Adverse foliar symptoms

Symptoms caused by insect pests should be managed as required such that outbreaks are minor and limited. No plants should be knowingly sold infested with a population that is likely to become damaging (see Section A.13.7 Product quality and meeting customer expectations).

Symptoms of necrosis and chlorosis on foliage should be assessed as to the suspected cause. Those symptoms that are consistent with non-pathogenic causes (sunburn, nutrient regime, environmental conditions etc. need not have further action). However, due diligence must be taken to limit the extent and severity of such symptoms developing in the future. Any remedial action that can be taken, e.g. alteration of light, irrigation or nutrient regime, should also be taken such that plants grow optimally.

Remove singular leaves that are suspected of being infected with a fungal leaf pathogen. Discard such leaves hygienically away from the growing area. Where suspected fungal leaf spot pathogen symptoms are present on 5% or more plants across a batch, send a representative sample of symptomatic leaves to a diagnostic laboratory for testing.

No plants should be knowingly sold infested with a population of fungal leaf spot pathogens that would require clients to apply remedial fungicides (see Section A.13.7 Product quality and meeting customer expectations).

In addition, *Pseudocercospora purpurea* (a serious Group 1 non-viroid pathogen) is only known to be present in north Queensland (NQ). Therefore, production nursery businesses outside of NQ with plants showing symptoms of this pathogen should submit leaf material for diagnostic testing. It is not known how the pathogen will behave (how damaging it will become outside of NQ), hence it is currently placed as a Group 1 pathogen.

A.13.5.2.3 Adverse stem/graft symptoms

Where a plant shows stem rot or graft necrosis that is not suspected to be the result of poor formation of the graft, mechanical damage, graft incompatibility or the physiological condition of the rootstock, submit the plant for diagnostic testing.

Examine plants around symptomatic plant/s to ensure that they are free of disease. Where a large number of plants (greater than 5) show symptoms speak to a diagnostic laboratory about the specific symptoms and submit plants that will best equip them to test and diagnose the problem based on their advice. For example, a problem in propagation will require more plants to be submitted than larger, more mature nursery plants.

Do not sell plants that have symptoms of stem or graft necrosis (see Section A.13.7 Product quality and meeting customer expectations).

A.13.5.2.4 Adverse seed symptoms

Submit as many symptomatic seeds (and plants that may be growing from symptomatic seeds) as is practical to a diagnostic laboratory for testing (in general, 10 seeds per symptom type can be used to test for and identify a range of pathogens).

Do not sell plants that demonstrate symptomatic seeds (see Section A.13.7 Product quality and meeting customer expectations).

A.13.5.2.5 Unhealthy roots

Where roots appear to be unhealthy or rotten, cut the epidermis along the root with a sharp knife to expose the centre of the root (the stele). If the root is white it is not rotten. However, if there are few

APPENDIX 1 - NIASA Appendix 13 – Requirements for high health avocado production

actively growing, white feeder roots visible compared to the number of dark roots, it may indicate that growing conditions are not optimal.

Examine the roots of plants around the sentinel plant to determine if symptoms are present in more plants. If roots of plants are consistently showing signs of disfunction, submit a plant for diagnostic testing. If it is only one plant, assess growing conditions, take remedial action and only submit a plant for testing if root health does not improve as is expected.

Where the internal root tissue appears rotten submit the plant for diagnostic testing. Check root health of plants around the sentinel, ensuring that the blade is sterilised between plants (or use a different blade). Submit at least one plant for diagnostic testing. If more than one plant shows symptoms talk to your diagnostic laboratory for advice on how many plants to submit.

A.13.5.2.6 Maintaining records of testing

Sample details must be recorded on the approved laboratory request for testing form and sent to the approved laboratory in accordance with the advice provided by the testing laboratory.

A copy of the laboratory request for testing form and sample testing results must be maintained by the business.

The production nursery must send a copy of test results that show a positive detection of a Group 1 pathogen to the NGIA accreditation provider without delay.

A.13.5.2.7 Action on receipt of a positive test result for a Group 1 pathogen

Should a positive test result be received, follow up inspection and resampling is to be conducted to confirm infection, and determine the extent of contamination and determine the likelihood of elimination. Until such time as the extent of contamination is identified, propagated plants produced at the production site must not be certified as meeting the requirements of NIASA High Health Avocado Production or ANVAS.

If test results show that the outbreak is widespread, propagated plants produced at the production site must not be certified as meeting the requirements of NIASA High Health Avocado Production or ANVAS. Where a business also holds a current ANVAS accreditation, plants must be labelled "NOT ANVAS CERTIFIED".

If test results indicate an isolated outbreak, further testing may be undertaken to ensure elimination of these pathogens from the site. Propagated plants affected by the outbreak must be isolated from other plants, marked, and must not be certified as meeting the requirements of NIASA High Health Avocado Production. Where a business also holds a current ANVAS accreditation, plants must be labelled "NOT ANVAS CERTIFIED".

NOTE - In the case of propagated plants found to be infected by a Group 1 Viroid identified through samples despatched for testing during crop monitoring, the affected batch of plants and any other plants using the same source material) must be isolated from other plants, marked, and destroyed. A record of the destruction and disposal of the infected plants must be provided to the NIASA accreditation provider and maintained by the production nursery business. The affected batch shall be destroyed by the business either by incinerating the plants or burying the plants to a depth of not less than 100cm.

A record of the destruction and disposal of the infected plants including the batch details, the number of plants destroyed, the destruction method and the destruction date, must be provided to the NIASA accreditation provider and maintained by the production nursery business.

Key points for High Health Avocado production – Action on identification of symptoms of infection or infestation.

- Propagated plants must be regularly inspected for the presence of Group 1 pathogens.
- Above ground plants parts must be inspected at least quarterly. At least 35 plants within each batch within each production area must be closely examined for pest and disease symptoms.
- Below ground plant parts must be examined for disease symptoms at least quarterly commencing 6 months after individual plant establishment and until propagated plants reach the hardening off stage of production.
- Below ground plant parts are examined on sentinel plants established throughout the crop at a
 rate determined based on estimated annual nursery production and on any other plant displaying
 symptoms consistent with root disease.
- Where symptoms of infection are identified, steps must be taken based on the plant part inspected including requirements for sample collection and submission.
- Records must be made and maintained of plant inspection and monitoring, any samples collected and the results of testing.
- Should a positive test for a Group 1 pathogen be received, follow up inspection and resampling is
 to be conducted to confirm infection, and determine the extent of contamination and determine
 the likelihood of elimination. Until such time as the extent of contamination is identified,
 propagated plants produced at the production site must not be certified as meeting the
 requirements of NIASA High Health Avocado Production or ANVAS. Where a business also
 holds a current ANVAS accreditation, plants must be labelled "NOT ANVAS CERTIFIED".
- Should a positive test for a Group 1 viroid be received, the NIASA accreditation provider must be
 notified and follow up inspection and resampling is to be conducted to confirm infection, and
 determine the extent of contamination. The affected batch of plants and any other plants using the
 same source material) must be isolated from other plants, marked, and destroyed. A record of
 the destruction and disposal of the infected plants must be provided to the NIASA accreditation
 provider and maintained by the production nursery business

A.13.6 Use of fungicides

Fungicides **to treat or prevent root diseases** must **not be directly applied** to plants until plants are fully hardened and ready for consignment off the production nursery at no more than 72 hours before despatch.

Indirect use of root fungicides (for example, fungicide granules or another similar product used to treat growing media) may be used at susceptible stages of production where these applications have the capacity to protect against infection. High risk periods include crop staging (potting up) such as at seed germination (bed or direct sowing) and transplanting of rootstock. Protecting plant wounds such as those caused by grafting using appropriate plant protection products is permissible at the time of grafting.

Propagated plant material may be subject to fungicide testing.

A.13.7 Product quality and meeting customer expectations

Requirements for meeting customer expectations are managed in accordance with requirements provided in NIASA Section 3.5 Product quality and meeting customer expectations.

APPENDIX 1 - NIASA Appendix 13 - Requirements for high health avocado production

Production nurseries may produce trees grafted onto either seedling or clonal rootstocks depending on individual customer requirements. Regardless of rootstock, nursery plants must be inspected towards the end of the propagation process and no later than 72 hours prior to despatch and comply with the following quality specifications. Trees with these qualities are necessary for successful field establishment.

In accordance with requirements provided in NIASA Section A.12.2 Dispatch, a visual assessment of trees must be conducted prior to loading and consignment. The pre-despatch assessment must verify that:

- Trees are true-to-type without any obvious sign of pest, disease, mechanical or chemical disorder.
- Leaves are glossy green without any sign of deformity or malnutrition.
- Graft unions are smooth and healthy, without any indication of incompatibility.
- Trees are of the size specified by the customer for field planting.
- Trees have a strong central leader adequately staked.

Trees that do not meet these requirements must be rejected for consignment, and action must be taken to determine the source of the problem and correct the problem. Where a business holds a current ANVAS accreditation, plants must be labelled "NOT ANVAS CERTIFIED".

A.13.8 Auditing for compliance and continual improvement

Audits to assess compliance to Avocado 'high health' requirements shall be conducted annually in conjunction with annual NIASA auditing.

The auditor shall assess compliance to requirements based on examination of records, examination of general health of the crop and through crop sampling.

Examination of general health of the crop may include sampling of individual plants that demonstrate symptoms of infection by Group 1 or 2 pathogens.

Sentinel plants will be examined for root health in the manner described within this appendix. Where suspicion of infection by Group 1 and 2 pathogens are suspected, samples will be taken for analysis. The cost of analysis will be borne by the production nursery business.

Where Group 1 and 2 pathogens are detected through testing, the accredited business will be subject to the requirements specified within Section A.13.5.2 Action on identification of symptoms of infection or infestation of this Appendix.

The business must achieve a **Satisfactory** result at audit for each of the requirements specified within this Appendix to be granted Avocado High Health accreditation. Results are captured within the Nursery Production Checklist (see APPENDIX 5 NIASA PRODUCTION NURSERY CHECKLIST).

Further information

Audit assessment results for NIASA are categorised as follows:

1. Doesn't Apply (means not applicable to the business)

Is recorded where a requirement/procedure, in the opinion of the auditor, does not apply to the activities undertaken by the business, and implementation of the procedure is not required to satisfy the conditions of accreditation.

Complies Fully

Is recorded where the business, in the opinion of the auditor, can demonstrate that it complies fully with the procedural requirement.

Satisfactory

Is recorded where, in the opinion of the auditor, compliance to a procedure is generally satisfactory however a non-conformance to a requirement(s) of a procedure is identified which threatens neither the effectiveness nor the assurance provided by the accreditation. These non-conformances are generally administrative or technical in nature.

Being Upgraded

Is recorded where, in the opinion of the auditor, a non-conformance is identified with compliance to a procedure which could threaten the assurance provided by the arrangement, but where there is no evidence of a failure to address the specific risk provided for by the procedural requirement and the business has corrective action already underway.

Needs Attention

Is recorded where, in the opinion of the auditor, a non-conformance is identified that could seriously threaten the effectiveness of the accreditation arrangement.

This may include a circumstance where a business fails to carry out a procedure or activity that is critical in addressing a serious risk.

Acknowledgements

The development of this Appendix has been funded by Hort Innovation under project AV16013, using the Avocado Industry research and development levy and contributions from the Australian Government.
SCHEDULE 1: GROUP 1 and 2 VIROID AND NON-VIROID PATHOGENS

Viroids

Avocado nursery viroids are divided into two groups:

- **Group 1 viroids** This group contains viroids which may be introduced into the production process and are destructive in both the nursery and post-nursery phase; and
- **Group 2 viroids** This group contains viroids which have the potential to be destructive but are unlikely to infect plants in the nursery and in the field.

Avocado sunblotch Viroid (ASBVd) is a serious pest of avocado plants. Although the incidence of trees infected with ASBVd is low, its impact is high and is easily spread in seed, budwood and scion material and through mechanical transmission. It is listed as a Group 1 viroid.

Potato spindle tuber viroid (PSTVd) has been reported as infecting avocado overseas (in Peru), but not in Australia. It has been reported from tomato and solanaceous ornamental plants in Western Australia and Queensland and is currently under active eradication in South Australia. It is a regulated pest in other states.

PSTVd is not currently considered to pose a significant threat to avocado production because of Australian horticultural systems, therefore it is listed as a Group 2 viroid. In Peru, potatoes have historically been intercropped with avocado, leading to spread of potato spindle tuber viroid into avocado. It is recommended to avoid growing solanaceous crops in close proximity to avocado as this viroid can be mechanically transmitted (rubbing plants or handling infected plants followed by handling uninfected plants). Therefore, it is also recommended to avoid handling solanaceous plants prior to working with avocado plants in the nursery.

Group 1 viroids

Common name	Scientific name
Avocado Sunblotch	Avocado sunblotch viroid (ASBVd)

Group 2 viroids

Common name	Scientific name
Potato spindle tuber viroid	Potato spindle tuber viroid (PSTVd)

Non-viroid pathogens

Other avocado nursery pathogens are also divided into two groups based on their seriousness:

- **Group 1 Non-viroid pathogens** This group contains pathogens which are destructive in both the nursery and post-nursery phase.
- **Group 2 Non-viroid pathogens** This group contains pathogens cause only issues in the nursery and not in the field.

Soil borne pathogens include *Phytophthora cinnamomi*, *Calonectria ilicicola*, and *Dactylonectria* species.

Phytophthora cinnamomi will kill trees during the establishment phase and also large trees in the field; *Calonectria ilicicola* and *Dactylonectria* spp. will kill nursery trees and field trees during establishment

APPENDIX 1 - NIASA Appendix 13 – Requirements for high health avocado production

but will not kill older trees. These fungi will infest field soils and can be introduced into new areas where they have not been previously recorded.

Plants infected with a Group 1 soil borne pathogen may not display any symptoms in the nursery even though there has been drastic damage to the root system over several months.

Pathogens causing stem or graft rot symptoms are very serious and often cause death of the plant, either in the production nursery or after planting. Plants should not be sold with any signs of stem or graft necrosis. Such plants should be removed from the nursery hygienically to reduce risk of infecting surrounding plants.

Similarly, a number of fungi can cause seed rot symptoms that may lead to increased risk of stem rot diseases.

For some pathogens, when present, the level of infestation can be generally low and their presence in the production nursery is frequently associated with poor cultural conditions or retaining plants in the nursery for too long. Their presence may also be indicative of a failure in nursery hygiene. Genera associated with minor root decay include *Pythium*, *Rhizoctonia*, *Fusarium*, Verticillium, and *Macrophomina*.

Disease management in the production nursery is still based on disease prevention rather than cure. Clean seed, pasteurised growing media, irrigation water free of soil borne pathogens, clean containers and a nursery hygiene system are fundamental components to address this risk.

Common name	Scientific name
Phytophthora root rot	Phytophthora cinnamomi
Black root rot	Calonectria ilicicola
Black root rot	Dactylonectria spp.
Stem dieback or graft rot	Fungi from the family Botryosphaeriaceae
Stem dieback or graft rot	Colletotrichum sp.
Seed rot	Fungi from the family Botryosphaeriaceae
Seed rot	<i>Botrytis</i> sp.
Leaf spot	Pseudocercospora purpurea

Group 1 Non-viroid pathogens

Group 2 Non-viroid pathogens

Common name	Scientific name
Pythium root rot	Pythium species
Rhizoctonia root rot	Rhizoctonia solani
NA	Fusarium species
Verticillium wilt	Verticillium dahlia
NA	Macrophomina phaseolina
Anthracnose	Colletotrichum spp.

Further Information

A Fact Sheet providing further information and images on Group 1 and 2 viroids and non-viroid pathogens is available through the NGIA Nursery Production FMS website at http://nurseryproductionfms.com.au/.

SCHEDULE 2: EXAMPLE RECORD SHEETS

The following recording sheets are examples of how the mandatory record keeping for NIASA can be achieved.

There is no requirement to use these sheets but they indicate the information that must be kept in accordance with the NIASA High Health Avocado Appendix.

Records must be made available to the Nursery Production FMS Auditor when requested.

- High Health Avocado Production Propagation Material Record (Example 1)
- High Health Avocado Production Propagation Material Record (Example 2)
- High Health Avocado Production Propagation Material Source Material Supplier Record -(Example 1)
- High Health Avocado Production Propagation Material Source Material Supplier Record -(Example 2)
- High Health Avocado Production Multiplication Block Record (Group 1 viroid tested block) -(Example)
- High Health Avocado Production Crop Monitoring Record (Example)



High Health Avocado Production Propagation Material Record

Example 1



Accredited Business name:

Collection Detail	S					
Collection date	Site address	Block name/Code	Viroid tested Multiplication Block?	Type of Material collected	Cultivar	Material amount and batch code
			□ Yes OR □ No	□ Seed OR □ Budwood/scion		
			□ Yes OR □ No	□ Seed OR □ Budwood/scion		
			□ Yes OR □ No	Seed ORBudwood/scion		
			□ Yes OR □ No	Seed ORBudwood/scion		
			□ Yes OR □ No	Seed ORBudwood/scion		
			□ Yes OR □ No	Seed ORBudwood/scion		
			□ Yes OR □ No	Seed OR Budwood/scion		
			□ Yes OR □ No	Seed OR Budwood/scion		



High Health Avocado Production Propagation Material Record

Example 2



Accredited Business name:

Propagation Material Site Address:

Collection details					
Collection Date	Block Name/Code	Viroid tested Multiplication Block?	Type of Material collected	Cultivar	Material Amount and Batch Code
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		□ Yes □ No	□ Seed □ Budwood/scion		
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		
		🗆 Yes 🗆 No	□ Seed □ Budwood/scion		



High Health Avocado Production Propagation Material Source Material Supplier Record

Example 1



Accredited Business name:

Propagation Material Supplier Name:

Propagation Material Supplier Address:

Collection details				
Date Received	Type of Material	From an area declared free of Group 1 Viroids?	Cultivar	Material Amount and Batch Code
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	□ Yes □ No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
	□ Seed □ Budwood/scion	□ Yes □ No		
	□ Seed □ Budwood/scion	□ Yes □ No		



High Health Avocado Production Propagation Material Source Material Supplier Record

Example 2



Accredited Business name:

Collection det	ails					
Date Received	Supplier Name	Supplier Address	Type of Material	From an area declared free of Group 1 Viroids?	Cultivar	Material Amount and Batch Code
			□ Seed □ Budwood/scion	□ Yes □ No		
			□ Seed □ Budwood/scion	□ Yes □ No		
			□ Seed □ Budwood/scion	□ Yes □ No		
			□ Seed □ Budwood/scion	□ Yes □ No		
			□ Seed □ Budwood/scion	🗆 Yes 🗆 No		
			□ Seed □ Budwood/scion	□ Yes □ No		
			☐ Seed ☐ Budwood/scion	□ Yes □ No		
			☐ Seed ☐ Budwood/scion	□ Yes □ No		



High Health Avocado Production Multiplication Block Record (Group 1 viroid tested block)



Accredited Business (Name):

Multiplication Block Address:

Multiplication Block Reference (Name or Code):

SECTION A – Property C	Ownership Details				
Owner name/business	name:				
Other details if applica	ble:				
SECTION B – Block Deta	ails				
Date record started:				Number of row	vs in block:
Number of trees in blo	ck:			Average numbe	er of trees per row:
Cultivar/s present:					
GPS coordinate of cent	re of block:				Map attached? 🛛 Yes
Other details if applica	ble:				
SECTION C – Identificat	ion of trees for testing, c	ollection or	traceback purp	oses	
Description of how each tree to be sampled for testing will be identified within the block on sample bags (for example a tag placed on each tree, a row number and tree number in row count, GPS or other method):					
SECTION D – Propagation material collected/ to be collected from the multiplication tree block			lock		
□ Fruit □ Budwood / scion □ Fruit and budwood/scion					
Collection method (Fru	iit):	🗆 Fruit c	ollected directly	y off the tree	□ Fallen fruit □ Both □ N/A
SECTION E – Multiplicat	ion block Group 1 viroid	testing out	comes (all trees	in the block mus	st be tested)
Sampling date:		Result:	🗆 Negative [☐ Positive	 Sample submission form attached Test report attached
Sampling date:		Result:	□ Negative [☐ Positive	 Sample submission form attached Test report attached
Sampling date:		Result:	□ Negative [Desitive	 Sample submission form attached Test report attached
Sampling date:		Result:	□ Negative [] Positive	 Sample submission form attached Test report attached
Sampling date:		Result:	□ Negative [☐ Positive	 Sample submission form attached Test report attached



High Health Avocado Production Crop Monitoring Record

Example Record



Business name:

Business address: Inspection Person (name): Date: Crop area monitored Pest/diseases detected? (record NO or describe) Plants inspected Monitoring **Crops monitored** Comments / actions (e.g. Sentinels 1-10, 35 plants (Site Plan reference – e.g. (e.g. Bench 3) (Include sample numbers if applicable) activity Diseases/disorders Insects/pests Shadehouse 1) etc.) Sentinel/roots Above ground Sentinel/roots Above ground

Appendix 2.

NIASA Appendix 5 – Production nursery checklist

APPENDIX 5 NIASA PRODUCTION NURSERY CHECKLIST

Confidential



Nursery Industry Accreditation Scheme, Australia

Business Nan	ne:	
Address:		<u>, </u>
,		Postcode:
Proprietor's F	ull Name(s):	
Telephone:	Facsimile:	
Email		
	Application Number:	
	Audit Date: Review Date:	

Note: Grey checklist items must be graded as satisfactory or greater to achieve NIASA accreditation

SECTION 1: Water and irrigation

Tick	Action
	Needs disinfestation
	Needs disinfestation

Comments:

Treatments	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Filtration					
Flocculation					
Precipitation (e.g. of iron, manganese)					
pH adjustment					
Aeration					
Circulation					
Treatment monitoring procedures					

Records of monitoring program must be sighted by the Nursery Production FMS Auditor

Comments:

Disinfestation

Slow Flow Filtration Flow rate 100L/m²/hr UV irradiation >60% at 254 μ m UV transmittance Ozonation ≥1.4ppm 16 minutes contact time Chlorination ≥2ppm 20 minutes contact time Chloro-bromination ≥3ppm 8 minutes contact time Chlorine dioxide ≥3ppm 8 minutes contact time Ultrafiltration (micro-filtration in MWIPN) <0.1 μ m (Dowdens) Iodine ≥5ppm 30 minutes contact time Other (Describe) Disinfestation / monitoring procedures

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Records of monitoring program must be sighted by the Nursery Production FMS Auditor

Comments:

SECTION 1: Water and irrigation Continued

Storage of Water

Prevention of contamination or recontamination during storage

Storages secure from unauthorised access Pump shed secure from unauthorised access Irrigation controllers and disinfestation treatment system secure from unauthorised access

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

Water Quality	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
рН					
Electrical Conductivity (EC)					
Sodium levels					
Iron levels					
Suspended materials					
Frequency of analysis (e.g. monthly)					
Testing facilities (pH & EC)					
Records of annual analytical testing					
Other (describe)					

Records of analysis must be sighted by the Nursery Production FMS Auditor.

Comments:

Irrigation System	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Irrigation scheduling					
Irrigation controls					
System design					
Frost control					
Fertigation equipment					

Comments:

SECTION 1: Water and irrigation Continued

Site Drainage	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Whole site, surface					
Whole site, subsurface					
Drainage water diverted away from growing media composting and storage areas					
Road and building surrounds have effective drainage					
Disposal of wastewater in an appropriate manner					

Comments:

SECTION 2: Growing media

Applicable to all businesses that manufacture and/or use growing media

PROPAGATION GROWING MEDIA

Propagation Growing Media Source Approved supplier (mixed growing media) Non-approved supplier Approved materials – nil action

Non-approved materials Growing media manufactured on-site –

On-site growing media recycled

Safety Data Sheet available on-site

Comments:

Tick	Action
	Nil
	Pathogen testing and treatment required
	Nil
	Dath a new toote, and the atmosphere wine of
	Pathogen tests and treatment required
	Treated (composted etc.) as per NIASA
	growing media requirements
	Treated (composted etc.) as per NIASA
	growing media requirements

Propagation Growing Media Quality	Attention	Upgraded	Satisfactory	Fully
Testing equipment				
Testing procedures				
Records of testing				
Disinfestation equipment				
Disinfestation procedures				
Records of disinfestation				

Records must be sighted by the Nursery Production FMS Auditor

Comments:

Propagation Growing Media Mixing Prevention of contamination Suitability of mixing procedures Suitability of mixing facilities Ease of cleaning Cleanliness

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

APPENDIX 2 - NIASA Appendix 5 – Production nursery checklist

Doesn't

Apply

es

SECTION 2: Growing media Continued

Propagation Growing Media Storage and Handling	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Hygiene of storage and handling facilities					
Batch separation in storage facilities					
Storage records					
Ease of cleaning					
Cleanliness					
Disposal of used or contaminated growing media in an appropriate manner					

Records must be sighted by the Nursery Production FMS Auditor

Comments:

PRODUCTION GROWING MEDIA

Production Growing Media Source
Approved supplier (mixed growing media)
Non-approved supplier
Approved materials – nil action

Non-approved materials Growing media manufactured on-site

On-site growing media recycled

Safety Data Sheet available on-site

Tick	Action
	Nil
	Pathogen testing and treatment required
	Nil
	Pathogen tests and treatment required
	Treated (composted etc.) as per NIASA
	growing media requirements
	Treated (composted etc.) as per NIASA
	growing media requirements

Comments:

Production Growing Media Quality
Testing equipment
Testing procedures
Records of testing
Disinfestation equipment
Disinfestation procedures
Records of disinfestation

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Records must be sighted by the Nursery Production FMS Auditor

Comments:

SECTION 2: Growing media Continued

Production Growing Media Mixing	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Prevention of contamination					
Suitability of mixing procedures					
Suitability of mixing facilities					
Ease of cleaning					
Cleanliness					

Comments:

	Noods	Roing		Complies	Doosn't
Production Growing Media Storage and Handling	Attention	Upgraded	Satisfactory	Fully	Apply
Hygiene of storage and handling facilities					
Batch separation in storage facilities					
Storage records					
Ease of cleaning					
Cleanliness					
Disposal of used or contaminated growing media in					
an appropriate manner					

Records must be sighted by the Nursery Production FMS Auditor

SECTION 3: Propagation

Applicable to all businesses that propagate plants

Stock Plants	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Nutrition					
Hygiene system in place					
Disease management					
Pest management					
Weed management					
Growing environment					
Drainage					
Mulching					
Varietal identification					

Comments:

Propagule Preparation Area	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Separation from contamination					
Access restrictions					
Surfaces suited to decontamination					
Routine decontamination procedures					
- propagules					
- tools,					
- benches					
- floors					
- hands					
- footwear					
 used containers/trays 					
Refuse disposed of in appropriate manner					
Records of procedures					
Propagule storage					

Comments:

SECTION 3: Propagation Continued

Plant Dranagation Area	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Panah tupa					
Dench beight					
Dench drainage					
Bench drainage					
Bench maintenance					
Bench disinfestation					
Ground level bed type					
Ground level bed drainage					
Ground level bed maintenance					
Ground level bed disinfestation					
Floor disinfestation					
Floor and pathway drainage					
Footbaths					
Pest management					
Disease management					
Weed management					
Refuse disposed of in appropriate manner					
Environmental control (e.g. misting, fogging, light,					
temperature control)					
Building suitability					
Building maintenance					
Building cleaning/disinfestation					
Access restrictions					
Segregation from possible host plants					
Wastewater disposal					
Refuse disposed of in appropriate manner					
Recording systems					

Comments:

SECTION 3: Propagation Continued

	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Acclimatisation Facilities (Hardening Off)		op 9			
Bench type					
Bench height					
Bench drainage					
Bench maintenance					
Bench disinfestation					
Ground level bed type					
Ground level bed drainage					
Ground level bed maintenance					
Ground level bed disinfestation					
Floor disinfestation					
Floor and pathway drainage					
Footbaths					
Pest management					
Disease management					
Weed management					
Refuse disposed of in appropriate manner					
Environmental control (e.g. misting, fogging, light,					
temperature control)					
Building suitability					
Building maintenance					
Building cleaning/disinfestation					
Access restrictions					
Segregation from possible host plants					
Wastewater disposal					
Refuse disposed of in appropriate manner					
Recording systems					

Comments:

SECTION 4: Protected production areas

Applicable to all businesses growing crops in protected production facilities and areas under protective covers

	Needs	Being	Satisfactory	Complies	Doesn't
Greenhouses, Shadehouses, Plant Display Houses	Attention	Upgraded		Fully	Apply
Suitability					
Appearance and ergonomics					
Maintenance of surrounds					
Maintenance of production area					
Cleaning program					
Road drainage					
Road stability					
Road Maintenance					
Light levels					
Temperature control					
Frost protection					
Humidity control					
Wind protection					
Hail protection					
Bench height					
Bench drainage					
Bench hygiene					
Facilities for hanging baskets					
Bed type					
Bed drainage					
Bed maintenance					
Screenings depth					
Screenings maintenance					
Pathways suitability					
Pathways drainage					
Pathways maintenance					
Floor drainage					
Floor cleanliness					
Plant spacing					
Container stability					
Nutritional program					
Ongoing growing stock media testing					
Ongoing growing stock media testing records					
Pest management					
Disease management					
Weed management					
Acclimatisation procedures					
Wastewater management					
Wastewater disposed of in an appropriate					
manner					
Refuse disposed of in appropriate manner					
Recording systems					

Comments:

SECTION 5: Exposed production areas

Applicable to container businesses growing container crops in the open (full sun)

	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Suitability					
Appearance and ergonomics					
Maintenance of surrounds					
Maintenance of production area					
Cleaning program					
Road drainage					
Road stability					
Light levels					
Temperature control					
Frost protection					
Humidity control					
Wind protection					
Hail protection					
Bench height					
Bench drainage					
Bench hygiene					
Facilities for hanging baskets					
Bed type					
Bed drainage					
Bed maintenance					
Screenings depth					
Screenings maintenance					
Pathways suitability					
Pathways drainage					
Pathways maintenance					
Floor drainage					
Floor cleanliness					
Plant spacing					
Container stability					
Nutritional program					
Ongoing growing stock media testing					
Ongoing growing stock media testing records					
Pest management					
Disease management					
Weed management					
Acclimatisation procedures					
Wastewater management					
Wastewater disposed of in an appropriate					
manner					
Road Maintenance					
Refuse disposed of in appropriate manner					
Recording systems					

Comments:

SECTION 6: Inground production areas

Applicable to all businesses growing crops in soil

	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Soilborne/waterborne pathogen testing					
Separation from other diseased non-crop hosts					
Access restrictions					
Fencing					
Area maintenance					
Soil disinfestation method					
Soil disinfestation records					
Drainage water deflected from production site, in ar					
appropriate manner					
Drainage – production areas					
Drainage – service areas					
Wastewater disposal					
Wind control					
Erosion control					
Cropping capacity of area (soil type, topography)					
Tillage methods					
Transplanting methods					
Vehicle wash down and disinfestation					
Plant spacing					
Root development					
Road/pathway stability					
Nutritional program					
Pathological soil testing programme					
Analytical Soil testing program					
Analytical records (soil)					
Pest management					
Disease management					
Weed management					
Tool disinfestation					
Refuse disposed of in appropriate manner					
Recording systems					

Comments:

SECTION 7: Plant handling

Applicable to all businesses

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

SECTION 8: Plant protection chemicals and equipment

Applicable for all businesses where agri-chemicals are stored and/or used

	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Secure storage of pesticides (locked)					
Warning signs displayed					
Pesticide containers in sound conditions					
Ventilation in chemical storage					
Safety data sheets on hand					
Safety equipment suitability,					
Safety equipment maintenance					
Safety equipment availability					
Safety equipment storage					
Emergency eyewash					
Emergency spill kit					
Application equipment suitability					
Application equipment maintenance					
Application equipment operation					
Operator qualifications					
Crop protection records (Spray Diary)					
Recording system (Manifest, diary, etc)					
Facility design (suitability for spillage cleanups					
during storage and handling)					
Pesticide containers storage bunded					
Measuring equipment (accuracy and					
maintenance)					
Compliance with current regulations					
Separation between fertilisers, fungicides and					
insecticides, herbicides and sterilants (e.g.					
chlorine)					
Disposal of excess spray dilutants in an					
Disposal of pesticide containers in appropriate					
manner					

Note: The minimum requirements for pesticide storage are described under the heading 'Minor Storage' within the booklet AS 2507-1998 The storage and handling of agricultural and veterinary chemicals available from Standards Australia.

Comments:

SECTION 9: Plant imports

Applicable to all businesses where plants or plant material is brought on-site (includes growing media production sites)

Receiving area/quarantine facility for inspection purposes clearly identified	
Knowledge of NIASA BMP Guidelines	
Receiving intake inspection area facility clean, well-lit and free from vertebrate and	
invertebrate pests, diseases and weeds	
Greenlife appropriately labelled with correct nomenclature	
Stock free of organic material such as soil on containers, etc	
Staff receiving consignments adequately	
trained in pest and disease identification	
Intake inspection procedures	
Pathogen testing of plant imports	
Plant imports isolated from other plants	
Wastewater diverted away from adjacent	
production areas in an appropriate manner Quarantine period	┝
Quarantine holding area	
Plant protection procedures appropriate	F
Plant/batch records allowing trace back of problems	

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

SECTION 10: Plant growing and storage containers

Applicable to all businesses growing in containers

Storage
New containers
Used containers
Waste materials stored in an appropriate
manner
Waste materials disposed of in an appropriate
manner

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

Disinfestation of used containers	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
Disinfestation equipment					
Disinfestation method					
Records of disinfestation					
Used disinfectant solutions					
Disinfectants disposed of in an appropriate					
manner					

Comments:

SECTION 11: Business management

Applicable to all businesses

Product quality

Root binding (Refer Guidelines) Evidence supplied about compliance of finished product with client or market specifications Visual inspection by Nursery Production FMS Auditor of finished product quality

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:



Staff issues

Licences for forklift/bobcat (where business has such equipment) Valid First aid certificate (must be sighted) Staff completed NIASA induction Staff trained in managing chemical spills

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

The Nursery Production FMS Auditor should record owner/managers' response to following questions but is not required to physically check them.

Do you have the following? Safety guards on machinery First aid kit(s) Fire extinguisher(s) Staff lunch room (refrigeration, storage, etc) Staff amenities (toilets, wash-up area, etc) Dust masks and gloves available to potting staff

Yes	Needs Attention				

Comments:

SECTION 11: Business management Continued

Information sources and environmental performance

Access to relevant technical information, e.g. Water Management Best Practice Guidelines. EcoHort assessment completed

Needs Attention	Satisfactory	Complies Fully

Comments:

Professional image and appearance

Maintenance of facilities Maintenance of surrounds Appearance of public access areas Appropriate signage inc. NIASA accreditation sign

Needs Attention	Being Upgraded	Satisfactory	Complies Fully

Comments:

COMMITMENT TO CONTINUOUS IMPROVEMENT

A) Please indicate what (if any) workshops/training events undertaken by management and/or staff over the last 12 months.

Workshop or training event	Person(s) attending

B) What 3 key improvements to the business do you aim to make prior to next inspection?

1.

2.

3.

Comments:

SECTION 12: Requirements for High Health Avocado Production

Applicable to businesses seeking High Health Avocado Production accreditation in addition to meeting other NIASA production nursery accreditation requirements

SEED, BUDWOOD AND SCION MATERIAL

Seed	Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
A <i>propagation material record</i> is maintained that identifies the source/s of seed for plant propagation, and its cultivar					
Seed is stored under appropriate storage conditions					
Batches of seed are labelled in a manner that allows traceback to the <i>propagation material record</i>					
The production nursery has a system in place to identify the Group 1 Viroid test status of the seed					
Records must be sighted by the Nursery Produ	ction FMS A	Auditor			

Comments:

Scion and bu	ldwood	material
--------------	--------	----------

A propagation material record is maintained that identifies the source/s of scion material or budwood used for plant propagation, and its cultivar

Material is stored under appropriate storage conditions

Batches of material are labelled in a manner that allows traceback to the *propagation material record*

The production nursery has a system in place to identify the Group 1 viroid test status of the material

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Records must be sighted by the Nursery Production FMS Auditor

Comments:

Production Continued

Labelling of propagated plants

Each propagated plant carries a label or code that links the seed/budwood/scion material used back to the *propagation material record* Each propagated plant carries a label or code that identifies the plant's rootstock and/or scion Propagated plants which require in-line testing for Group 1 Viroids are identified

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

TESTING FOR GROUP 1 VIROIDS

Propagated Plants

(Tick which box or boxes apply)

Propagated plants are entirely comprised of materials sourced from a place that has been declared free of Group 1 Viroids Propagated plants are entirely comprised of

materials from Group 1 Viroid tested Multiplication Blocks

Propagated plants are entirely comprised of material from a place that has been declared free of Group 1 Viroids and material from a Group 1 Viroid tested Multiplication Block

Propagated plants contain material that has not been sourced from a Group 1 Viroid tested Multiplication Block or a place that has not been declared free of Group 1 Viroids

Tick	Action
	Maintain evidence of declaration of freedom
	Multiplication block testing for Group 1 Viroids (or In-line testing of propagated plants for Group 1 Viroids)
	Multiplication block testing for Group 1 Viroids and evidence of declaration of freedom (or In-line testing of propagated plants for Group 1 Viroids)
	In-line testing of propagated plants for Group 1 Viroids.

Production Continued

Evidence of area freedom from Group 1 Viroids

The production nursery relies upon materials sourced from a place that has been declared free of Group 1 Viroids and maintains evidence of declaration of freedom

Needs	Being	Satisfactory	Complies	Doesn't
Attention	Upgraded		Fully	Apply

Comments:



The production nursery has a system in place to identify each tree in the block for sampling and testing purposes

The production nursery maintains records of testing of all trees present in the multiplication block which can be linked to the *multiplication block record*

All trees in each block have been tested and found free of Group 1 Viroids within the past 5 years

Records must be sighted by the Nursery Production FMS Auditor

Production Continued

Estimated number of trees containing untested source material produced per year (*Tick which box applies*)

< 30,000 trees produced per year

>=30,000 tress produced per year

>= 60,000 trees produced per year

>= 90,000 trees produced per year

>= 120,000 trees produced per year

>= 150,000 trees produced per year

TickAction1 in 20 trees to be in-line tested1 in 50 trees to be in-line tested1 in 100 trees to be in-line tested1 in 150 trees to be in-line tested1 in 200 trees to be in-line tested1 in 200 trees to be in-line tested1 in 250 trees to be in-line tested

Comments:

In-line testing of propagated plants for Group 1 Viroids

The production nursery maintains records of inline sampling and testing for Group 1 Viroids The production nursery can demonstrate that inline sampling and testing is conducted at the required rate

Staff understand and can explain the process that must be undertaken on detection of a Group 1 viroid in propagated plants

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Records must be sighted by the Nursery Production FMS Auditor

Production Continued

INSPECTION FOR GROUP 1 PATHOGENS

Above ground plant part monitoring

Monitoring of propagated plants for pests and disease is conducted quarterly

At least 35 plants are inspected for pests and disease within each batch of plants present within each growing area

Inspection staff can demonstrate the inspection process required for each plant inspection Inspection staff understand actions that must be taken on detection of suspicious symptoms Records of any testing conducted and test results are maintained

A *crop monitoring record* is maintained that documents:

- the date/s on which monitoring was conducted
- the person conducting the inspections
- the activity type (above ground plant part inspection)
- the crops monitored (location, crop batch)
 scope of the monitoring (e.g. the number of
- scope of the monitoring (e.g. the number of plants inspected per batch)
- the outcomes of the monitoring including sample numbers if applicable

Records must be sighted by the Nursery Production FMS Auditor

Comments:

Estimated number of trees produced per year for
sentinel plant root monitoring
(Tick which hox applies)

(Tick which box applies)

- < 30,000 trees produced per year
- >=30,000 tress produced per year
- >= 60,000 trees produced per year
- >= 90,000 trees produced per year
- >= 120,000 trees produced per year >= 150,000 trees produced per year

Tick	Action
	1 in 50 plants are sentinel plants
	1 in 200 plants are sentinel plants
	1 in 400 plants are sentinel plants
	1 in 600 plants are sentinel plants
	1 in 800 plants are sentinel plants
	1 in 1000 plants are sentinel plants

Comments:

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Satisfactory

Complies

Fully

Doesn't

Apply

SECTION 12: Requirements for High Health Avocado

Production Continued

Below ground plant part monitoring (Sentinel Plants)

Sentinel plants are established at the specified rate

Each sentinel plant is marked with a unique sentinel plant number

Sentinel plant monitoring for disease is conducted quarterly, commencing six months after the initial establishment of an individual plant until plants reach the hardening off stage of production Inspection staff can demonstrate the inspection process required for each inspection

Inspection staff understand actions that must be taken on detection of suspicious root symptoms Records of any testing conducted and test results are maintained

A *crop monitoring record* is maintained that documents:

- the date/s on which monitoring was conducted
- the person conducting the inspections
- the activity type (sentinel plant)
- the crops monitored (location, crop batch)
- the scope of the monitoring (e.g. the unique number/s of the sentinel plants inspected in the batch)
- the outcomes of the inspection including sample numbers if applicable

Records must be sighted by the Nursery Production FMS Auditor

Comments:

USE OF FUNGICIDES

The production nursery business understands the requirements of fungicide use under the procedure

No evidence of inappropriate fungicide use is identified by the Auditor upon inspection of the production nursery's *chemical application record*

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

APPENDIX 2 -	NIASA	Appendix	5 – Production	nursery checklist
	-			

je or production		
strate the inspection		
ispection		
actions that must be		
ious root symptoms		
lucted and test results		
maintained that		
nitoring was		
-		

Needs

Attention

Being Upgraded

Production Continued

PRODUCT QUALITY AND MEETING CUSTOMER EXPECTATIONS

The business has a system in place to inspect trees for quality requirements within 72 hours of despatch

Staff can explain quality requirements and the process for rejection of non-conforming trees

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

CROP INSPECTION BY AUDITOR

General crop health - above ground plant parts

General crop health - sentinel plants

Trees ready for consignment meet product quality requirements

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply
SECTION 13: Pathology samples

Applicable to all businesses

RECORD OF SAMPLES TAKEN BY NURSERY PRODUCTION FMS AUDITOR

When collecting samples, record the information requested on the forms provided, and submit the forms with the samples to the laboratory.

The following information should also be recorded on the checklist.

Date of Sampling	Sample Description	Results of testing

APPENDIX 2 - NIASA Appendix 5 – Production nursery checklist

Appendix 3. NIASA High Health Avocado Accreditation. Administration and Resourcing Plan for ANVAS Certification

NIASA High Health Avocado Accreditation. Administration and Resourcing Plan for ANVAS Certification

Nursery & Garden Industry Australia (NGIA) and Avocados Australia Ltd (AAL)

Version 1.0

Contents

1.	Arra	ngeme	nts for Scheme administration	3
	1.1	Overv	view	3
	1.2	Scher	ne administration	3
		1.2.1	Relevant suppliers of services	3
			1.2.1.1 For NIASA and High Health Avocado Production accreditation	3
			1.2.1.2 For ANVAS accreditation	4
		1.2.2	NIASA and ANVAS	4
			1.2.2.1 Ownership of the Nursery Industry Accreditation Scheme, Australia (NIASA)	4
			1.2.2.2 Ownership of the Avocado Nursery Voluntary Accreditation Scheme (ANVAS)	4
			1.2.2.3 Relationship between NGIA and AAL for NIASA high health avocado production accredit	ation
			supporting ANVAS	4
			1.2.2.4 Promotion of NIASA and ANVAS	5
		1.2.3	Fees and Charges for scheme administration	5
			1.2.3.1 NGIA	5
			1.2.3.2 AAL	5
		1.2.4	Accreditation	6
			1 2 4 1 NIASA and High Health Avocado Production Accreditation	6
			1.2.4.2 ANVAS	6
	1.3	Trans	itional arrangements	7
2.	Supr	oliers of	goods and services	8
	2.1	Analv	tical services	8
		2.1.1	Relevant supplier of services	8
		2.1.2	Fees and charges for analytical services	8
			2.1.2.1 Viroid testing	8
			2.1.2.2	8
			2.1.2.3 Other non-viroid pathogen testing	8
3.	Signi	ificant l	pusiness costs other than for scheme administration	9
	3.1	Grou	o 1 viroid testing (ASBVd)	9
	-	3.1.1	In-line testing option for a production nursery	9
			3.1.1.1 Agreed option for in-line testing included in the High Health Avocado Production	
			requirements.	9
			3.1.1.2	9
			3.1.1.3 Other options investigated	10
		3.1.2	Multiplication tree testing option for a production nursery (for seed and budwood/scion)	10
	3.2	Grou	o 1 and 2 pathogen monitoring	11
4.	Indic	ative c	ost estimate summary	12
5.	Atta	chment	5	12
	5.1	Attac	hment 1 – Scheme administration and implementation flowchart.	12
			•	

1. Arrangements for Scheme administration

1.1 Overview

Nursery production of 'high health' avocado plants is recognised within Australia as playing an important role in supporting the Australian avocado production industry.

Purchasers of avocado nursery stock require assurance that stock purchased meets an industry standard, is true to type, and that appropriate steps have been taken to reduce the chance of introduction of serious pathogens into the production environment.

The Avocado Nursery Voluntary Accreditation Scheme (ANVAS), administered by Avocados Australia Limited (AAL), is recognised as the Australian avocado industry's scheme to provide superior planting material to industry members.

'High health' avocado nursery production requirements are included as an appendix to the Nursery & Garden Industry Australia's (NGIA) Nursery Industry Accreditation Scheme, Australia (NIASA) Guidelines.

The incorporation of High Health Avocado Production Accreditation requirements into NIASA is not intended to replace the ANVAS. The intention is for NGIA, through NIASA, to administer and audit technical requirements for high health avocado production that are implemented by NIASA production nurseries that contribute to meeting ANVAS requirements.

A business may apply to NGIA for incorporation of High Health Avocado Production Accreditation requirements into their existing audit and assessment arrangements by selecting the option on their NIASA application form.

In order for a production nursery to be eligible to apply to AAL for ANVAS accreditation, the production nursery **must** be:

- a) NIASA accredited; AND
- b) implement the requirements specified within the NIASA High Health Avocado Production Appendix; AND
- c) be found at audit to have implemented the procedures within the Appendix to a Satisfactory standard; AND
- d) demonstrate this through provision of a NIASA High Health Avocado Production Accreditation certificate.

Should AAL agree that the production nursery business meets ANVAS requirements, AAL may issue the business with an annual Certificate of ANVAS accreditation. AAL may also charge the applicant with an annual 'certification' fee at its discretion.

In accordance with NIASA governance and administration arrangements, costs of implementation and testing are borne by the nursery production business.

An overview of the administrative and delivery framework is provided as Attachment 1.

1.2 Scheme administration

1.2.1 Relevant suppliers of services

The relevant suppliers are:

1.2.1.1 For NIASA and High Health Avocado Production accreditation

A. The Nursery & Garden Industry Australia (NGIA)

Unit 58 Quantum Corporate Park

5 Gladstone Road

CASTLE HILL NSW 2154

```
INITIAL -
```

1.2.1.2 For ANVAS accreditation

B. Avocados Australia Ltd (AAL)

Level 1, suite 8

63 Annerley Road

Woolloongabba QLD 4102.

1.2.2 NIASA and ANVAS

1.2.2.1 Ownership of the Nursery Industry Accreditation Scheme, Australia (NIASA)

It is acknowledged that:

- a) NGIA is the sole and exclusive owner of NIASA; being the production nursery, greenlife market and growing media production Best Management Practice Accreditation Scheme; and
- b) NGIA is the sole and exclusive owner of the NIASA trademark and NIASA Intellectual Property Rights; and
- c) NGIA has the sole and exclusive right to operate, manage and administer NIASA.

1.2.2.2 Ownership of the Avocado Nursery Voluntary Accreditation Scheme (ANVAS)

It is acknowledged that:

- a) AAL is the sole and exclusive owner of ANVAS; being the Australian avocado industry accreditation scheme to provide superior planting material for the avocado industry;
- b) AAL is the sole and exclusive owner of the ANVAS trademark and ANVAS Intellectual Property Rights; and
- c) AAL has the sole and exclusive right to operate, manage and administer ANVAS.

1.2.2.3 <u>Relationship between NGIA and AAL for NIASA high health avocado production accreditation supporting</u> <u>ANVAS</u>

The NGIA will administer and resource NIASA, and AAL will administer and resource ANVAS.

The requirements contained within the NIASA High Health Avocado Nursery Production Appendix will be determined based on consultation between NGIA and AAL. For this purpose, decision making on production requirements is provided through NGIA and AAL as part of an Authorised Oversight Committee. Where specialist technical advice is required it has been determined that this should be provided through a supporting Technical Expert Panel.

- a) The Authorised Oversight Committee will include:
- The AAL CEO;
- An AAL Board member; and
- The National Biosecurity Manager, NGIA, or another person nominated by NGIA.

This Committee will provide the final 'sign-off' of the High Health Avocado Nursery Production Appendix in consideration of advice (where sought) from the Technical Expert Panel. If the Technical Expert Panel are deadlocked on an issue the committee has the final say. The National Biosecurity Manager NGIA will then take the approved criteria to the NGIA National Governance Committee for ratification and inclusion into the NIASA Guidelines in accordance with its governance and administration procedures.

- b) The Technical Expert Panel will include nominated technical experts from:
- AAL two members including the AAL CEO and an AAL Chair;
- NGIA the National Biosecurity Manager or another person nominated by NGIA; and

• The Queensland Department of Agriculture and Fisheries (QDAF) or the Queensland Alliance for Agriculture and Food Innovation (QAAFI) - three technical experts.

Unless otherwise specified, each member will bear their own costs for attendance.

1.2.2.4 Promotion of NIASA and ANVAS

Both NGIA and AAL acknowledge that promotion of respective industry schemes supports the best interests of members.

Scheme promotion will be at the cost of either relevant party.

1.2.3 Fees and Charges for scheme administration

1.2.3.1 <u>NGIA</u>

NGIA determines Nursery Production FMS Program and Guidelines Fees and charges. NGIA reserves the right to amend the Fees at any time after consultation with the NGIA Governance Committee.

The current schedule of fees for NIASA as it relates to ANVAS are as follows:

Program	Annual Certification Fee		Hourly Audit Rate	
riogram	NGI Member	Non-member NGI	NGI Member	Non-member NGI
NIASA	\$1,000.00	\$2,500.00	\$150.00	\$300.00

Note: NGIA provides equivalence in membership recognition if a business is a member of a relevant PIB approved by the National Governance Committee, e.g. Avocados Australia Ltd.

An indictive Nursery Production FMS average audit length (hr) is provided below.

Audit descriptor	Average audit time (hr)
Initial/Final NIASA Audit	4
Annual NIASA Audit	2.5
Estimated combined annual NIASA plus Avocado High Health Audit	4
Audit Travel Time for each business set at	0.5

The indictive NGIA/NIASA administration and auditing cost when considered on a per tree basis is provided below. NOTEthis includes existing costs of NIASA Accreditation PLUS additional costs for High Health Avocado Production Accreditation.

Annual production (trees)	Indicative cost per tree produced (rounded to nearest cent)
30,000	6 cents (NOTE - 5 cents is NIASA and 1 cent addresses additional avocado
	administration and auditing by NGIA)
60,000	3 cents
90,000	2 cents
120,000	1 cent
150,000	1 cent

1.2.3.2 <u>AAL</u>

AAL determines ANVAS Fees and charges. AAL reserves the right to amend the Fees at any time after consultation with the NGIA.

Area	Cost	
ANVAS charge (existing – to be removed)	10 cents per tree produced	
Annual certification fee	\$1000 per annum	

1.2.4 Accreditation

1.2.4.1 NIASA and High Health Avocado Production Accreditation

Application for NIASA and High Health Avocado Production accreditation shall be made by a business by completing and submitting the approved application form to NGIA. The business shall indicate application for High Health Avocado Production accreditation by ticking the appropriate checkbox and completing the form in accordance with the instruction provided.

A business must comply with the Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS - ACCREDITATION UNDER THE NURSERY INDUSTRY ACCREDITATION SCHEME AUSTRALIA policy (NI-POL-001).

Rules for processing applications, and giving, rejecting, maintaining and suspending or cancelling accreditation shall be in accordance with the NGIA's **Nursery Production Farm Management System (FMS) GOVERNANCE AND ADMINISTRATION FRAMEWORK** policy (FMS-POL-001).

After a verification audit to confirm application of the scheme to scheme requirements, a successful applicant will receive a Certificate of Accreditation for NIASA including NIASA High Health Avocado Production upon meeting the requirements of the Scheme. The Certificate is valid for the calendar year during which it is awarded.

Should a business have its NIASA accreditation suspended or cancelled, NGIA shall inform AAL of the suspension or cancellation of the accreditation within 7 days of the giving of the suspension or cancellation notice.

1.2.4.2 ANVAS

Application for ANVAS Accreditation shall be made by a business by completing and submitting an ANVAS application form to AAL.

The ANVAS application form forms part of the ANVAS scheme owned by AAL. Information required for ANVAS accreditation and direction provided on the application form, including any terms and conditions, fees and privileges, are given, included or required at the sole discretion of AAL.

A successful applicant shall be contacted by AAL and informed of the accreditation decision, and if successful, provided with an annual ANVAS Certificate of Accreditation valid for the calendar year during which it is awarded.

Information required by AAL on annual application for ANVAS and industry forecasting and research purposes may include, but not necessarily be limited to:

- a) The number of avocado trees produced annually by the production nursery.
- b) Type/cultivar.
- c) Destinations of planting material.

Privileges of ANVAS may include, but not necessarily be limited to:

- a) Business inclusion in ANVAS nurseries advertisement in *Talking Avocados* magazine issued four times each year. Permission to advertise ANVAS nurseries separately in *Talking Avocados*. Non-ANVAS accredited nurseries prohibited from advertising in *Talking Avocados*.
- Business inclusion in ANVAS listing on the Avocado Directory (on the Avocados Australia website). Permission to list ANVAS nurseries separately in the Avocado Directory. Non-ANVAS accredited nurseries are prohibited from listing in the Avocado Directory.
- c) ANVAS accredited nurseries actively promoted to industry through AAL communication channels. Non-ANVAS accredited nurseries will not be promoted to industry by AAL.

1.3 Transitional arrangements

In order to provide adequate time for businesses to implement new system requirements, including business that will also need to prepare for initial NIASA accreditation, these requirements will *commence* on 1 January 2019 with full compliance to transition to occur by 1 January 2020.

Commence means a business that holds current ANVAS accreditation must commence implementation of the NIASA High Health Avocado Production requirements.

<u>Requirements for immediate commencement at 1 January 2019</u> that are specified within the NIASA High Health Avocado Production Appendix are sections:

- a) **A.13.2.2 Growing media/propagating media**, to replace **ANVAS Technical Report A3** Potting mix related requirements.
- b) A.13.3 Disinfestation and hygiene, to replace ANVAS Technical Report A4, A5 and A9 requirements as they relate to disinfestation and hygiene.
- c) A.13.2.1 Water, to replace ANVAS Technical Report A12 Water related requirements.
- d) A.13.6 Use of fungicides, to replace ANVAS Technical Report A13 requirements as it relates to fungicide use.

<u>NIASA requirements for immediate commencement at 1 January 2019</u> that are part of NIASA but <u>NOT</u> directly specified within the NIASA High Health Avocado Production Appendix are sections:

- a) **1.1.16 Beds and benching** to replace **ANVAS Technical Report A7** requirements as it relates to Bench tops.
- b) **1.1.10 Floors and pathways, A.1.16 Site sanitation, 2.2 Wind control, A.3.5 Storage and handling of treated growing media** to replace **ANVAS Technical Report A6** and **A11** requirements as they relate to suitable dust suppression.

<u>Requirements that must be implemented by 1 January 2020</u> that are specified within the NIASA High Health Avocado Production Appendix are sections:

- a) A.13.2.3 Seed, budwood and scion material, to replace ANVAS Technical Report A1 and A2 requirements and the Virus-tested tree registration Programme requirements- as it relates to Seed and budwood from viroid tested multiplication trees and harvest and heat treatment of seed.
- b) A.13.5 Inspection and testing for the presence of Group 1 non-viroid pathogens in propagated plants, to replace ANVAS Sampling Procedures requirements as it relates to sampling and testing for *Phytophthora cinnamomi*.
- c) All other remaining NIASA High Health Avocado Production Appendix requirements.

Businesses that have not implemented A.13.5 requirements prior to 1 January 2020 will be subject to ANVAS Sampling Procedures at audit at their own cost.

2. Suppliers of goods and services

2.1 Analytical services

2.1.1 Relevant supplier of services

The relevant suppliers are:

A. Grow Help Australia
Department of Agriculture and Fisheries
Ecosciences Precinct
Loading Dock 3, Joe Baker St
Dutton Park QLD 4102

2.1.2 Fees and charges for analytical services

Fees and charges for analytical services may change from time to time and are made at the sole discretion of the service provider. Quoted fees and charges for services are as follows:

2.1.2.1 Viroid testing

Group 1 viroids

Common name	Scientific name
Avocado sunblotch	Avocado sunblotch viroid (ASBVd)

Group 2 viroids

Common name	Scientific name
Potato spindle tuber viroid	Potato spindle tuber viroid (PSTVd)

Test	Cost per test
First sample	\$157.00
Next 2 to 30 samples	\$61.00
Next 31 or more samples	\$35.00

2.1.2.2

2.1.2.3 Other non-viroid pathogen testing

Group 1 non-viroid pathogens

Common name	Scientific name
Phytophthora root rot	Phytophthora cinnamomi
Black root rot	Calonectria ilicicola
Black root rot	Dactylonectria macrodidyma
Stem dieback or graft rot	Fungi from the family Botryosphaeriaceae
Stem dieback or graft rot	Colletotrichum sp.
Seed rot	Fungi from the family Botryosphaeriaceae
Seed rot	Botrytis sp.
Leaf spot	Pseudocercospora purpurea

Group 2 non-viroid pathogens

Common name	Scientific name
Pythium root rot	Pythium species
Rhizoctonia root rot	Rhizoctonia solani
NA	Fusarium species
Verticillium wilt	Verticillium dahlia
NA	Macrophomina phaseolina
Anthracnose	Colletotrichum spp.

Group 1 and 2 non-viroid pathogens		
Per sample test (including Phytophthora cinnamomi)	\$121.60	

3. Significant business costs other than for scheme administration

Non-administrative scheme costs to a business applied on a per tree produced basis are provided below.

3.1 Group 1 viroid testing (ASBVd)

Indicative costs are provided below.

3.1.1 In-line testing option for a production nursery

This option requires testing of propagated plants within the production nursery that include seed or budwood/scion material that has not been sourced from an ASBVd tested multiplication tree.

3.1.1.1 <u>Agreed option for in-line testing included in the High Health Avocado Production requirements.</u>

Annual production (trees)	Indicative cost per tree produced	
OPTION A - In-line testing - 95% confidence of detecting infestation if present at 0.5% prevalence (1 in 200 plants		
could be infested and not detected). This is consistent with international rates for compliance checking of goods.		
30,000	2 cents (rounded up)	
60,000	1 cent (rounded up)	
90,000	1 cent (rounded up)	
120,000	1 cent (rounded up)	
150,000	1 cent (rounded up)	

This is provided through in-line sampling at the following rates.

Estimated number of plants containing	Proportion of plants to be sampled for testing	
untested source materials produced per year	Approximate % of total	Actual sampling rate per
· · · /		batch of plants
<30,000	5%	1 in 20 plants
>=30,000	2%	1 in 50 plants
>=60,000	1%	1 in 100 plants
>=90,000	0.67%	1 in 150 plants
>=120,000	0.5%	1 in 200 plants
>=150,000	0.4%	1 in 250 plants

3.1.1.2

3.1.1.3 Other options investigated

Annual production (trees)	Indicative cost per tree produced		
OPTION B - In-line testing - 95% confidence of detecting infestation if present at 0.2% prevalence (1 in 500 plants			
could be infested and not detected)			
30,000	3 cents (rounded down)		
60,000	2 cents (rounded up)		
90,000	1 cent (rounded down)		
120,000	1 cent (rounded up)		
150,000	1 cent (rounded up)		

Annual production (trees)	Indicative cost per tree produced		
OPTION C - In-line testing - 95% confidence of detecting infestation if present at 0.1% prevalence (1 in 1000 plants			
could be infested and not detected)			
30,000	6 cents (rounded down)		
60,000	3 cents (rounded down)		
90,000	2 cents (rounded down)		
120,000	2 cents (rounded up)		
150,000	1 cent (rounded down)		

Annual production (trees)	Indicative cost per tree produced		
OPTION D - In-line testing - 95% confidence of detecting infestation if present at 0.05% prevalence (1 in 2000 plants			
could be infested and not detected)			
30,000	10 cents (rounded up)		
60,000	5 cents (rounded down)		
90,000	3 cents (rounded down)		
120,000	3 cents (rounded up)		
150,000	2 cents (rounded down)		

3.1.2 Multiplication tree testing option for a production nursery (for seed and budwood/scion)

This option requires each multiplication tree within a multiplication block to be tested initially for ASBVd and then again, every 5 years thereafter.

Costs can only be calculated based on the number of tested multiplication trees required by the business. Estimated costs do not include costs other than for testing.

An indicative guide is provided below.

Annual production	Number of	Indicative cost per tree produced	
(trees)	multiplication trees		
30,000	500	Initial year 8 cents, then averaging 2 cents per year thereafter.	
	1000	Initial year 13 cents, then averaging 2.5 cents per year thereafter.	
	5000	Initial year 52 cents, then averaging 10 cents per year thereafter.	
60,000 500 Initial year 4 cents, then avera		Initial year 4 cents, then averaging 1 cent per year thereafter.	
	1000	Initial year 6 cents, then averaging 1 cent per year thereafter.	
	5000	Initial year 26 cents, then averaging 5 cents per year thereafter.	
90,000	500	Initial year 2 cents, then averaging >1 cent per year thereafter.	
	1000	Initial year 4 cents, then averaging 1 cent per year thereafter.	
	5000	Initial year 17 cents, then averaging 3 cents per year thereafter.	

Annual production	Number of	Indicative cost per tree produced	
(trees)	multiplication trees		
120,000	500	Initial year 2 cents, then averaging >1 cent per year thereafter.	
	1000	Initial year 3 cents, then averaging >1 cent per year thereafter.	
	5000	Initial year 13 cents, then averaging >3 cents per year thereafter.	
150,000	500	Initial year 2 cents, then averaging >1 cent per year thereafter.	
1000 Initial year 3 cents, then averaging >1 cent		Initial year 3 cents, then averaging >1 cent per year thereafter.	
	5000	Initial year 10 cents, then averaging 2 cents per year thereafter.	

3.2 Group 1 and 2 pathogen monitoring

An estimate of the cost of sentinel plant root health monitoring is provided below on a cost per tree produced basis. The estimate is based on a labour cost of \$80 per hour with a 30 second inspection time per plant.

Annual tree production	Indicative cost per tree produced	
Root health sentinel plant monitoring - 95% confidence of detecting infestation if present at 2% prevalence per		
round (no more than 1 in 50 plants could be infested and not detected upon completion of monitoring)		
30,000	2 cents	
60,000	1 cent	
90,000	1 cents	
> 120,000	< 1 cent	

An estimate of analytical testing costs is provided below on a cost per tree produced basis, based on proportion (%) of plants inspected each year requiring diagnosis.

Annual production	% plants requiring	Indicative cost per tree produced
(trees)	sample collection after	
	inspection	
30,000	0.5% (3 samples/yr)	1 cent
	1% (6 samples/yr)	2 cents
	2% (12 samples/yr)	5 cents
60,000	0.5%	< 1 cent
	1%	1 cent
	2%	2 cents
90,000	0.5%	< 1 cent
	1%	1 cent
	2%	2 cents
120,000	0.5%	< 1 cent
	1%	< 1 cent
	2%	1 cent
150,000	0.5%	< 1 cent
	1%	< 1 cent
	2%	1 cent

4. Indicative cost estimate summary

An indicative business resource cost estimate for a production nursery on a per tree produced basis is provided below. Estimates are based on in-line testing only and include system administration costs (NIASA) and costs of implementation of monitoring and testing only. Figures assume root health sampling rates of 0.5% of plants inspected. The estimate does not include the cost of testing of samples collected at audit where suspicion of infection is detected.

Annual production (trees)	Indicative cost per tree produced	
30,000	9 cents* (approximately 50% admin/audit cost which reduces as the number of	
	trees produced increases).	
60,000	5 cents	
90,000	3 cents	
120,000	3 cents	
150,000	2 cents	

5. Attachments

5.1 Attachment 1 – Scheme administration and implementation flowchart.





Hort Innovation – Final Report: Implementation of Recommendations from the Avocado Nursery Voluntary Accreditation Scheme Review

Appendix 4. ANVAS Guidelines mapped against NIASA Guidelines and other Scheme documentation ANVAS Guidelines mapped against NIASA Guidelines and other Scheme documentation

ANVAS GUIDELINES		NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
1. Aims of the Scheme	1. sound nursery practices; 2. The use of virus- tested and registered sources of seed and budwood; 3. The exclusion of soil-borne plant pathogens and root diseases.	NIASA Guidelines	N/A	 NIASA addresses requirement. The guidelines support achievement of ANVAS Aims. NOTE ACTIONS The DAFF is currently reviewing virus testing and root testing procedures. Recommendations will inform testing requirements to be included within the High Health Avocado Nursery Production Appendix to NIASA
2. Eligibility	Any avocado nurseryman or grower may apply for accreditation under the Scheme. Participation shall be voluntary provided participants agree to abide by this set of Guidelines.	N/A	N/A	☑ NIASA addresses requirement. NIASA is a voluntary scheme.
3. Administration	3[a] The Scheme shall be administered by the Australian Avocado Growers' Federation (AAGF) and its affiliated bodies.	3. NIASA ACCREDITATION SERVICES Nursery Production Farm Management System (FMS) GOVERNANCE AND ADMINISTRATION FRAMEWORK – 30 June 2017.	 3.1 Ownership It is acknowledged that: NGIA is the sole and exclusive owner of the Nursery Production FMS Program and all Intellectual Property Rights; NGIA has the sole and exclusive right to operate, manage and administer the Nursery Production FMS Program. 3.2 Assignment NGIA is entitled to license, assign, dispose of and deal with the Intellectual Property Rights, as it thinks fit, in its absolute discretion. Except with the prior written consent of NGIA, no other party may license, assign, dispose of or deal with the Intellectual Property Rights.	 NIASA addresses requirement. NIASA provides for clear ownership, and assignment entitlement as it thinks fit. ACTIONS. AV13020. Oversight committee to be proposed and agreed to (TOR).
	3[b] The AAGF shall consider applications for accreditation as required.	5. ASSESSMENT Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS – 19 July 2017.	5.1 Once Your Application is received by the NGIA Your Application will be assessed within fourteen (14) days to determine if You are an Appropriate Business for NIASA Accreditation and You will be notified of the result of the assessment.	 NIASA addresses requirement. NIASA provides for consideration of all applications within 14 days of receipt of application. ACTIONS Application for NIASA accreditation will need to provide for High Health Avocado Production Nursery.
	3[c] All dealings between the nurseryman and the AAGF shall be confidential.	8. CONFIDENTIALITY Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS – 19 July 2017.	 8.1 The NGIA will direct its employees, agents and contractors to treat as confidential, any confidential information belonging to You with which the NGIA becomes acquainted during the term of the Contract including Audit reports and data stored on the NAP except that, where the NGIA considers it appropriate, the NGIA may disclose Your identity and the nature, status, scope or effect of Your NIASA Accreditation. 8.2 You must treat as confidential and not disclose to any third party, without the prior written consent of the NGIA. 	☑ NIASA addresses requirement. NIASA includes user and scheme confidentiality provisions within its governance and administration framework and terms and conditions.

ANVAS GUIDELINES	5	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
			 proprietary or confidential information belonging to the NGIA. 8.3 The obligations of confidentiality under these terms and conditions do not extend to information that: (a) is rightfully known to or in the possession or control of the receiving party and not subject to an obligation of confidentiality owed by the receiving party; (b) is public knowledge (otherwise than as a result of breach of these terms and conditions); (c) is required by an accrediting authority to be disclosed; or (d) is required by law to be disclosed. 	
	3[d] The AAGF may seek competent technical advice before reaching a decision on any application but shall reach its decisions independently of that advice.	 5. ASSESSMENT Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS – 19 July 2017. 7. NURSERY PRODUCTION FMS AUDITORS Nursery Production Farm Management System (FMS) GOVERNANCE AND ADMINISTRATION FRAMEWORK – 30 June 2017. 	 5.1 Once Your Application is received by the NGIA Your Application will be assessed within fourteen (14) days to determine if You are an Appropriate Business for NIASA Accreditation and You will be notified of the result of the assessment. 5.2 Should Your Application be accepted You will be contacted to arrange a preliminary Audit to assess You and the Site against the NIASA Guidelines. 5.3 You may require more than one Site Audit to satisfy the NIASA Accreditation Procedures prior to Your Site being accredited. 5.4 Upon successfully meeting all of the criteria within the NIASA Accreditation Procedures Your Application will be submitted to the Governance Committee for ratification at their next scheduled meeting or at a time agreed by the Governance Committee. 5.5 You must promptly comply with the NIASA Accreditation Procedures and all reasonable requirements of the NGIA and provide the Nursery Production FMS Auditor with all co-operation and assistance required to enable the NGIA to provide the NIASA Accreditation Services requested by You, including reasonable access from time to time to the Site facilities, documents and records belonging to You, and to Your employees, contractors and agents. 7.1 Selection The NGIA must appoint Nursery Production FMS Auditors to provide the Services and perform obligations as detailed in this document, the Terms and Conditions and the Procedures. The selection of Auditors is made by the NGIA based on the criteria set out in APPENDIX 2 – SELECTION OF NURSERY PRODUCTION FMS AUDITORS. The National Administrator must be involved in the selection proces and given the opportunity to review applications and participate in interviews in person or by Device during the selection period. 	✓ NIASA addresses requirement. NIASA provides for assessment of the application by the National Administrator, or their delegate, for the scheme. If the application is accepted the National Administrator arranges for a technical on-site audit of application of the NIASA Guidelines at the applicant's site. Auditors must hold qualifications in auditing and demonstrate technical competence prior to being approved as an auditor. An independent decision to grant or refuse accreditation is made by the Governance Committee which may consider technical advice on compliance to scheme requirements provided through audit.

ANVAS GUIDELINES	S	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
			The NGIA must ensure that their Auditors comply with Auditor obligations as set out in this document.	
	3[e] The Registrar of ANVAS shall publish a list of ANVAS accredited nurseries in each edition of Talking Avocados and when there is any doubt to the standing of an accreditation the nursery's name should be deleted from the list until accreditation is re-instated.	N/A	N/A	 No impediment noted NIASA does not provide for this option however this may remain an option for AAL to use as they see fit based on evidence of accreditation provided to AAL by the nurseryman. ACTIONS. AV13020. TOR. AAL to retain the rights to use the ANVAS branding/ privileges.
4. Application for Accreditation of Nurseries	4[a] Application shall be made on the prescribed form (Application for Membership) and may be made at any time of the year to the Register.	3. NIASA ACCREDITATION SERVICES Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS – 19 July 2017.	 3.1 An Application must be lodged with the NGIA. 3.2 Subject to any requirement of the NGIA, an Application must be made for each Site on which You carry on an Appropriate Business under the one business name. 3.3 The NGIA agrees to provide, and You agree to accept, the NIASA Accreditation Services requested by You pursuant to Your Application. 	 NIASA addresses requirement. NIASA contains no exception to application at any time. Application for NIASA is made on an approved application form. ACTIONS The NIASA application form to be amended to include an option for High Health Avocado Nursery Production.
	4[b] Applicants will be advised when accreditation has been granted or of any reason accreditation cannot be granted or continued.	6. NIASA ACCREDITATION Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS – 19 July 2017.	 6.1 If: (a) You are not in breach of these terms and conditions and the warranties in the Application; and (b) if, pursuant to clause 5.4, the Governance Committee is satisfied that NIASA Accreditation is appropriate, the NGIA, will: (c) grant NIASA Accreditation, on such terms and conditions as the NGIA thinks fit, in its absolute discretion; (d) issue You with a Certificate, valid for the remainder of the calendar year during which it is issued; (e) grant to You a non-exclusive licence, revocable at will, to use the applicable NIASA Accreditation Mark for the purpose only of displaying the NIASA Accreditation; (f) authorise Your access to the NAP including user name, log-in and password details; and (g) keep You informed of changes or updates to the NIASA Accreditation Procedures, NIASA Accreditation Services, NIASA Accreditation Procedures, NIASA Accreditation is appropriate, the NGIA will notify You. 6.3 You will comply with NGIA's directions, acting reasonably, in relation to NIASA Accreditation. 	☑ NIASA addresses requirement. NIASA provides for advice on accreditation if granted or refused.

ANVAS GUIDELINES	5	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	4[c] Accreditation of successful applications will in general be for one year, commencing 1 January, but shall be subject to periodic review by the AAGF during that year.	 6. NIASA ACCREDITATION 7. AFTER NIASA ACCREDITATION Nursery Industry Accreditation Scheme Australia (NIASA) TERMS AND CONDITIONS – 19 July 2017. 	 See 6.1 (d) above. 7.2 Subject to these terms and conditions and unless earlier terminated under this Contract, Your NIASA Accreditation remains valid for subsequent calendar years on payment of an annual fee to NGIA (unless otherwise agreed with the NGIA). 	 No impediment noted NIASA provides for the same accreditation arrangement time period. However, accreditation is continuous on payment of the annual fee. Under NIASA a business does not need to apply for accreditation annually. ACTION Seek agreement to not continue with annual application.
5. Privileges	5[a] A nurseryman whose nursery has been accredited under the Scheme may use the words "ANVAS Nursery" in advertising and the logo approved by the AAGF.	 7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017. 6. NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017. 	 7.6 Subject to these terms and conditions, for each Site, You may publicise the fact that NIASA Accreditation has been granted and display the Certificate as evidence of NIASA Accreditation. You may copy the Certificate, provided that each copy is clearly identified as a copy. See 6.1 (e) above. Use of accreditation mark. 	 No impediment noted NIASA provides for use of the logo to advertise accreditation and allows a business to publicise that it is a NIASA accredited business. ACTIONS. AV13020. TOR. AAL to retain the rights to use the ANVAS branding. Will need to be addressed through agreement between NGIA and AAL.
	5[b] An accredited nursery is eligible to become an approved supplying nursery of the AAGF.	N/A	N/A	 Will need to be addressed however no impediment noted ACTIONS. AV13020. TOR. AAL to retain the rights to promote use the ANVAS branding.
	5[c] Accredited nurseries shall have a minimum of two inspections each year to monitor nursery hygiene and occurrence of plant diseases. These inspections shall be in late October/early November and late March/early April. 5[d] Accredited nurseries may send soil samples	Application form for NIASA accreditation (Section E) Advertised accreditation	2. I/we agree to accommodate a minimum of one annual audit by the Auditor appointed for that purpose. Analytical Testing - Phosyn Analytical. NIASA Accredited	 Will need to be addressed NIASA currently provides for one annual audit to assess compliance to the scheme typically conducted late March/early April. Revised sampling protocols may allow for extension to annual audit. ACTIONS Consult on requirement for twice annual audit. NOTE: NZAGA High Health Scheme provides for an annual audit. Mo impediment noted
	for biological assay at any time.	privileges.	businesses receive a discount of 15% off all services offered by Phosyn Analytical. Farm Minder - NIASA Accredited businesses receive a discount of 30% off the Subscription Price off Farm Minder.	NIASA currently does not provide for free soil assays. ACTIONS Consult on bulk testing arrangements
	5[e] Accredited nurseries may use Virus Tested Tree Registration Programme labels on tress that	N/A	N/A	🗵 Will need to be addressed

ANVAS GUIDELINES	5	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	are propagated from material provide under the Programme.			NIASA currently does not provide for VTTR labels. VTTR labels are no longer available. ACTIONS Make recommendations to AAL and consult on requirement.
6. Responsibilities <i>Nurseryman</i>	6[a] A nurseryman may not guarantee plants as being "disease-free" as a consequence of gaining accreditation under the Scheme, not shall any warranty be implied by the AAGF, its affiliated bodies or co-operating organisation or personnel.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	 7.8 The Certificate is not to be construed as representing, nor does NGIA warrant, that NIASA Accreditation is approved by any NIASA Accreditation authority, governmental or statutory authority. 7.9 You must not: (a) engage in any conduct which might mislead, deceive or confuse any person in relation to; or (b) otherwise misrepresent the nature, status, scope or effect of, Your NIASA Accreditation. 	NIASA addresses requirement.
	6[b] A nurseryman on request shall agree to officers of the relevant State Departments or the AAGF or employees of the AAGF entering the nursery to make inspections or to take samples for biological assay.	5. ASSESSMENT 6. NIASA ACCREDITATION 7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	 5.5 You must promptly comply with the NIASA Accreditation Procedures and all reasonable requirements of the NGIA and provide the Nursery Production FMS Auditor with all co-operation and assistance required to enable the NGIA to provide the NIASA Accreditation Services requested by You, including reasonable access from time to time to the Site facilities, documents and records belonging to You, and to Your employees, contractors and agents. 6.3 You will comply with NGIA's directions, acting reasonably, in relation to NIASA Accreditation. 7.3 You must maintain the Site, product, process or service and comply with all reasonable requirements that the NGIA considers necessary to ensure that NIASA Accreditation continues to be appropriate. 	☑ NIASA addresses requirement.
	6[c] A nurseryman must complete the Nurseryman Declaration of the Technical Report.	Application form for NIASA accreditation	Section E. Endorsement Compliance with Terms and Conditions	Will need to be addressed This is not a requirement of NIASA. Audit is conducted prior to accreditation and throughout accreditation and does not rely upon a declaration by the business. The business agrees to apply with NIASA requirements on application by agreeing to comply with the NIASA Terms and Conditions. ACTIONS Consult on removal of requirement.
	6[d] A nurseryman must advise the DPI/Dept of Agriculture Inspector IMMEDIATELY if there is any suspicion that a pathogen is present or in the event of a positive results indicating presence of pathogens.	N/A	N/A	 Will need to be addressed FMS auditors currently perform inspection roles. ACTION Consultation with provision to include notification requirements in the High Health Avocado Nursery Production Appendix.
	6[e] A nurseryman shall suspend all avocado orders to customers as ANVAS registered when	N/A	N/A	범 Will need to be addressed

ANVAS GUIDELINES	5	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	accreditation has been suspended because of a soil-borne plant pathogen by an ANVAS designated Plant Pathologist in soil samples taken directly from plants in the nursery, until accreditation is restored.			NIASA allows suspension of accreditation however does not impose requirements on an accredited business prior to suspension. ACTION Consult on options to be considered in the High Health Avocado Nursery Production Appendix.
	6[f] A nurseryman must not use chemicals to suppress the incidence of plant pathogens in plants in the ANVAS facility, however this may be carried out in the dispatch area, provided that the dispatch area in in the opinion of the inspector clearly segregated from the ANVAS facility.	N/A	N/A	 Will need to be addressed This is not a requirement of NIASA. ACTION Consult on alternative options to be considered in the High Health Avocado Nursery Production Appendix in consideration of HIA review report.
	6[g]A nurseryman must aim to produce all trees from propagation material from the Virus Tested Tree Registration Programme.	N/A	N/A	 Will need to be addressed This program is no longer in effect. Other options may be available to mitigate the risk of infected trees being sold. ACTION Other options may be considered in addressing the risk of sale of infected trees. Include requirements in NIASA High Health Avocado appendix. The DAFF is currently reviewing sampling procedures. Recommendations will inform testing requirements to be included within the High Health Avocado Nursery Production Appendix.
Varieties Committee of AAGF	6[h] ANVAS accreditation of nurseries; Development of protocol and procedures; Revoking, suspending or discontinuing ANVAS accreditation; Recommendations to AAGF; Varietal data; and Any decision to require random tests to be conducted for presence of suppressive chemicals.	N/A	N/A	 Will need to be addressed however no impediment noted This will be primarily be a responsibility of NGIA with consultation on specific issues with AAL including consultation on protocols and procedures and allocation of responsibilities for product branding. ACTIONS TOR to address roles and responsibilities of AAL and NGIA in consideration of NIASA Governance and Administration Framework.
ANVAS Registrar	Advise DPI/Dept of Agriculture Inspector of protocol and procedures; Request DPI/Dept of Agriculture Inspector to conduct inspections, sampling and where necessary investigations;	N/A	N/A	Will need to be addressed however no impediment noted This will be primarily be a responsibility of NGIA with consultation on specific issues with AAL. ACTIONS

ANVAS GUIDELINE	S	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	Advise Varieties Committee result of inspections, assays and investigations; Communicate decisions of Varieties Committee to nurseries and block holders; Bookkeeping; and Maintain tree list data base and planting material register.			TOR to address roles and responsibilities of AAL and NGIA in consideration of NIASA Governance and Administration Framework
DPI or Dept of Agriculture Inspector	 6[i] Conduct inspections and sampling in accordance with prescribed procedures contained in this protocol; 6[j] Conduct investigations to assist the nursery to isolate and eradicate pathogens from the nursery; 6[k] Provide technical advice to the Varieties Committee; 6[l] Provide timely reports to the ANVAS Registrar; and 6[m] Supervise destruction of diseases trees. 	GOVERNANCE AND ADMINISTRATION FRAMEWORK – 30 June 2017	 7. FMS AUDITORS 7.2 Functions The functions of the Nursery Production FMS Auditors include: (a) conduct Audits at the direction of the NGIA and produce Audit Reports; (b) record all Audit findings in the NAP; (c) advise the National Administrator of Audit completion; (d) at the direction of the NGIA to investigate and report back to the National Administrator on possible infringements of the Procedures; (e) to act impartially and in confidence, but have no responsibility for the collection of Fees; (f) to observe and comment on the efficacy of the Procedures, and (g) recommend changes to the National Administrator for consideration at subsequent Governance Committee meetings. 7.3 Reporting Nursery Production FMS Auditors must report promptly to the NGIA and National Administrator on all Nursery Production FMS Program activities of which they were a part. On matters relating to the NAP, resources and tools and relevant grower support materials, the Nursery Production FMS 	 Will need to be addressed however no impediment noted 'Inspector' role is in the most part being undertaken by NIASA auditors. NIASA does not provide for the destruction of diseased trees. ACTIONS TOR to address relevant roles and responsibilities of AAL and NGIA in consideration of NIASA Governance and Administration Framework.
7. Termination or Suspension of Accreditation	7[a] Accreditation shall terminate on 31 December but may be continuous if the annual application is successful.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	 7.2 Subject to these terms and conditions and unless earlier terminated under this Contract, Your NIASA Accreditation remains valid for subsequent calendar years on payment of an annual fee to NGIA (unless otherwise agreed with the NGIA). 	☑ NIASA addresses requirement. Consistency between NIASA and ANVAS on timeframe however mechanism varies.

ANVAS GUIDELINE	5	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	 7[b] Accreditation shall be suspended if, in the opinion of the AAGF: a) satisfactory nursery hygiene is not being maintained; b) plant health is unsatisfactory; c) Phytophthora, Pythium, Verticillium or other soil-borne plant pathogens is detected by a qualified Plant Pathologist; d) virus or viroid is detected by the indexing authority in nursery plants being sold as registered nursery trees; e) the nurseryman does not abide by the schedule of fees; f) rootstock and or varieties are misinterpreted; g) pasteurised potting mix has not been used. 	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	 7.3 You must maintain the Site, product, process or service and comply with all reasonable requirements that the NGIA considers necessary to ensure that NIASA Accreditation continues to be appropriate. 7.11 The NGIA may suspend or terminate Your NIASA Accreditation with immediate effect by giving notice to You if the NGIA reasonably believe that NIASA Accreditation is no longer appropriate or You breach this Contract. 7.12 If Your NIASA Accreditation is suspended: (a) the NGIA will, within thirty (30) days of notifying You of the suspension, furnish You with information outlining the steps that must be taken by You to enable the suspension to be lifted; (b) You must immediately take all steps necessary to enable the suspension of Your NIASA Accreditation to be lifted; and (c) You must take all steps reasonably required by the NGIA to prevent the public being misled or misinformed. 	☑ NIASA addresses requirement. NIASA relies on non-compliance with requirements to determine if 'NIASA accreditation continues to be appropriate'. There is no specific list of breaches that incur mandatory suspension.
	7[c] Accreditation shall be terminated if, in the opinion of the AAGF, the nurseryman has abused any privileges or neglected any responsibility of the Scheme.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	 7.11 The NGIA may suspend or terminate Your NIASA Accreditation with immediate effect by giving notice to You if the NGIA reasonably believe that NIASA Accreditation is no longer appropriate or You breach this Contract. 7.14 The NGIA may terminate Your NIASA Accreditation with immediate effect by giving notice to You, if Your NIASA Accreditation has remained suspended for a period of more than ninety (90) days. 7.15 If Your NIASA Accreditation expires or is terminated or the Contract is terminated or You no longer wish to be NIASA Accredited, You must immediately: (a) pay to the NGIA all amounts owing but unpaid by You; (b) cease using any NIASA Accreditation Mark; (c) withdraw from public display and return to the NGIA, as required by the NGIA, the original and all copies of the Certificate; (d) cease all advertising, promotions or other publication of the fact of NIASA Accreditation; (e) take any steps reasonably required by the NGIA to notify staff, customers and/or suppliers of the expiry or termination of the NIASA Accreditation; 	☑ NIASA addresses requirement.

ANVAS GUIDELINE	S	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
			 (f) take steps to repaint or redecorate signage or other parts of Your Site to remove all references to NIASA Accreditation; (g) stop using the NGIA's confidential information and, at the NGIA's option return to the NGIA all the NGIA's confidential information in Your possession or control; and 7.16 take all other necessary steps to ensure that third parties are not misled to believe that the NIASA Accreditation has not expired or been terminated. (i) stop using the NGIA's confidential information and, at the NGIA's option return to the NGIA all the NGIA's confidential information and, at the NGIA's option return to the NGIA all the NGIA's confidential information in Your possession or control; and (ii) take all other necessary steps to ensure that third parties are not misled to believe that the NIASA Accreditation has not expired or been terminated. 	
8. Restoration of Accreditation	8 [a] The AAGF may restore accreditation to a nurseryman upon meeting all the necessary guidelines.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	 7.12 If Your NIASA Accreditation is suspended: (a) the NGIA will, within thirty (30) days of notifying You of the suspension, furnish You with information outlining the steps that must be taken by You to enable the suspension to be lifted; (b) You must immediately take all steps necessary to enable the suspension of Your NIASA Accreditation to be lifted; and (c) You must take all steps reasonably required by the NGIA to prevent the public being misled or misinformed. 	☑ NIASA addresses requirement.
9. Sampling procedures for ANVAS	9 [a] Procedures to be followed by DPI inspector for taking soil and root samples in ANVAS facilities are set out in the ANVAS Sampling procedures.	NIASA APPENDIX 2 – SAMPLING AND DETECTING MAJOR PLANT PATHOGENS IN POTTED PLANTS, GROWING MEDIA, SOIL AND WATER SUPPLIES	 A.2.1 Detecting fungal plant pathogens A.2.2 Sampling considerations for diseases other than caused by Phytophthora spp. A.2.3 Collecting and sending plant samples for laboratory testing A.2.4 Direct isolations A.2.5 Direct microscope examination A.2.6 Baiting for Phytophthora spp. A.2.7 Symptoms of Phytophthora diseases A.2.8 Baiting water supplies A.2.9 Other detection techniques A.2.10 Sampling precautions to prevent spread of diseases or cross contamination of samples A.2.11 Collecting samples from growing media suppliers 	✓ Will need to be addressed however no impediment noted ACTIONS The DAFF is currently reviewing sampling procedures. Recommendations will inform testing requirements to be included within the High Health Avocado Nursery Production Appendix.
10. Action on obtaining a positive pathogen result	10[a] A follow up inspection and resampling by DPI inspector is to be conducted to confirm infection, and determine the extent of contamination and determine the likelihood of elimination.	N/A	N/A	 Will need to be addressed however no impediment noted ACTIONS Recommendations on action on receipt of a positive test result to be considered and options provided to AAL for consultation.

ANVAS GUIDELINES	6	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
				Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.
	10[b] If in the opinion of the inspector the outbreak is widespread a recommendation to revoke ANVAS Accreditation is to be sent to the ANVAS Registrar.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	7.11 The NGIA may suspend or terminate Your NIASA Accreditation with immediate effect by giving notice to You if the NGIA reasonably believe that NIASA Accreditation is no longer appropriate or You breach this Contract.	☑ NIASA addresses requirement.
	10[c] If further inspection and sampling indicates an isolated outbreak the diseased trees are to be destroyed under supervision and further testing conducted to ensure elimination of these pathogens from the ANVAS facility before ANVAS accreditation will be afforded.	N/A	N/A	 Will need to be addressed however no impediment noted ACTIONS Recommendations on action on receipt of a positive test result to be considered and options provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.
11. Use of private inspectors	 11[a] Only DPI/Dept of Agriculture Inspectors appointed under the respective Plant Health Acts are authorised as the official inspectors of the scheme. 11[b] Nurseries are however free to employ private inspectors, pest scouts or consultants and carry out any sampling and testing as they desire, including assay for plant pathogens. 11[c] In the event of a positive result being obtained under any circumstances, the nursery is obligated to advise the DPI/Dept of Agriculture Inspector. 11[d] The DPI/Dept of Agriculture Inspector is to investigate all positive pathogen results as "highly suspicious", however the initial result is NOT to be regarded as official until a positive result is obtained from a sample obtained by the official inspector. 11[e] The DPI/Dept of Agriculture Inspector is to report the result of his investigation, including further testing, to the ANVAS Registrar. 11[f] The Registrar is to advise the Varieties Committee of the investigation and outcome. 11[g] AAGF is to decide on accreditation or 	N/A	N/A	 MIASA addresses requirement. Inspectors are no longer engaged for ANVAS. The role is undertaken by NIASA FMS Auditors. NIASA allows for the use of technical officers and does not preclude other persons as 'private inspectors'. Nursery reporting requirement to be considered. ACTIONS Include reporting requirements for positive detections in High Health Avocado Nursery Production Appendix.

ANVAS GUIDELINES	5	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
12. Assay for suppressive chemicals	 12[a] The Varieties Committee may require random assay for suppressive chemicals where 12[b] the Committee is satisfied there is a likelihood that these chemicals are being used. 12[c] Such testing will be at the expense of AAGF. 12[d] In the event of a nursery being found to be using suppressive chemicals, the Varieties Committee may terminate ANVAS accreditation. 	N/A	N/A	 Will need to be addressed ACTIONS Recommendations on suppressive chemical use provided for in the ANVAS review project considered and options provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.
13. Penalties	13[a] Failure of disclosure on the Nursery Application may preclude accreditation. Failure of the nursery to fully comply with the protocol may also preclude accreditation.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	7.11 The NGIA may suspend or terminate Your NIASA Accreditation with immediate effect by giving notice to You if NGIA reasonably believes that NIASA Accreditation is no longer appropriate or You or you breach this Contract.	☑ NIASA addresses requirement.
	13[b] Evidence of continued failure to comply with this protocol may result in the nursery not being ANVAS accredited in the future.	7. AFTER NIASA ACCREDITATION NIASA TERMS AND CONDITIONS – 19 July 2017.	7.11 The NGIA may suspend or terminate Your NIASA Accreditation with immediate effect by giving notice to You if NGIA reasonably believes that NIASA Accreditation is no longer appropriate or You or you breach this Contract.	☑ NIASA addresses requirement.
14. Block Registration	 Application for registration of a candidate nuclear, multiplication or registered tree shall be made to the AAGF within (3) three calendar months of the date shown on delivery docket. A candidate nuclear tree shall be assigned an intest identification number consistent with the Australian Agricultural Council Accession List of Virus Tested Fruit Varieties and indexed in a glasshouse facility approved by the AAGF. A candidate multiplication tree or candidate registered tree shall have an identification number which shall include the number or numbers of the foundation and/or nuclear source trees. Registration of foundation, nuclear, multiplication and registered trees shall be continuous unless they are disqualified. Foundation and nuclear trees will be indexed at least every five years and multiplication trees will be indexed at least every twenty years. 	N/A	N/A	 Will need to be addressed This program is no longer in effect. The risk is that a production nursery uses infected material and provides infected trees for sale. This is not currently implemented and provides a significant burden upon the administrator and user. Other options to address sourcing and use of virus tested materials may be considered. ACTIONS Recommendations on block registration considered and options provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.

ANVAS GUIDELINES		NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	A nominee of the AAGF shall inspect all plantings of candidate trees to verify compliance with these regulations prior to registration or for the purposes of determining whether or not any registration shall be cancelled or amended. This will be on a twelve monthly basis for foundation, nuclear and multiplication trees.			
15. Testing Procedures for Registered Trees	Testing procedures prescribed under these regulations shall be conducted in a manner approved by the AAGF. Each indexing test shall involve a test for sunblotch infection either by a graft transmission test or a biochemical test. A graft transmission test shall have a minimum of ten avocado seedlings grown from foundation or nuclear stock, and each indicator seedling shall be graft-inoculated with a minimum of two independent buds from the candidate tree. The graft-inoculated indicator plants shall be observed for a period of not less than two years, except where results show the candidate tree to be virus infected or inspections reveal the tree to be off-type. A biochemical test shall be sufficiently sensitive to specifically detect one nanogram of avocado sunblotch viroid in one gram dry weight of leaf tissue. An indexing authority may prescribe additional tests if seasonal conditions or other factors tend to obscure virus symptoms, when virus infection is suspected but not yet confirmed, or when symptoms may be masked in a particular variety. The AAGF may, at the request of an indexing authority, permit the use of less than ten indicator seedlings per test, some other indicator plant, or some other indexing method. The indexing authority shall provide a written report on the results of indexing tests before registration of a candidate tree is granted.	N/A	N/A	 Will need to be addressed This program is no longer in effect. Testing procedures are currently being reviewed by DAFF. ACTIONS Testing procedures are currently being reviewed and options will be provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.
16. Planting and	An applicant will be responsible for the selection	N/A	N/A	🗵 Will need to be addressed
Management of Registered Blocks	of candidate tree, the location of the planting, making application for registration, the proper			This program is no longer in effect.

ANVAS GUIDELINES	S	NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	maintenance of a planting and for maintaining the identity of all trees. An applicant will make arrangements with the owner of the property on which the trees are located so that inspections and collections of propagation material for testing purposes can be done with the owner's consent. No tree in this programme may be planted within fifteen metres of a non-registered avocado tree or any known host of avocado sunblotch viroid. Cutting tools used on any tree in this programme shall be either restricted for that nurpose or			The risk is that a production nursery uses infected material and provides infected trees for sale. ACTIONS Recommendations on block registration and planting and management of blocks considered and options provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.
	thoroughly cleaned with sodium hypochlorite.			
17. Refusal or Cancellation of Registration	Registration may be refused or cancelled for any trees in this programme if: a) fees prescribed under these regulations are not paid; b) a tree, or any alternative host tree, within fifteen metres of it is found to be virus infected; c) a tree is off type; d) the identity of a tree becomes uncertain or has not been properly maintained; e) a misrepresentation is made in relation to any matter under this programme; or f) any other requirement of these regulations has not been met.	N/A	N/A	 Will need to be addressed This program is no longer in effect. This is not currently implemented. ACTIONS Recommendations on refusal and cancellation of registration considered and options provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.
18. General Administration for Registered Blocks	Participation in this programme shall be voluntary and may be withdrawn at the option of the applicant. The applicant shall furnish any information requested and shall give his consent to the AAGF or any indexing authority to take propagation material for testing purposes. Registration under this programme shall not imply any warranty or endorsement on the part of the AAGF, its affiliated bodies or any indexing authority. Any claim for rights to plant patents or other forms of exclusive control over any tree shall be the prerogative of the applicant and the AAGF shall not by reason of registration under the programme be deemed to be supporting or hindering any such claim.	N/A	N/A	 Will need to be addressed This program is no longer in effect. ACTIONS Recommendations on block registration and associated matters considered and options provided to AAL for consultation. Outcome of consultation provided for in the High Health Avocado Nursery Production Appendix.

ANVAS GUIDELINES		NIASA SCHEME		OUTCOME
Section	Requirement	Section	Requirement	
	The AAGF shall prescribe forms of application			
	and certificates of inspection and registration as			
	may be required.			
	The AAGF shall from time to time, appoint a			
	Registrar to administer all matters pertaining to			
	these regulations and shall determine the period			
	and terms of such appointments. The Registrar			
	will maintain a register of trees in this			
	programme, and record any other matters			
	related to these regulations.			
	The AAGE shall proscribe a schedule of fees to			
	finance administration inspections and indexing			
	costs of this programme but may waive payment			
	of fees in special circumstances.			
	The AAGF shall prepare consecutively numbered			
	labels which shall be used exclusively on trees			
	eligible for registration under these regulations.			
	These labels will be made available to supplying			
	nurserymen selling nuclear or multiplication			
	stock as seed, marcoted rootstocks, seedlings or			
	grafted plants after pre-payment of fees.			
	An applicant may use an AAGF label as evidence			
	to establish the origin of a candidate tree,			
	providing the label is annotated by the supplying			
	number of the foundation or nuclear source			
	trees.			
	An applicant who disagrees with a decision of			
	the AAGF concerning any matter under these			
	regulations may make a written submission to			
	the AAGF for review. The decision of the AAGF			
	will be final.			

Appendix 5. Addressing ANVAS technical requirements within the NIASA Guideline

Addressing ANVAS technical requirements within the NIASA Guideline.

NIASA GUIDELINE						RELATED ANVAS TECHNICAL CRITERIA	COMMENT
1 CROP HYGIENE						Related Chapter	
1.1 The prevention of root diseases						Related section	
1.1.1 Water						TECHNICAL REPORT. A12.	Risk is addressed in NIASA.
Reticulated (t treatment.	own) water and wa	ater from bores	and clean roof	catchments should not re	equire disinfestation	Is water obtained from a deep well or bore NOT exposed to surface run off? (yes/no) <u>OR</u> Is water chlorinated and tested to ensure that	NIASA makes provision for pathogen prevention through modern best practice management of water, and disinfestation of water, where appropriate including chlorination at the rate provided by ANVAS
earth dam or uncovered tank, then it must be treated as for surface water supplies. Note: town water in some country areas is not treated by the supply authority and may require disinfestation.						it contains at least 2mg/kg available chlorine at time of treatment (yes/no)	Water is also addressed in NIASA Nursery Production Checklist and Growing Media Supplier Checklist (See APPENDIX 5 and 11):
Water sourced from non-contaminated sources or disinfested and stored for subsequent use must be stored in such a way as to prevent contamination by pathogens.							 Section 1: Water and irrigation - (Source). Section 1: Water and irrigation - (Disinfestation).
Table 2 - NIAS	SA approved water	disinfestation r	nethods				It is recommended that additional options for water disinfestation
Chemical D	isinfectants						provided for in NIASA are adopted for avocado production (NIASA
Name	Residual level after contact	Contact time	Effective water pH	Comments		risk mitigation procedures include a su practice disinfestation options).	risk mitigation procedures include a suite of up to date best practice disinfestation options).
	time (ppm)	(minutes)	range				Based on the recommendation, for an ANVAS "High Health Avocado Production" Appendix, the recommended approach could provide the following advice while highlighting key points:
Chlorine	2.5	20	5.5 – 7.5	Decreased efficacy at higher pH			Water Water is managed in accordance with requirements provided in
Chloro	3	8	5.5 – 9.0	Increase contact			NIASA section 1.1.1 Water.
Chlorine	3	8	50-100	Increased efficacy			Kou nointe for Uinh Horth Augenda muchustion annondiu
dioxide	5	0	5.0 10.0	with higher pH			Water that is obtained from town suppliers, hores or clean
Ozone	1.4	16	Nil	Requires complete mixing into water			catchments does not require disinfestation. Other sources of water must be disinfested using an approved
lodine	5	30	Nil	Increased efficacy at approx, 20°C			disinfestation procedure. Subsequent storage of water requires facilities and procedures
Non Chemi	cal Disinfestation						that do not allow for contamination by untreated water,
Name		Treatment r	egime				soil, plant debris, dust and animal movement.
Ultrafiltration <0.1µm							
UV irradiation		>60% UV transmittance at 254µm					
Slow Flow Filtration (SFF) ≤100L/hr/m² flow rate (**)							
1.1.2 Growin	g media/propagati	ng media				TECHNICAL REPORT. A3. Potting mix.	Risk is addressed in NIASA.
Disinfestation	n of growing media	. Growing med	lia or growing n	nedia components, which	present a risk of	- at least 25 cm deep in container (state	NUACA and a set of the formation of the three devices that
contamination (non- approved materials), must be treated by an approved method. More detailed						depth)	NIASA makes provision for pathogen prevention through modern best
amount treated method used and results must be kent						- usimesteu with steam, methyl bromide or not disinfected (specify)	disinfestation of growing media using a number of techniques and
NIASA growing media suppliers. Growing media components other than those generally accented as being						- stored in sterile bins or on disinfested	where appropriate. NIASA also provides comprehensive guidelines for
pathogen-free (for example perlite and vermiculite), or consistently testing free of specified pathogens, or which are routinely disinfested by any of the approved methods already described (approved materials),						sealed floors (specify)	growing media quality.

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
 NIASA GUIDELINE must be from an approved source. An approved source is a NIASA accredited growing media supplier of pathogen-tested materials (Appendix 1). If not from an accredited source it must be pathogen tested. Growing Media Quality. Each batch of growing media no be tested for EC and pH using suitable equipment. Adequate records of all growing media mixing areas (if growing media is not to be subsequently treated or disinfested) must be situated on surfaces and in areas, which both shed and exclude runoff water and exclude contamination by tracked soil and other possibly contaminated materials. Mixing surfaces and equipment must be suited to easy cleaning. Storage of growing media. Growing media needs to be stored in facilities that effectively prevent infestation or reinfestation by roor tor organisms. As such, all growing media and growing media components which and exclude runoff water and exclude contamination by troided in appendix 1. Trailers and troilleys. Different types of growing media is abuld be stored separately to avoid possible cross contamination. More specific information is provided in Appendix 3. All storage surfaces must be suited to easy cleaning between batches. Where the possibility of disease risk occurs, the site must be assayed for the presence of soil borne plant pathogens. Storage areas for approved growing media. Treated growing media and growing media and proving media and proving media and proving media and proving media and prowing media and prowing media and prowing media and proved manner (Appendix 3). Prensot of growing media. Treated growing media and growing media determined as being free of specified pathogens must not be contaminated during handling and transport. Equipment used to transport growing media and the wing the audit of the subsequent set of solic forwing media must be effectively separated from areas used to torappendia.	 RELATED ANVAS TECHNICAL CRITERIA well aerated, free draining, adequate holes in base of containers (yes/no) For A3 also see: 1.1.15 – Containers; A.1.5 Prevention of product, equipment & site contamination; and APPENDIX 3 – Disinfestation procedures for nursery growing. 	 COMMENT However, in NIASA, growing media disinfestation is only directed at mixes which include [non-approved] materials that present a risk of contamination. Non-approved materials are addressed in NIASA Appendix 3. <u>It is not recommended</u> that this procedure is changed for avocado production as NIASA risk mitigation is directed only at materials that pose a risk. NIASA does not directly specify potting mix to be of 25cm depth in container and specification for adequate holes in the base of containers. It is unlikely that related issues would occur based on commercial containers/bags currently in use. <u>It is not recommended</u> that this requirement from ANVAS be specifically carried through, however if considered necessary provision could be made to include advice in an Avocado High Health Production appendix to include a statement to the effect '<i>In addition, containers must provide for adequate drainage and the size of the container used must consider the vigour of the plant and the time that the plant will be occupying the container in order to allow appropriate root development and prevent excessive root binding (see NIASA section 2.6 Root binding)</i>'. These requirements are also listed in NIASA Nursery Production Checklist (See APPENDIX 5): Section 2: Growing media (Propagation growing media source), (Propagation growing media quality), (Propagation growing media mixing), (Production growing media storage and handling) Section 3: Completed growing media finished product processes) - Disinfestation procedures, Records of disinfestation and testing e.g. composting, boiling, etc For an ANVAS "High Health Avocado Production" Appendix the recommended approach could provide the following advice while highlighting/reinforcing key points: Growing media/propagating media Growing media for main and testing e.g. composting. boiling, etc For an ANVAS "High Health Avocado Production Appendix. Growing media

Hort Innovation - Final Report: Implementation of Recommendations from the Avocado Nursery Voluntary Accreditation Scheme Review

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		Growing media/propagating media that is sourced from a non- NIASA accredited growing media supplier requires pathogen testing and treatment prior to use. Growing media/propagating media prepared on-site which includes components that pose a risk of contamination, for example river sand, must be disinfested using an approved disinfestation procedure. Growing media/propagating media must be stored in a manner to prevent contamination prior to use.
 1.1.3 Motherstock plants Motherstock plants must be monitored for pests, diseases and weeds and treated as appropriate with plant protection chemicals to decrease the possibility of pests, diseases and weeds entering propagation facilities. Drainage must be adequate to promote plant health and prevent the contamination of propagules. A suitable system for identifying plants by variety needs to be in place. Seeds must either be collected from the plants or if collected from the ground, treated in a manner approved by the Nursery Production FMS Auditor. This could include the use of a suitable heat disinfestation procedure or chemical treatment, depending on the nature of the material. Cuttings must be obtained, where possible, from parts of the plant not contaminated by soil splash. Mulching is recommended to minimise contamination of the lower part of the plant with soil. Cuttings should be routinely disinfested. Divisions must come from motherstock free of pests, weeds and diseases. Where motherstock is in-ground, good drainage is essential. 	KEY AREA – PROPAGATION MATERIAL QUALITY TECHNICAL REPORT. A1. and A2. 1. Seed and budwood from registered virus- tested multiplication trees (yes/no) 2. Seed harvested directly from parent tree and/or heat treated (specify)	 NIASA does not address the registration requirements and testing requirements of ANVAS for collection and use of seed and budwood material. Currently the virus tested tree registration program is not in operation. It is reasonable to assume significant administrative cost associated with the governing body re-establishing, registering and tracking registered trees. Options must consider the use of imported seed as propagation material which appears to be required for supply reasons and would not be able to be used under existing ANVAS rules. Two practical options might be considered for inclusion of viroid testing into an Avocado High Health Production Appendix. Business maintains records of motherstock blocks/ multiplication trees used for collection (with a suitable system for identifying trees in place) AND results of testing in accordance with an approved testing procedure specified within the appendix; or NOTE: The current NZ scheme provides this option with each tree to be sampled before first use (ASBVd). They report that updated procedures allow bulking of samples to cover 10 trees per PCR test. 100% testing must be completed again every 5 years after initial testing (with 20% of the plants tested each year). End point testing is also required for plants produced. 5 out of every 1000 plants must be sampled. 50 plants may be bulked into one PCR test (one PCR test per 10,000 plants produced). Business conducts end-point testing of propagated trees in accordance with an approved procedure included in the appendix and maintains records of results of that testing. NOTE: The current NZ scheme provides this option with end point testing required for plants produced. 5 out of every 100 plants must be sampled. 50 plants may be bulked into one PCR test (one PCR test per 10,000 plants produced).

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		Must be addressed in NIASA Appendix.
		NIASA does provide for risk mitigation in the collection of seeds in the
		manner specified within ANVAS.
		For an ANVAS "High Health Avocado Production" Appendix, for
		propagation materials, considering the options provided, the
		following advice could be included while highlighting/reinforcing
		key points –
		Seed hudwood and scion material
		Lise of infected propagation material can result in infection of
		propagated trees.
		h h . Qu
		Seed
		Seed must be collected from:
		multiplication trees that have been subject to the approved
		viroid testing procedure and found to be free of viroids (see
		Testing of multiplication trees); or
		propagated plants must be tested prior to consignment and
		found free of viroids (see Testing of propagated plants).
		Phytophthora can enter wind fallen fruit and arow into the seed
		To address the risk of phytophthora infection, seed to be used for
		plant propagation may either be collected from fruit attached to
		a tree. or they must be treated in an approved way prior to use
		(see NIASA section 1.1.3 Motherstock plants - seed).
		Budwood and scion material
		Budwood or scion material must be collected from:
		multiplication trees that have been subject to the approved
		viroid testing procedure and found to be free of viroids (see
		Testing of multiplication trees); or
		propagated plants must be tested prior to consignment and
		jound to be free of virolds (see resting of propagated
		piuntoj.
		Records of collection of seed, budwood or scion material from
		multiplication trees
		A record must be made and maintained for propagation material
		collected from multiplication trees that includes:
		The date of collection and the name of the collector/s.
		Identification of the multiplication tree including the site
		address, block name and a description of where the tree is
		plantea within the block, for example, by providing a GPS
		coordinate, a row and tree number, or a unique tag
		Identification of the material type to the cultivar level
		A code that will be used to trace use of the propagation material
		throughout the propagation process.
NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
------------------------	--	--
		Evidence of any testing of the tree/s in accordance with the
		approved viroid testing procedure (see Testing of
		multiplication trees) prior to collection.
		Records of seed, budwood or scion material not collected from
		multiplication trees
		A record must be made and maintained for propagation material that is not collected from multiplication trees that includes:
		The date of receipt of the material.
		Identification of the origin of the material including business
		name and address.
		Identification of the material type to the cultivar level.
		A code that will be used to trace the propagation material
		throughout the propagation process.
		I shalling of metarials and propagated plants
		Propagation materials must be clearly labelled prior to use. The
		label must include a code that identifies and links the material to
		the propagation material record to allow tracing back to
		multiplication trees or source material suppliers should
		propagated plants be found to be diseased.
		Each propagated plant must carry a label throughout the
		A code that links material used for its propagation to the
		propagation material record.
		The rootstock and/or scion material used.
		Whether the propagated plants include materials that have not
		been subject to viroid testing.
		Key points for High Health Avocado production
		collected from viroid tested multiplications trees OR
		propagated plants containing non-viroid tested material
		must be tested prior to consignment in accordance with
		the approved procedure.
		Seed that is not collected directly from a tree must be subject to
		an approved treatment prior to use.
		Records must be made and maintained that allow the
		nuenujication of the origin, cultivar and virola test status of propagation materials used for each propagated plant
		Each propagated plant must carry a label identifies the origin of
		materials used for its propagation, the rootstock and/or
		scion material used, and whether the plant includes
		material that has not been subject to viroid testing.
1.1.4 Working surfaces	KEY AREA – DECONTAMINATION/HYGIENE	Does not directly address ANVAS an ANVAS requirement but expands on
	TECHNICAL REPORT. A4	ANVAS requirements and contributes to risk mitigation for introduction
	Hose nozzles kept off nursery floor (yes/no)	and spread of pathogens and other contaminants from working
	TECHNICAL REPORT. 45	Surraces.

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
	Utensils, containers, trolleys and barrows	See Comment for 1.1.5 Tools.
	confined to nursery area and regularly	
	disinfested with chemicals (comment)	
1.1.5 Tools	KEY AREA – DECONTAMINATION/HYGIENE	This section needs expansion in the High Health Avocado Production
All tools need to be treated between batches of growing media or after use, by first cleaning off surface	TECHNICAL REPORT. A4	Appendix.
residue and then scrubbing of pressure cleaning using an acceptable disinfectant.	Hose nozzies kept off hursery floor (yes/ho)	(1, 1, 6) in Nurson, Production, It is dealt with appropriately for footwear
	TECHNICAL REPORT 45	production only in Site Sanitation
	Utensils, containers, trolleys and barrows	
	confined to nursery area and regularly	However, it is listed in NIASA Checklist:
	disinfested with chemicals (comment)	 Section 3: Propagation (Plant propagation area) – Routine
		decontamination procedures – tools.
		For an ANVAS "High Health Avocado Production" Appendix,
		decontamination and hygiene could be expanded to provide the
		following advice while highlighting/reinforcing key points:
		Decontamination and hygiene
		For the control of plant pathogens, disinfestation and hygiene
		procedures are paramount in any production nursery.
		Disinfestation, or sanitation, means removing contamination
		from potentially infested items. Chemical disinfectants or
		detergents and heat treatments are still the most reliable
		methods for the control of most plant pathogens.
		Hygiene means taking steps to prevent things from becoming
		contaminated where possible.
		·
		Hygiene steps include avoiding contact of items with potentially
		infested surfaces, for example keeping hose nozzles and hand
		tools off the nursery floor.
		Drongring disinfectant colutions
		When preparing disinfectant or detergent solutions
		Follow all label requirements and safety precautions when
		handling chemicals.
		Only use freshly prepared disinfectant solutions.
		When using chlorine based chemicals, diluted chlorine solutions
		are particularly unstable and must be made up fresh daily.
		Undiluted chlorine must be stored out of direct sunlight in a cool
		100M preferably below 28 C. Quaternary ammonium compounds (QUAT) are incomposible
		with most cleaners and deteraents and have a low tolerance to
		hard water (increasing with calcium carbonate ($CaCO_3$) above
		120mg/L). As a biocide the added benefit of using a QUAT is the
		ability to leave a residual anti-microbial film on surfaces. At

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		concentrations greater than 1-10ppm they are regarded as highly toxic to some aquatic life forms.
		Copper sulphate (CuSO ₄) can be extremely toxic in water of low alkalinity and is ineffective at high pH. Its persistent nature makes it a good biocide however it can also be absorbed by soil and organic material. In working concentrations, it can also be lethal to some aquatic life forms. The business must also: dispose of spent disinfectant solutions responsibly as per the product label. if handling and storing bulk chemicals (e.g. chlorine) complete a risk assessment and develop an 'Emergency Response Plan' document. NOTE: Some QUATS are highly toxic to plants and care MUST be taken to select an appropriate product when treating near crops. Decontamination and hygiene procedures Hand hyaiene
		High hygiene levels must be maintained in risk areas such as propagation, potting or staging operations. The business must ensure that hands are washed thoroughly between operations using an approved hand disinfectant such as Sunlight soap, Savlon or Dettol antiseptic soap, or disposable gloves are used and changed between operations.
		<i>Footwear</i> Footwear decontamination and hygiene is undertaken in accordance with requirements provided in NIASA section 1.1.6 Footwear.
		Footwear must be clean and must not have been in contact with soil and/or vegetative material that could transfer pests and pathogens into the production areas.
		If footwear does not meet this requirement, a business must:
		install foot baths at all entrance points of production areas; or scrub clean with a brush prior to using an approved disinfectant or detergent solution to spray footwear; or change footwear and use only designated footwear in the working area; or provide boot covers for all staff, contractors and visitors.
		Tools, knives and other instruments Tool decontamination and hygiene is undertaken in accordance with requirements provided in NIASA section 1.1.5 Tools.
		Cutting tools need to be treated at a minimum between batches of propagated plants, and as frequently as between trees when

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		collecting material from motherstock trees by first cleaning off surface residue and then scrubbing or pressure cleaning using an acceptable disinfectant.
		Equipment Equipment including trolleys, barrow and trays that come into contact with vegetative propagation material or inputs such as growing media should be routinely cleaned with a brush or pressure washer then treated with an approved disinfectant or detergent.
		<i>Plant Containers (pots, bags and trays)</i> Containers are managed in accordance with requirements provided in NIASA section 1.1.15 Containers.
		Used containers, or new containers not stored in a way to prevent contamination, pose a significant risk of transfer of pathogens and if used, must be decontaminated.
		It is important to use effective protocols for the disinfestation of plant containers and emphasise that a quick chemical dip treatment will not disinfest surfaces. Using chemicals in the procedure requires the use at an appropriate concentration for an approved contact time. Heat treatment (pasteurisation) also has a defined set of parameters that include the appropriate temperature for an approved contact time.
		In addition, containers must provide for adequate drainage and the size of the container used must consider the vigour of the plant and the time that the plant will be occupying the container in order to minimise the risk of development of root disease and allow appropriate root development and prevent excessive root binding (see NIASA section 2.6 Root binding).
		Working surfaces Working surface decontamination and hygiene is undertaken in accordance with requirements provided in NIASA section 1.1.4 Working Surfaces.
		Key points for High Health Avocado production High hygiene levels must be maintained in risk areas such as propagation, potting or staging operations. Production/staging areas should be protected from contamination by ensuring staff entering an area have clean hands and footwear is clean and decontaminated.

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		 Tools, knives, other instruments, equipment and working surfaces must be cleaned and disinfected regularly. New clean containers need not be disinfected however used containers must be reasonably cleaned of waste material and then disinfested using an approved disinfestation procedure. Clean and disinfected containers must be stored above floor level to prevent soil, plant debris and drainage water containers/bags must allow for adequate drainage and be of sufficient size and volume to prevent the development of root diseases and for adequate root development.
1.1.6 Footwear Where contamination of footwear may have occurred; either they should be cleaned and disinfested, or changed at different workstations. Methods of disinfestation should be in compliance with health regulations in each state. Regularly replenished and cleaned footbaths may be essential in some situations (for instance at entries to in-ground sites).	KEY AREA - DECONTAMINATION TECHNICAL REPORT. A9. Security. -Public and stray animals restricted entry (yes/no) -Loading area isolated from nursery (yes/no) -Foot baths at entrance property installed and maintained (comment) For A9 also see: • 1.1.8 - Access; • A.1.5 - Prevention of product, equipment & site contamination; and • A 12.6 Unloading	 Risk is addressed in NIASA but could be strengthened in NIASA Appendix. Requirements are also included in the NIASA Nursery Production Checklist (See APPENDIX 5): Section 3: Propagation (Plant propagation area), (Acclimatisation Facilities – Hardening off) – Footbaths. Section 3: Propagation (Plant propagation area) – Footbaths. See comment above in 1.1.5 Tools.
1.1.7 Vehicles	N/A	Contributes to risk mitigation for introduction and spread of pathogens and other contaminants onto and within the site.
 1.1.8 Access Pests and diseases can be easily spread on hands, clothing, footwear and equipment. Access to in-ground stock areas and propagation facilities must be restricted to all but essential traffic. Propagation areas must not be thoroughfares for staff or materials involved in materials and plant handling operations unrelated to propagation. Propagation propagules areas should also be separated from sources of contamination. 	 KEY AREA – HYGIENE TECHNICAL REPORT. A9. Security. Public and stray animals restricted entry (yes/no) Loading area isolated from nursery (yes/no) Foot baths at entrance property installed and maintained (comment) For A9 also see: 1.1.6 – Footwear; A.1.5 - Prevention of product, equipment & site contamination; and A 12.6 Unloading. 	 Risk is addressed in NIASA. No additional content required. Access to propagation areas limited to essential traffic. Also addressed in the NIASA Nursery Production Checklist (See APPENDIX 5): Section 3: Propagation (Propagules Preparation area), (Plant Propagation area), (Acclimatisation Facilities) – Access restrictions. Section 9: Plant imports – Receiving area/quarantine facility for inspection purposes clearly identified.
1.1.9 Removal of plant and growing media wastes Discarded plants and spilt growing media are to be accumulated in specially allocated containers and removed on a frequent basis. Plants with difficult to control pests (e.g. Western Flower Thrips and Silver Leaf Whitefly) and diseases (especially viruses) should be removed promptly from the production area. Delays cause an accelerated spread of pests and disease.	KEY AREA – HYGIENE TECHNICAL REPORT. A8. Waste soil and plant material regularly burnt or taken away (yes/no)	Risk is addressed in NIASA. No additional content required. NOTE - NIASA does not allow for the burning of waste which is consistent with modern waste disposal regulations. Waste material management is addressed in the NIASA Nursery Production Checklist (See APPENDIX 5):

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		Section 2: Growing Media (Plant growing media mixing) – Disposal
		of used or contaminated growing media in an appropriate manner.
		Section 3: Propagation (Plant propagation area) – Refuse disposed
		of in an appropriate manner.
		Section 10: Plant growing and storage containers – Waste materials
		disposed on in an appropriate manner.
1.1.10 Floors and pathways	KEY AREA – HYGIENE	Complies partially but could be strengthened in NIASA APPENDIX if
Propagating facilities. Although sealed surfaces are preferable, gravel is permitted on paths and under	TECHNICAL REPORT. A6.	necessary.
benches where the ground is well drained and the coarse gravel aggregate is 10–25mm in diameter and at	Floors of nursery and hardening-off area	
least 75mm deep. However, disease organisms such as Botrytis spp. can become a problem in older facilities	sealed (yes/no)	NIASA provides for sealed surfaces or use of course gravel aggregate at
frequent basic. Plant debris must not be placed on the floor. Dead and disacced plants and propagules should		a depth of 75mm deep.
he placed directly into specially allocated containers (refer Section 1.1.9). Eoothaths can greatly reduce the	Suitable dust suppression (ves/po)	It is recommended that NIASA procedures for floors and nathways are
risk of disease entry into these areas		adopted for High Health Avocado Production
Production facilities. Pathways adjacent to containerised plant production facilities should be sealed using	For A11 also see:	
bitumen or concrete or by the use of coarse gravel (10–25mm diameter) on a consolidated graded surface at	• 2.2 - Wind control.	NOTE- existing ANVAS nurseries use course gravel aggregate.
a depth of at least 75mm. Pooling is unacceptable on pathways, roadways and surfaces used for plant		
production. Roadways adjacent to production facilities must be properly drained and consolidated, and		NOT listed in NIASA Checklist:
preferably sealed. Dust from roads should not enter production or propagating areas.		• Dust suppression / roads however 'prevention of contamination' is
		noted in Section 1: Water (storage of water) & Section 2: Growing
		media (Propagation growing media).
1.1.11 Quarantine areas	TECHNICAL REPORT. A10	Risk is addressed in NIASA. No additional content required.
Plants or propagules entering the nursery should be from NIASA Accredited suppliers. Those from non- NIASA	Plants from nurseries not accredited under	
sources need to be placed in a specially designated quarantine area and carefully monitored for pests and	ANVAS excluded from ANVAS facility (yes/no)	NIASA provides for risk mitigation steps to be taken for plants generally,
diseases. The intent is to prevent the movement of pests and diseases into production areas. An appropriate		and plants from non-NIASA accredited businesses specifically.
pesticide application regime should also be maintained.		Also Listed in NUASA Nursery Production Checklist (See ADDENDIX 5)
		Also Listed III MASA Nursery Production Checklist (See APPENDIX 5):
		Checklist item could be added specifically for avocado material from
		non-accredited places.
1.1.12 Potting facilities	N/A	Contributes to risk mitigation for spread of pathogens and other
Containers, plants to be potted/staged, the growing media and the newly potted plants must not come into		contaminants.
contact with possibly contaminated materials or surfaces during potting operations. Spilt growing media		
should be cleaned up and discarded regularly.		
1.1.13 Plant handling	N/A	Contributes to risk mitigation for spread of pathogens and other
Plants and/or their containers must not come into contact with possibly contaminated surfaces, plants or		contaminants.
materials, during handling operations on the production nursery.		
1.1.14 Washing facilities	N/A	Contributes to risk mitigation for spread of pathogens and other
The importance of removing disease inoculum from hands, clothes and feet is under rated. <i>Pythium spp.</i> ,		contaminants.
Fusarium spp., Rhizoctonia spp., Chalara spp., Phytophthora spp. and Cylindrocladium spp. can all be		
transmitted to benched plants by the use of solied hands. Good access to hand washing facilities and their		
routine use is essential in a disease prevention programme. While a hand washing blocide (recommended by State Health Departments) may be percessary in some situations, sear and water used with a bruch is usually.		
suitable		
111E Container	TECHNICAL REPORT A2 Potting mix	Not specified within NIASA
New containers need not be disinfected if stored free of soil plant debris and drainage water contamination	- at least 25 cm deep in container (state	
Clean and disinfected disinfested containers must be stored above floor level.	depth)	But could be included in the High Health Avocado Production
Used containers must be reasonably cleaned of waste material and then dipped in fresh 4000 ppm (or 0.4%)	- disinfested with steam, methyl bromide or	APPENDIX if necessary.
hypochlorite solution for at least 20 minutes, longer contact periods are necessary for some diseases.	not disinfected (specify)	

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
Alternatively, they can be treated with aerated steam or other methods approved by the Nursery Production FMS Auditor (see Appendix 3). Records of the disinfestation of containers must be kept. Disinfectant chemicals are dangerous and the nursery must be equipped to use and dispose of the spent solutions safely. They must be handled and stored as per government regulations regarding hazardous chemicals.	 stored in sterile bins or on disinfested sealed floors (specify) well aerated, free draining, adequate holes in base of containers (yes/no) For A3 also see: 1.1.2 - Growing media/propagating media; A.1.5 - Prevention of product, equipment & site contamination; and APPENDIX 3 – Disinfestation procedures for nursery growing. 	 In addition, containers must provide for adequate drainage and the size of the container used must consider the vigour of the plant and the time that the plant will be occupying the container in order to minimise the risk of development of root disease and allow appropriate root development and prevent excessive root binding (see NIASA section 2.6 Root binding).
1.1.16 Beds and benching	KEY AREA – DECONTAMINATION/HYGIENE	Complies however ANVAS allows only for benching. NIASA allows for
 Coarse gravel or crushed rock covered surfaces have been shown, by broad scale nursery testing, to be effective in disease prevention where the surfaces are consolidated, well drained and the gravel aggregate, screenings of 10mm to 25mm diameter, is a minimum of 75mm deep and preferably deeper. Weed mat over gravel aggregate may be useful in keeping the material free of crop debris and growing media spill, and reducing root escape. Concrete, polythene or bitumen is permitted where; they are covering properly consolidated surfaces, exceptionally good drainage occurs, and all other hygiene practices are excellent. Beds with these surfaces must not pool water and must be separated as much as possible from adjacent production sites in terms of water runoff. Benches. Where benches are used, the height requirement is dependent on the type of surface underneath. Benches spanning or adjacent to either properly sealed or aggregate surfaced floors and paths and grown in polyhouses/glasshouses with low Mean Application Rates (MAR), need not be higher than 30cm. However, where splash and other methods of contamination are likely to occur, a suitable bench height is 75cm or higher. The bench surface should preferably be free draining (for example galvanised mesh) and easily disinfested. Hanging baskets and double benches are allowed in growing areas providing all other hygiene practices adhere to the Guidelines. 	TECHNICAL REPORT. A7. Bench tops in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment) <i>For A7 also see:</i> 1.1.4 - Working surfaces.	 a range of options. NIASA makes provision for pathogen prevention by allowing a number of options to prevent contamination by soil including use of coarse gravel or crushed rock sealed surfaces and benching. <u>It is recommended</u> that additional options for beds and benching provided for in NIASA are adopted for avocado production (NIASA risk mitigation procedures include a suite of up to date best practice hygiene options that control the risk of soil borne pathogens contaminating propagated plants. Supporting these options are requirements for control of run-off through propagation and hardening off areas). Also Listed in NIASA Nursery Production Checklist (See APPENDIX 5): Section 3: Propagation (Plant propagation area) – Bench type & Bench height. Section 4: Protected production areas & Section 5: Exposed production areas – Bench height.
1.1.17 In-ground production	N/A	To be excluded as an option provided for in NIASA in the High Health Avocado Production Appendix.
1.2 Disease Pest and Weed Control	Partially related section.	Contributes to quality of plants produced.
1.2.1 Weed control	N/A	Contributes to quality of plants produced.
1.2.2 Insects and other pests, Integrated Pest Management (IPM)	N/A	Contributes to quality of plants produced.
1.2.3 The prevention and control of pathogens, other than those causing root and crown rots	TECHNICAL REPORT. A1. and A2.	Does not contribute in a specific way over and above that provided
Pathogens should be prevented from entering the site where possible and if not, managed to levels that allow the sale of a high-quality product. Pathogen tested mother stock should be used wherever possible. Freedom from and testing for quarantinable pests and diseases may be mandatory in the future.	 Seed and budwood from registered virus- tested multiplication trees (yes/no) Seed harvested directly from parent tree and/or heat treated (specify) 	elsewhere.
1.2.4 Crop protection programs in general	N/A	Contributes to quality of plants produced.
2 CROP MANAGEMENT PRACTICES	Partially related Chapter.	Contributes to quality of plants produced.
2.1 Water, irrigation and humidity	N/A	Contributes to quality of plants produced.

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
2.2 Wind control	KEY AREA – HYGIENE	Complies.
The physiological and physical damage sustained by plants should be, where necessary, minimised by the use	TECHNICAL REPORT. A11.	
of suitably constructed windbreaks. Windbreaks and other methods of dust control must be employed where	Suitable dust suppression (yes/no)	Not specifically included in checklist.
applicable.	5	
	For All also see:	
	• 1.1.10 - Floors and pathways.	Contributes to suclide of algebra and used
2.3 Light	N/A	Contributes to quality of plants produced.
2.4 Temperature	N/A	Contributes to quality of plants produced.
2.5 Plant nutrition and fertilising	N/A	Contributes to quality of plants produced.
2.6 Structures and production areas	N/A	Contributes to quality of plants produced.
	N/A	Contributes to quality of plants produced.
3 GENERAL SITE MANAGEMENT	Unrelated Chapter.	Contributes to production nursery standing.
3.1 Professional image and appearance	N/A	Contributes to production nursery standing.
3.2 Staff facilities and safety measures	N/A	Contributes to production nursery standing.
3.3 Training and continuous improvement	N/A	Contributes to production nursery standing.
3.4 Environmental performance	N/A	Contributes to production nursery standing.
3.5 Product quality and meeting customer expectations	INSPECTORS REPORT. B3.	Complies.
Product quality is a contentious issue as there are few objective quality measures for nursery products and	3. General tree health (inspect a	
quality can be interpreted in a large variety of ways. However one of the aims of NIASA is to "improve	minimum of 10 containers per bench	
customer confidence at all levels of the distribution chain, which includes buyers of finished product. For	and comment)	
growing media producers the buyers are primarily production of wholesale nursenes and there are some		
NIASA accredited production nurseries on the other hand sell to a wide range of huvers operating many and		
varied businesses. Large forestry operations buy millions of just one type of tree from specialist nurseries by		
contract and orchardists buy thousands of fruit trees from other specialists also by contract. Chain store and		
retail buying groups buy hundreds if not thousands of different plant lines every week of the year, mostly		
under arranged terms of supply. A lot of other stock is sold from 'spec vans' to small independent buyers with		
their own ideas of quality and value for money.		
In the checklist businesses are asked for 'product specifications' or 'market specifications', which are stated		
quality expectations, e.g. not more than 150mm high. For businesses supplying to a written contract these		
specifications should form part of the contract and the Nursery Production FMS Auditor can then check the		
systems you have in place to meet those specifications. For much of the industry it's nowhere near that		
simple.		
The key element is that a consistent product is supplied which meets the customer's expectations. The		
Nursery Production FMS Auditor can do a quick visual assessment of your products consistency but the aim		
should be for you to evaluate customer satisfaction. Formal and informal feedback on the quality of finished		
product supplied by NIASA accredited businesses can be considered by accreditation committees when those		
businesses come up for re-accreditation.		
A WATER MANAGEMENT	Unrelated Chapter	Contributes to production efficiency
4.1 Efficient irrigation	N/A	Contributes to production efficiency
4.1.1 Top irrigation	N/A	Contributes to production efficiency
4.1.2 Rottom irrigation	N/A	Contributes to production efficiency.
4.1.3 Irrigation controllers	N/A	Contributes to production efficiency.
4.1.4 Irrigation scheduling	N/A	Contributes to production efficiency.
4.1.5 System Design and Operation	N/A	Contributes to production efficiency.
4.1.6 Misting Systems	N/A	Contributes to production efficiency.
4.1.7 Filtration Systems	N/A	Contributes to production efficiency.

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
4.1.8 Pumps and other irrigation equipment	N/A	Contributes to production efficiency.
4.1.9 Fertigation	N/A	Contributes to production efficiency.
4.2 Wastewater reuse	N/A	Contributes to production efficiency.
4.3 Sediments and litter	N/A	Contributes to site management.
4.4 Nutrients in wastewater	N/A	Contributes to site management.
4.5 Contamination of wastewater with plant protection products	N/A	Contributes to site management.
4.5.1 Reducing levels of plant protection products in wastewater	N/A	Contributes to site management.
4.5.2 Application equipment and chemical handling and storage	N/A	Contributes to site safety and production efficiency.
APPENDIX 1 SUPPLIERS OF GROWING MEDIA AND GROWING MEDIA INGREDIENTS		
A.1.1 Need for growing media supplier accreditation	N/A	N/A
A.1.2 What is involved?	N/A	N/A
A.1.3 Freedom of site from Phytophthora spp.	N/A	Contributes to quality of media used in production.
A.1.4 Quality control procedures	N/A	Contributes to quality of media used in production.
A.1.5 Prevention of product, equipment & site contamination	TECHNICAL REPORT. A12.	Contributes to quality of media within context as an accredited media
The growing media storage and preparation facilities must comply with the general NIASA accreditation	Is water obtained from a deep well or bore	supplier to a High Health Avocado Producer.
guidelines in terms of preventing materials, equipment and site infestation and contamination	NOT exposed to surface run off? (yes/no)	
(Refer Sections 1.1.1 [water], 1.1.2 [growing media/propagating media], 1.1.6 [footwear], 1.1.7, 1.1.14, 1.2.1,	<u>OR</u>	
1.2.3, 1.2.4, 2.1, 2.2 [wind control], 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.2, 4.3 and 4.5).	Is water chlorinated and tested to ensure that	
	it contains at least 2mg/kg available chlorine	
	at time of treatment (yes/no)	
	TECHNICAL REPORT. A3. Potting mix.	
	- at least 25 cm deep in container (state	
	deptn)	
	- disinfected with steam, methy bronnide of	
	- stored in sterile hins or on disinfested	
	sealed floors (specify)	
	- well aerated free draining adequate holes	
	in base of containers (ves/no)	
	For A3 also see:	
	• 1.1.2 - Growing media/propagating	
	media; and	
	• 1.1.15 – Containers and	
	• APPENDIX 3 – Disinfestation	
	procedures for nursery growing.	
	TECHNICAL REPORT. A9. Security.	
	-Public and stray animals restricted entry	
	(yes/no)	
	-Loading area isolated from nursery (yes/no)	
	-Foot baths at entrance property installed	
	and maintained (comment)	
	5 10	
	For Ay also see:	
	• 1.1.6 – Footwear;	
	 1.1.8 – Access; and 	

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
	• A 12.6 - Unloading.	
	TECHNICAL REPORT. A11.	
	Suitable dust suppression (yes/no)	
A.1.6 Personnel	N/A	Contributes to quality of media used in production.
A.1.7 Internal audits	N/A	Contributes to quality of media used in production.
A.1.8 External audits	N/A	Contributes to quality of media used in production.
A.1.9 Manufacturer standards	N/A	Contributes to quality of media used in production.
A.1.10 Production nursery monitoring	N/A	Contributes to quality of media used in production.
A.1.11 Flow chart	N/A	Contributes to quality of media used in production.
A.1.12 Guidelines for composting bark and sawdust	N/A	Contributes to quality of media used in production.
A.1.13 Records	N/A	Contributes to quality of media used in production.
A.1.14 Growing media batch sampling requirements	N/A	Contributes to quality of media used in production.
A.1.15 Site sampling needs for soil borne diseases	N/A	Contributes to quality of media used in production.
A.1.16 Site sanitation	TECHNICAL REPORT. A11.	Contributes to quality of media within context as an accredited media
	Utensils, containers, trolleys and barrows	supplier to a production nursery.
	confined to nursery area and regularly	
	disinfested with chemicals (comment)	
A.1.17 Storage of fertilisers, additives and components	N/A	Contributes to quality of media used in production.
A.1.18 Pathogen certification	N/A	Contributes to quality of media used in production.
A.1.19 Growing media component supplies	N/A	Contributes to quality of media used in production.
A.1.20 Compliance declaration	N/A	Contributes to quality of media used in production.
APPENDIX 2 SAMPLING AND DETECTING MAJOR PLANT PATHOGENS IN POTTED PLANTS, GROWING MEDIA, S	SOIL AND WATER SUPPLIES	
A 2.1 Detecting fungal plant pathogons	ANVAS Guidalinas Q SAMPLING	Will need to be reviewed based on DAFE work
A.2.1 Detecting fungal plant pathogens	PROCEDURES FOR ANIVAS FACILITIES	Will need to be reviewed based off DAFF work.
A 2.2 Sampling considerations for diseases other than caused by Phytophthora con		Will need to be reviewed based on DAFE work
A.2.2 Sampling considerations for diseases other than caused by Phytophitiona spp.	PROCEDURES FOR ANIVAS FACILITIES	Will heed to be reviewed based of DATT work.
A 2 3 Collecting and sending plant samples for laboratory testing	ANVAS Guidelines, 9, SAMPLING	Will need to be reviewed based on DAFF work
	PROCEDURES FOR ANVAS FACILITIES	
A.2.4 Direct isolations	ANVAS Guidelines, 9, SAMPLING	Will need to be reviewed based on DAFE work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.5 Direct microscope examination	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.6 Baiting for Phytophthora spp.	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.7 Symptoms of Phytophthora diseases	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.8 Baiting water supplies	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.9 Other detection techniques	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.10 Sampling precautions to prevent spread of diseases or cross contamination of samples	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	
A.2.11 Collecting samples from growing media suppliers	ANVAS Guidelines. 9. SAMPLING	Will need to be reviewed based on DAFF work.
	PROCEDURES FOR ANVAS FACILITIES	

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
APPENDIX 3 DISINFESTATION PROCEDURES FOR NURSERY GROWING MEDIA		
	/ .	
A.3.1 Introduction	N/A	N/A
A.3.2 Pasteurisation with aerated steam	TECHNICAL REPORT. A3. Potting mix.	Complies.
	- at least 25 cm deep in container (state	
	- disinfested with steam methyl bromide or	
	not disinfected (specify)	
	- stored in sterile bins or on disinfested	
	sealed floors (specify)	
	- well aerated, free draining, adequate holes	
	in base of containers (yes/no)	
A.3.3 Basamid	TECHNICAL REPORT. A3. Potting mix.	Complies.
	- at least 25 cm deep in container (state	
	depth)	
	- disinfested with steam, methyl bromide or	
	not disinfected (specify)	
	- stored in sterile bins or on disinfested	
	well corated free draining adequate belos	
	in base of containers (ves/no)	
A 3 4 Soil solarisation	TECHNICAL REPORT A3 Potting mix	Not provided as an option in ANVAS
	- at least 25 cm deep in container (state	NIASA makes provision for pathogen prevention through modern best
	depth)	practice management of growing media including use of soil
	- disinfested with steam, methyl bromide or	solarisation for disinfestation. See comments provided in 1.1.2
	not disinfected (specify)	Growing media/propagating media.
	- stored in sterile bins or on disinfested	
	sealed floors (specify)	
	- well aerated, free draining, adequate holes	
	in base of containers (yes/no)	
A.3.5 Storage and handling of treated growing media	TECHNICAL REPORT. A3. Potting mix.	Complies.
	- at least 25 cm deep in container (state	
	depth)	
	- disinfected with steam, methyl bromide of	
	- stored in sterile bins or on disinfested	
	sealed floors (specify)	
	- well aerated, free draining, adequate holes	
	in base of containers (yes/no)	
A.3.6 Transport of treated growing media	N/A	N/A
A.3.7 Beneficial micro-organisms	N/A	N/A
APPENDIX 5 NIASA PRODUCTION NURSERY CHECKLIST		
SECTION 1: Water and irrigation	TECHNICAL REPORT. A12.	Included (no modification needed).
	is water obtained from a deep well or bore	LISTED IN THIS NIASA CHECKIIST:
		 Section 1: Water and irrigation - (Source). Section 1: Water and irrigation - (Disinfectation)
		 Section 1: water and irrigation - (Disinfestation).

Is water chloride and tested to ensure that at time of treatment (yes/no) Included. SECTION 2: Growing media TECHNICAL REPORT. A3. Potting mix. - at least 25 on deep in containers (stat depth) Included. - at least 25 on deep in container (stat depth) - section 2: Growing media (Propagation growing media source). (Propagation growing media source). - section 2: Growing media (Propagation growing media source). - stored in sterile bins or on disinfested valide (specify) - section 2: Growing media (Propagation growing media source). - section 2: Growing media (Propagation growing media source). - Section 2: Growing media (Propagation growing media source). - well aretel (specify) - section 2: Growing media (Propagation growing media source). - section 2: Growing media (Propagation growing media source). - section 2: Growing media (Point growing media source). - section 2: Growing media (Point growing media source). - Section 2: Growing media (Point growing media source). - section 2: Growing media (Point growing media source). - section 2: Growing media (Point growing media source). - section 2: Growing media (Point growing media source). - Section 3: Propagation TECNNICAL REPORT. A8. Wort seal and pater material regularly. - Section 3: Propagation (Plant growing media ming) - Disposi of used or contaminated growing media in an appropriate manner. - Section 3: Propagation (Plant growing media source). - section 3: Propagation (Plant growing media media ming) - Dispos	NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
It contains at least 2mg/kg available chlorine at time of treatment (veg/no) Included. SECTION 2: Growing media FECHNICAL REPORT. A3. Potting mix. - at least 25 cm deep in container (state depth) Included. SECTION 2: Growing media (Propagation growing media source), - disinfected (spech) Included. - at least 2. Growing media (Propagation growing media source), - disinfected (spech) Section 2: Growing media (Propagation growing media source), (Propagation growing media source), - source at insterile bins or on disinfected sealed floors (pace/l) Section 2: Growing media (production growing media source), - (Production growing media muking) – Obsposal or taken analy (specin) SECTION 3: Propagation TECHNICAL REPORT. A8, - Works 200m above floor AND of wire mesh or disinfested wooden slat (comment). Included forme medification needed). - Lated in this MIASA Checklist: - Section 3: Propagation (Plant propagation area) – Bench type & - Section 3: Propagation (Plant propagation area) – Bench disinfested wooden slat (comment). SECTION 3: Mixed REPORT. A4 Hose notzels kept of nursery floor (veg/m) - TECHNICAL REPORT. A4 Hose notzels kept of nursery floor (veg/m) - Exercine 3: Propagation (Plant propagation area) – Bouch disinfestation. NOT specifically included - Listed in this NIASA Checklist: - Section 3: Propagation (Plant propagation area) – Bouch disinfestation.		Is water chlorinated and tested to ensure that	
SECTION 2: Growing media at time of transment (ves/no) SECTION 2: Growing media TECHNICAL REPORT. A3. Potting mix. - at least 25 or deep in container (stat depti) Included. SECTION 2: Growing media (Propagation growing media source), stored in sterie) hors or on disinfested web lareted, free draining, adequate holes in base of containers (ves/no) Included. SECTION 3: Propagation TECHNICAL REPORT. A8. Used on this MIASA Checklis: (Production growing media storage and handling). SECTION 3: Propagation TECHNICAL REPORT. A8. Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Section 3: Propagation area) – Bench type & Bench tops in nursery and hardening-off are at least 30cm above floor AND of wire mesh or disinfested wooden sist (comment). Section 3: Propagation read) – Bench type & Bench tops is propriate manaperial material regulary burd of disinfestation. SECTION 3: Propagation (Plant propagation area) – Bench tops in the path the material regulary burd or disinfestation. Section 3: Propagation (Plant		it contains at least 2mg/kg available chlorine	
SECTION 2: Growing media TECHNICAL REPORT. A3. Potting mix. - at least 25 on deep in container (state depth) - disinetced (specify) - stored in sterile bins on on disinetest in base of containers (ves/no) Included. SECTION 3: Propagation TECHNICAL REPORT. A3. Bench hogin. Included. SECTION 3: Propagation TECHNICAL REPORT. A1. Bench hogin. Included. Included. SECTION 3: Propagation TECHNICAL REPORT. A1. Bench hogin. Included. SECTION 3: Propagation TECHNICAL REPORT. A1. Bench hogin. Included. SECTION 3: Propagation TECHNICAL REPORT. A1. Bench hogin. Included (come modification needed). SECTION 3: Propagation TECHNICAL REPORT. A1. Bench hogin. Included (come modification needed). SECTION 3: Propagation TECHNICAL REPORT. A1. Bench hogin. Included (come modification needed). SECTION 3: Propagation Section 3: Propagation (Part propagation area) - Bench type & Bench hogin. Included (come modification needed). SECTION 3: Propagation (Part propagation report area) Section 3: Propagation (Part propagation report area) - Bench type & Bench hogin. SECTION 3: Propagation (Part propagation report area) - Bench type & Bench hogint. Section 3: Propagation (Part propagation rarea) - Bench type & Bench hogint. Section 3: Propagation (Acclimatisation facilities- hardening off) - Bench type & Bench hogint. Section 3: Propag		at time of treatment (yes/no)	
* at least 25 cm deep in container (state depth) Usted in this NIASA Checklist: • disinfested with steam, methy bromide on otdisinfested (Spech) Section 2: Growing media (Propagation growing media source), (Propagation growing media source), (Propagation growing media source), (Production growing media storage and handling) • well aerated, free draining, adequate holes in base of containers (yes/no) • Section 2: Growing Media (Ploatcion growing media source), (Production growing media source), (Production growing media source), (Production growing media source), (Production growing media storage and handling). • well aerated, free draining, adequate holes in base of containers (yes/no) • Section 2: Growing Media (Ploat growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT. A2. Bench togs in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden sit (comment). Istued in this NIASA Checklist: • Section 3: Propagation facilities. hardening off) - Bench togs & Rench height. • Section 3: Propagation area) - Bench type & escento in: propagation procedures - benchs. • Section 3: Propagation area) - Bench disinfested wooden sit (comment). TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) NOT specificulty included TECHNICAL REPORT. A5 Utensis, containers, troileys and barrow NOT specificulty included	SECTION 2: Growing media	TECHNICAL REPORT. A3. Potting mix.	Included.
section 2: Growing media (ropagation growing media source), • Section 2: Growing media (ropagation growing media source), • otiorificated (specify) • stored in sterile bits or on disinfested • well aerated, free draining, adequate holes • Section 2: Growing media (ropagation growing media storage and handling). • well aerated, free draining, adequate holes • Section 2: Growing media storage and handling). • well aerated, free draining, adequate holes • Section 2: Growing media storage and handling). • well aerated, free draining, adequate holes • Section 2: Growing media storage and handling). • section 2: Growing media storage and handling). • Section 2: Growing media storage and handling). • well aerated, free draining, adequate holes • Section 3: Propagation growing media storage and handling). • SECTION 3: Propagation TECHNICAL REPORT, A7 . • Section 3: Propagation (Plant growing media nukng) – Dispoal of use or othaninated growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT, A4 • Section 3: Propagation (Plant propagation area) – Bench type & Bench height. SECTION 3: Propagation (Plant propagation area) – bench • Section 3: Propagation (Plant propagation area) – bench • disinfested wooden slat (comment). • Section 3: Propagation (Acclimatisation facilities - hardening off) – Bench type & Bench height. • Section 3: Propagation (Propaguie pre		- at least 25 cm deep in container (state	Listed in this NIASA Checklist:
- disinfected with steam, methy bronide or not disinfected (specify) (Propagation growing media quality), (Propagation growing media storage and handling). - stored in sterile bins or on disinfected sealed floor (Specify) - well aerated, free draining, adequate holes in base of containers (yes/no) (Production growing media storage and handling). - well aerated, free draining, adequate holes in base of containers (yes/no) • Section 2: Growing Media (Plant growing media storage and handling). • Section 2: Growing Media (Plant growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT. A8. • Section 2: Growing Media (Plant growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). SECTION 3: Propagation (Plant propagation growing media storage and handling). • Section 3: Propagation (Plant propagation area) – Bench type & or disinfested wooden slat (comment). • Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Section 3: Propagation (Rocalmatisation facilities- hardening off) – Bench type & Section 3: Propagation (Rocalmatisation facilities- hardening off) – Bench type & Section 3: Propagation (Rocalmatisation facilities- hardening off) – Bench type & Section 3: Propagation (Rocalmatisation facilities- hardening off) – Bench type & Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Section 3: Propagation (Rocalmatisation facilities- hardening off) – Bench type is propagation (Acclimatisation facilities- hardening off) – Bench type is propagation (Rocalmatisation facilities- hardening off) – Bench type is propag		depth)	• Section 2: Growing media (Propagation growing media source),
not disinfected (specify) mixing), (Propagation growing media strage and handling) selled floors (specify) selled floors (specify) in base of containers (yes/no) Section 2: Growing media strage and handling). ECHNICAL REPORT. A8. Section 2: Growing media strage and handling). SECTION 3: Propagation TECHNICAL REPORT. A8. Waste soil and plant material regularly burnt or taken away (yes/no) Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Bench tops in nursery and hardening off area or disinfested wooden slat (comment). Included (some modification needed). Section 3: Propagation (Plant propagation area) - Bench type & Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) - Bench type & Bench height. Section 3: Propagation (Propagation area) - Bench type & Bench height. Section 3: Propagation (Plant propagation area) - Bench type & Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) - Bench type & Bench height. Section 3: Propagation (Propagation area) - Bench type & Bench height. Section 3: Propagation (Propagation area) - Bouchtie disinfestation. Section 3: Propagation (Propagation area) - Bench type & Bench height. Section 3: Propagation (Propagation area) - Bouchtie disinfestation. Section 3: Propagation (Propagation area) - Bouchtie disinfestation. Wase nozzles kept o		- disinfested with steam, methyl bromide or	(Propagation growing media quality), (Propagation growing media
 - stored in sterile bins or on disinfested sealed floors (specify) - well aerated, free draining, adequate holes in base of containers (vs/no) Section 2: Growing media storage and handling). Section 2: Growing Media (Plant growing media mixing) - Disposal of used or containinated growing media in an appropriate manner. Section 3: Orgowing Media (Plant growing media mixing) - Disposal of used or containinated growing media in an appropriate manner. Section 3: Propagation (Propagation area) - Bench type & growing media in an appropriate manner. Section 3: Propagation (Propagation area) - Bench type & growing media in an appropriate manner. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench beight. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench beight. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) - bench disinfestation. 		not disinfected (specify)	mixing), (Propagation growing media storage and handling)
Seared insign (adequate holes in base of containers (yes/no) well aerated, free draining, adequate holes in base of containers (yes/no) Section 2: Growing Media (Plant growing media in an appropriate manner. TECHNICAL REPORT. A8. Waste soil and plant material regularly burnt or taken away (yes/no) Section 2: Growing Media (Plant growing media in an appropriate manner. Section 2: Growing Media (Plant growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT. A7. Bench tops in nursery and hardening-off ara at least 30cm above floor XDO divier mesh or disinfested wooden slat (comment). Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – Bouch disinfestation. Section 3: Propagation (Plant propagation area) – Bouch disinfestation. Section 3: Propagation (Plant propagation area) – Bouch disinfestation. 		- stored in sterile bins or on disinfested	 Section 2: Growing media (Production growing media source), (Dead attack as a state of the source) (Dead attack as a state of the source).
SECTION 3: Propagation TECHNICAL REPORT. A8. Waste soil and plant material regularly burn or taken away (yes/no) Included (Some modification needed). Used in this NIASA Checklist: SECTION 3: Propagation TECHNICAL REPORT. A7. Bench tops in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment). Included (some modification needed). Used in this NIASA Checklist: SECTION 3: Propagation (Plant propagation area) – Bench type is a test 30cm above floor AND of wire mesh or disinfested wooden slat (comment). Included (some modification needed). Used in this NIASA Checklist: SECTION 3: Propagation (Plant propagation area) – Bench type & Bench type & Section 3: Propagation (Plant propagation area) – Bench type & Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Bench type & Bench type & Section 3: Propagation (Propague) preparation area) – Routine decontamination procedures – benches. Section 3: Propagation (Propague) preparation area) – Bench disinfestation. Section 3: Propagation (Plant propagation area) – Bench disinfestation. TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) TECHNICAL REPORT. A5 Utensils, containers, trolleys and barrows NOT specifically included		- well aerated free draining adequate holes	(Production growing media quality), (Production growing media mixing) (Production growing media storage and handling)
TECHNICAL REPORT. A8. Section 2: Growing Media (Plant growing media mixing) – Disposal of used or contaminated growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). Bench tops in nursery and hardening-off area t least 30cm above floor AND of wire mess or disinfested wooden slat (comment). Iscletion 3: Propagation (Plant propagation area) – Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Plant propagation (Plant propagation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. <t< td=""><th></th><td>in base of containers (yes/no)</td><td>mang, (Houdellon growing media storage and nanding).</td></t<>		in base of containers (yes/no)	mang, (Houdellon growing media storage and nanding).
TECHNICAL REPORT. A8. of used or contaminated growing media in an appropriate manner. SECTION 3: Propagation TECHNICAL REPORT. A7. Bench tops in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment). Included (some modification needed). Listed in this NLSA Checklist: Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Propaguie preparation area) – Bench type & Bench height. Section 3: Propagation (Propagation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Propagation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Propagation rea) – Bench type & Bench height. Section 3: Propagation (Propagation procedures – benches. Section 3: Propagation (Propagation rea) – Bench disinfestation. Section 3: Propagation (Propagation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench disinfestation. Section 3: Propagation (Propagation area) – Bench type & Bench section 3: Propagation (Acclimatisation facilities- hardening off) – Bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench disinfestation. Section 3: Propagation (Acclimatisat			• Section 2: Growing Media (Plant growing media mixing) – Disposal
Waste soil and plant material regularly burnt or taken away (ves/no) Included (some modification needed). SECTION 3: Propagation TECHNICAL REPORT. A7. Bench tops in nursery and hardening-off are at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment). Included (some modification needed). Section 3: Propagation (Plant propagation area) – Bench type & Bench theight. Section 3: Propagation (Plant propagation facilities- hardening off) – Bench theight. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench tops in surgestion (Acclimatisation facilities- hardening off) – Bench tops & Bench height. Section 3: Propagation (Plont propagation area) – Bench type & Section 3: Propagation (Plont propagation area) – Bouch disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench tops in surgestion area) – bench disinfestation. NOT specifically included TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) NOT specifically included Utensils, containers, trolleys and barrows Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.			of used or contaminated growing media in an appropriate manner.
or taken away (yes/no) or taken away (yes/no) SECTION 3: Propagation TECHNICAL REPORT. A7. Bench tops in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment). Included (some modification needed). Listed in this NIASA Checklist: Section 3: Propagation (Plant propagation area) – Bench type & Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – bench disinfestation. Section 3: Propagation (Plant propagation area) – bench disinfestation. Section 3: Propagation (Plant propagation facilities- hardening off) – bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. Section 3: Propagation (Plant propagation facilities- hardening off) – bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) Iisted in this NIASA Checklist: Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.		Waste soil and plant material regularly burnt	
SECTION 3: Propagation TECHNICAL REPORT. A7. Included (some modification needed). Bench tops in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment). Isclude (some modification needed). Section 3: Propagation (Plant propagation area) – Bench type & Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Propagule preparation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – bench disinfestation. Section 3: Propagation (Plant propagation area) – bench disinfestation. FECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) NOT specifically included Listed in this NIASA Checklist: Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation.		or taken away (yes/no)	
Bench tops in nursery and hardening-off area at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment).Listed in this NIASA Checklist: Section 3: Propagation (Plant propagation area) – Bench type & Bench height.Section 3: Propagation (Propagule preparation area) – Routine decontamination procedures – benches.Section 3: Propagation (Propagule preparation area) – Routine decontamination procedures – benches.FECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no)NOT specifically includedTECHNICAL REPORT. A5 Utensils, containers, trolleys and barrowsListed in this NIASA Checklist: Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.	SECTION 3: Propagation	TECHNICAL REPORT. A7.	Included (some modification needed).
at least 30cm above floor AND of wire mesh or disinfested wooden slat (comment). • Section 3: Propagation (Plant propagation area) – Bench type & Bench height. • Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. • Section 3: Propagation (Propagule preparation area) – Routine decontamination procedures – benches. • Section 3: Propagation (Plant propagation area) – bench disinfestation. • Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – benches. • Section 3: Propagation (Plant propagation area) – bench disinfestation. • Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. • Section 3: Propagation (Plant propagation area) – bench disinfestation. • Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. • Section 3: Propagation (Plant propagation area) – bench disinfestation. • Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. • Section 3: Propagation (Plant propagation area) – Boutine decontamination procedures – tools. • Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.		Bench tops in nursery and hardening-off area	Listed in this NIASA Checklist:
of disinfested wooden siat (comment). Bench height. Section 3: Propagation (Acclimatisation facilities- hardening off) – Bench type & Bench height. Section 3: Propagation (Propagule preparation area) – Routine decontamination procedures – benches. Section 3: Propagation (Plant propagation area) – bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) NOT specifically included Listed in this NIASA Checklist: Utensils, containers, trolleys and barrows Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.		at least 30cm above floor AND of wire mesh	 Section 3: Propagation (Plant propagation area) – Bench type &
TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) TECHNICAL REPORT. A5 Utensils, containers, trolleys and barrows		or disinfested wooden slat (comment).	Bench height.
TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) TECHNICAL REPORT. A5 Utensils, containers, trolleys and barrows			Section 5: Propagation (Acclimatisation facilities- nardening on) – Bench type & Bench height
TECHNICAL REPORT. A4 NOT specifically included Hose nozzles kept off nursery floor (yes/no) Listed in this NIASA Checklist: TECHNICAL REPORT. A5 Section 3: Propagation (Plant propagation area) – bench disinfestation. Vtensils, containers, trolleys and barrows Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation.			 Section 3: Propagation (Propagule preparation area) – Routine
 Section 3: Propagation (Plant propagation area) – bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. NOT specifically included TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) TECHNICAL REPORT. A5 Utensils, containers, trolleys and barrows 			decontamination procedures – benches.
TECHNICAL REPORT. A4 Section 3: Propagation (Acclimatisation facilities- hardening off) – bench disinfestation. NOT specifically included NOT specifically included TECHNICAL REPORT. A5 Listed in this NIASA Checklist: Utensils, containers, trolleys and barrows Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.			Section 3: Propagation (Plant propagation area) – bench
 Section 3. Propagation (Acclimatisation facilities- nardening off) – bench disinfestation. NOT specifically included TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) TECHNICAL REPORT. A5 Utensils, containers, trolleys and barrows Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools. 			disinfestation.
TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no)NOT specifically includedTECHNICAL REPORT. A5 Utensils, containers, trolleys and barrowsListed in this NIASA Checklist: • Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.			 Section 5. Propagation (Accumatisation facilities- nardening on) – bench disinfestation.
TECHNICAL REPORT. A4 NOT specifically included Hose nozzles kept off nursery floor (yes/no) Listed in this NIASA Checklist: TECHNICAL REPORT. A5 Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.			
TECHNICAL REPORT. A4 Hose nozzles kept off nursery floor (yes/no) Hose nozzles kept off nursery floor (yes/no) Listed in this NIASA Checklist: TECHNICAL REPORT. A5 Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.			NOT specifically included
Hose nozzles kept off nursery floor (yes/no) Listed in this NIASA Checklist: TECHNICAL REPORT. A5 Utensils, containers, trolleys and barrows Utensils, containers, trolleys and barrows Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.		TECHNICAL REPORT. A4	
TECHNICAL REPORT. A5 Listed in this NIASA Checklist: Utensils, containers, trolleys and barrows Section 3: Propagation (Plant propagation area) – Routine decontamination procedures – tools.		Hose nozzles kept off nursery floor (yes/no)	
Utensils, containers, trolleys and barrows Utensils, containers, trolleys and barrows			Listed in this NIASA Checklist:
decontamination procedures – tools.		Litensils containers trolleys and barrows	• Section 3: Propagation (Plant propagation area) – Routine
contined to nursery area and regularly		confined to nursery area and regularly	decontamination procedures – tools.
disinfested with chemicals (comment)		disinfested with chemicals (comment)	
Listed in this NIASA Checklist:			Listed in this NIASA Checklist:
IECHNICAL REPORT. A8. • Section 3: Propagation (Plant propagation area) – Refuse disposed		IECHNICAL REPORT. A8.	Section 3: Propagation (Plant propagation area) – Refuse disposed
or taken away (ves/no)		or taken away (ves/no)	of in an appropriate manner.
Listed in this NIASA Checklist:			Listed in this NIASA Checklist:
TECHNICAL REPORT. A9. Security. Public and stray animals restricted entry		Public and stray animals restricted entry	Section 3: Propagation (Propagules Preparation area), (Plant
(ves/no)		(ves/no)	Propagation area), (Acclimatisation Facilities) – Access restrictions.
-Loading area isolated from nursery (yes/no)		-Loading area isolated from nursery (yes/no)	

SECTION 4: Raw material processing

SECTION 5: Site management

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
	-Foot baths at entrance property installed	
	and maintained (comment)	
SECTION 4: Protected production areas	TECHNICAL REPORT. A7.	Included (no modification).
	Bench tops in nursery and hardening-off area	Listed in this NIASA Checklist:
	at least 30cm above floor AND of wire mesh	 Section 4: Protected production areas & Section 5: Exposed
	or disinfested wooden slat (comment).	production areas – Bench height.
		 Section 4 (Protected production areas) and Section 5 (Exposed
		production areas) – bench hygiene.
SECTION 5: Exposed production areas	N/A	N/A
SECTION 7: Plant handling	N/A	N/A
SECTION 8: Plant protection chemicals and equipment	N/A	N/A
SECTION 9: Plant imports	TECHNICAL REPORT. A9. Security.	Listed in this NIASA Checklist:
	-Public and stray animals restricted entry	Section 9: Plant imports – Receiving area/quarantine facility for
	(yes/no)	inspection purposes clearly identified.
	 -Loading area isolated from nursery (yes/no) 	
	-Foot baths at entrance property installed	
	and maintained (comment)	
		Listed in this NIASA Checklist:
	TECHNICAL REPORT. A10	Section 9: Plant imports – Receiving area/quarantine facility for
	Plants from nurseries not accredited under	inspection purposes clearly identified.
	ANVAS excluded from ANVAS facility (yes/no)	Last de d'Arrene d'Cretter (
SECTION 10: Plant growing and storage containers	HECHNICAL REPORT. A8.	Included (no modification).
	or taken away (yes (no)	Section 10: Plant growing and storage containers Waste materials
	or taken away (yes/no)	 Section 10. Plant growing and storage containers – waste materials disposed on in an appropriate mapper
SECTION 11: Business management	N/A	
SECTION 11: Dusiness indiagement	N/A	
ADDENDIX 14 NIASA CROWING MEDIA SUDDUED CHECKLICT	N/A	N/A
APPENDIX 11 NIASA GROWING MEDIA SUPPLIER CHECKLIST		
SECTION 1: Water and irrigation		Included (no modification)
Section 1. Water and impation	Is water obtained from a deep well or here	Licted in this NIASA Checklist:
	NOT exposed to surface run off? (yes/no)	 Section 1: Water and irrigation - (Source)
	OR	 Section 1: Water and irrigation - (Disinfectation)
	Is water chlorinated and tested to ensure that	• Section 1. Water and imgation - (Disinestation).
	it contains at least 2mg/kg available chlorine	
	at time of treatment (ves/no)	
SECTION 2: Site drainage	N/A	N/A
SECTION 3: Completed growing media	TECHNICAL REPORT. A3. Potting mix.	Included (no modification).
	- at least 25 cm deep in container (state	Listed in this NIASA Checklist:
	depth)	• Section 3: Completed growing media (Finished product processes)
	- disinfested with steam, methyl bromide or	- Disinfestation procedures, Records of disinfestation and testing
	not disinfected (specify)	e.g. composting, boiling, etc
	- stored in sterile bins or on disinfested	Section 3: Completed growing media (Storage and handling

N/A

N/A

sealed floors (specify)

in base of containers (yes/no)

- well aerated, free draining, adequate holes

N/A

N/A

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
SECTION 6 Sampling requirements	N/A	N/A
SECTION 7 Plant protection chemicals and equipment	N/A	N/A
SECTION 8 Storage of fertilisers and components	N/A	N/A
SECTION 9 Product quality	N/A	N/A
SECTION 10 Staff issues	N/A	N/A
SECTION 11: Information sources and environmental performance	N/A	N/A
SECTION 12: Professional image and appearance	N/A	N/A
SECTION 13: Commitment to continuous improvement	N/A	N/A
SECTION 14: Pathology samples	N/A	N/A
APPENDIX 12 Freight and Logistics		
A12.1 Introduction	N/A	N/A
A12.2 Dispatch	N/A	N/A
A12.3 Loading	N/A	N/A
A 12.4 Division of orders	N/A	N/A
A 12.5 Climate control	N/A	N/A
A 12.6 Unloading	TECHNICAL REPORT. A9. Security.	Included (no modification).
Consignments shall be delivered to a point outside of the production area.	-Public and stray animals restricted entry	Listed in NIASA Checklist:
On delivery, plant consignments should be unloaded and moved to a holding area which must not be located	(yes/no)	Section 9: Plant imports – Receiving area/quarantine facility for
in the inspection or packing area. The consignment shall be clearly identified as incoming stock (Refer to	-Loading area isolated from nursery (yes/no)	inspection purposes clearly identified.
NIASA Section 1.1.11 Quarantine Areas). Plants shall be inspected upon arrival. Refer to BioSecure HACCP	-Foot baths at entrance property installed	
guidelines for additional information.	and maintained (comment)	
	E. A. A. La sec	
	For A9 diso see:	
	• 1.1.0 - Footwear;	
	 1.1.8 – Access; and A 1.5 - Prevention of product 	
	• A.1.5 - Prevention of product,	
A 12 7 Vahirla maintenance	N/A	N/A
	N/A	
A12.0 Vehicle wash down area	N/A	
	N/A	N/A
REQUIREMENTS NOT ADDRESSED OTHERWISE - GAPS		
Use of suppressive chemicals	TECHNICAL REPORT. A6.	NIASA does not prohibit the use of suppressive chemicals.
	A nurseryman must not use chemicals to	
	suppress the incidence of plant pathogens in	Provisions included within a NIASA High Health Avocado Appendix can
	plants in the ANVAS facility, however this	require compliance with requirements to a satisfactory level. Non-
	may be carried out in the dispatch area,	compliance as a result of testing or auditing can allow for suspension
	provided that the dispatch area in in the	and cancellation of accreditation.
	opinion of the inspector clearly segregated	
	from the ANVAS facility.	For an ANIVAC "Illigh Haplikh Associate Develoption" Association to
		FOR AN ANYAS HIGH HEALTH AVOCADO PRODUCTION APPENDIX THE
		recommended approach could provide the following advice:
		Use of prophylactic and curative funaicides
		Prophylactic and curative crop funaicides must not be directly
		applied to avocado plants until plants are ready for consignment.

NIASA GUIDELINE	RELATED ANVAS TECHNICAL CRITERIA	COMMENT
		Indirect use of crop protectants (for example, a fungicide used to treat growing media) may be used at susceptible stages of production where these applications have the capacity to reduce possible presence of inoculum and protect against infection. Propagated plants may be subject to testing.

Appendix 6. Revised Application Form for NIASA Accreditation





Application for NIASA Accreditation

This is the application form to be used for Nursery Industry Accreditation Scheme Australia (NIASA) Accreditation under the NIASA Guidelines.

All applicants must read this application and the accompanying Terms and Conditions before submitting this application. Please use **BLOCK LETTERS** to complete the application form if not completing the form electronically. Your application will be treated as **CONFIDENTIAL**.

Section A. Business Details (the individual or business applying for accreditation)				
Name:				
ABN:	ACN/ARBN <i>(as applicable)</i> :			
Trading Name				
Business Type: 🗹	Public Company	Private Company	Partnership	Sole Trader
	Other (Specify):			
	□ Nursery Production	Growing Mee	dia Supplier	Greenlife Market
Accreditation Sought.	Nursery Production with High Health Avocado Production			
Section B. Business Representative (for the purpose of accreditation)				
Full Name:				
Position:				
Constant Data lla	Email:	Mobile:		
	Phone:		Fax:	
Mail Address	Address:			
	Suburb:		State:	Postcode:
Registered Address (if different to Mail Address)	Address:			
	Suburb:		State:	Postcode:
Section C. Site Addre	ess or Addresses			
Primary site for	Address:			
accreditation	Suburb:		State:	Postcode:
Additional site 2 for	Address:			
accreditation	suburb: St		State:	Postcode:
Additional site 3 for	Address:			
accreditation	Suburb:		State:	Postcode:
Section D. Other Det	ails			
Number of employees:		Number of site	5:	



Section E. Endorsement

Compliance with Terms and Conditions

I/We hereby apply for NIASA Accreditation status in accordance with the following terms and conditions:

- 1. I/we agree to observe and comply with the accompanying Terms and Conditions of NIASA (receipt of which is acknowledged), as varied from time to time, and agree to maintain the standards of NIASA.
- 2. I/we agree to accommodate a minimum of one annual audit by the Auditor appointed for that purpose.
- 3. I/we warrant that the information provided in this form is true, complete and correct and will give prompt written notice to NGIA of any change in such information.

Fees and Charges:

4. I/we understand that the following fees (exclusive of GST) are non-refundable, may vary from time to time and are payable in relation to my/our application for NIASA Accreditation status for each business site.

Application fee including initial assessment/inspection:

Please contact NGIA	
NIASA Accreditation fee:	
NGI Members:	\$1000.00 per annum (ex GST)
NGI Non-members:	\$2500.00 per annum (ex GST)
NGI Member hourly audit rate:	\$150.00/hr (ex GST)
NGI Non-member hourly audit rate:	\$300.00/hr (ex GST)
Additional fees may be levied for travel,	subsequent audits and/or pathogen testing if necessary.

5. I/we indemnify and release NGIA and their respective employees, contractors and agents against any claims arising from any advice or suggestions in connection with the audits, and I/we confirm that we will not rely on such advice or suggestions.

Signature of person authorised to sign on behalf of the Applicant A	Date 🔺

Print Name 🔺

Please forward your application marked CONFIDENTIAL to Nursery & Garden Industry Australia:

BY EMAIL (Preferred): Scan the completed form and email to <u>biosecure@ngia.com.au</u>;

OR

POST OR FAX to:

Nursery & Garden Industry Australia PO Box 7129 BAULKHAM HILLS BC NSW 2153. Phone: 02 8861 5100 Fax: 02 9659 3446



Appendix 7. Your Levy at Work article and fact sheet



FEATURE



Benefits of biosecurity for bananas, avocados

Growers of banana and avocado crops can expect to benefit from the transition of their clean plant programs to the Nursery Production Farm Management System over the next 12-18 months, and other horticulture industries are likely to follow suit.

Both the banana and avocado industries have well-established and well-recognised programs to ensure the provision of high quality, disease-free planting material, but decided

to consolidate these into the overarching Nursery Production FMS to reduce the cost and improve the speed and quality of high health and biosecurity measures.

The decision to transition makes sense, according to John McDonald, National Biosecurity Manager for the Nursery & Garden Industry of Australia, as it will give the two industries a more 'complete' management system and economies of scale.

"There are similarities between our system and the Avocado Nursery Voluntary Accreditation Scheme (ANVAS) and Quality Banana Approved Nursery program



Figure 1: John McDonald, NGIA.

(QBAN) in managing hygiene of growing surfaces, growing media, growing containers and some product traceability and irrigation water, but many of these have not been updated or are limiting for production nurseries in 2018," Mr McDonald said.

"The Nursery Production FMS is a holistic on-farm management system that embraces biosecurity, best management practice and environmental and natural resource management, and it's constantly reviewed and updated in line with new advances in technology, research and development.

"Because it's an integrated system, all elements are audited together at one time which reduces cost and there are clear processes for non-conformance and re-dressing compliance around program elements. No duplication and improved efficiencies means less



Figure 2: Tissue culture production

administration costs, and that can be passed on to certified production nurseries and customers purchasing avocado trees or banana plants."

The transition of ANVAS, a production nursery accreditation program that supports clean planting material (trees) for growers, into the Nursery Production FMS will occur over the next 12 months and is currently on track to conclude at the end of September 2018.

Mr McDonald says the transition for QBAN,

supporting the clean propagation of banana planting material in production nurseries and tissue culture laboratories, is more complex and forecast to take two years, due to updates in tissue culture criteria and the introduction of mother blocks.





"NGIA has worked with Australian Avocadoes Limited and the Australian Banana Growers Council for more than eight years and the bulk of ANVAS nurseries and a number of QBAN nurseries are already accredited under the Nursery Industry Accreditation Scheme Australia (NIASA)," he explained.

"While it will not be a significant change for many of the current businesses, it may be for some, particularly around issues such as testing and recording data in their cropping system, irrigation, pesticide application, site management etc.

"The majority of production nurseries in the programs at present overwhelmingly support the transition."

Mr McDonald has also had early discussions with other horticulture industries to discuss the benefits of transitioning to the Nursery Production FMS.

"Other horticulture industries such as apples and pears, citrus, vines and strawberries all have certification or accreditation schemes that are applied to production nurseries, and there is the potential to align these to the Nursery Production FMS," he said.



Figure 3: Production Nursery (Plantation Timber)

This could mean adding criteria to the program.

"The citrus industry has a program mainly based on trueness to type however, a number of citrus production nurseries operate under the Nursery Production FMS, which is also the same for the apples and pears certification, so it may make sense to integrate trueness to type criteria into our program and they could be audited just the once," Mr McDonald suggested.

"NGIA has also had preliminary discussions with growers in the strawberry and nut industries to look at synergies, as well as the grape vine industry."

Mr McDonald said the benefits of the Nursery Production FMS are multiple.

"Unlike many nursery stock certification programs in horticulture, the Nursery Production FMS is industry managed, much broader around biosecurity, and is continuously reviewed, improved and upgraded with the introduction of new technology and pest, disease and weed research.

"The aim is to efficiently deliver these services without them costing production nurseries an arm and a leg, and cropping systems get the benefit of an affordable modern, high health program supporting the planting material that they're purchasing."

To find more about the Nursery Production FMS, please visit: http://nurseryproductionfms.com.au/

For further information, please contact Sophie Keatinge, Cox Inall Communications, on 0430 938 515 or <u>sophie.keatinge@coxinall.com.au</u>

This communication has been funded by Hort Innovation using the nursery research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture. Appendix 8. Avocado Nursery Diseases fact sheet



INTRODUCTION

The production of vigorous, pathogen free nursery trees provides confidence to customers and assists in promoting future sales. Diseases that can affect avocado nursery trees range from viroids, seed decays, root rots, stem lesions and dieback, graft cankers to leaf spots.

Avocado nursery trees can be sent to many growing areas in Australia. Therefore, a disease outbreak in a nursery will be more than of local interest. The movement of pathogens capable of existing in the soil for many years can have far reaching consequences. They may contaminate the field site leading to healthy replacements also becoming diseased. Pathogens may also impact other agricultural enterprises or move into natural ecosystems.

Customers expect that nursery trees should not only be free of disease symptoms, but also free of the pathogen propagules that precede disease expression in the future. For this reason, disease prevention, early detection and appropriate management is vital.

ABOUT THIS FACT SHEET

This fact sheet provides an overview for understanding, identifying and preventing the complex of diseases that can affect avocado nursery trees. It includes advice on symptoms, spread and management of these diseases.

Within this fact sheet, diseases are separated into **viroid** and **non-viroid** pathogens. Then further, into groups based on their seriousness.

- » Group 1 pathogens are considered the most serious. This group contains viroids that may be introduced into the production process and are destructive in both the nursery and post-nursery phase. It also contains nonviroid pathogens that can cause the death of the plant, e.g. Phytophthora; and
- *Group 2* pathogens are those that have the potential to be destructive but are unlikely to cause the death of the plant either in the nursery or in the field after planting.

Pathogens in both groups may negatively impact plant growth in the nursery and after field planting may impact production. Management actions outlined here should assist in preventing infestations.









FURTHER INFORMATION AND SUPPORT

The Nursery Industry Accreditation Scheme Australia (NIASA) now includes best practice advice in disease prevention, detection and management for commercial production of avocado trees. Information in the NIASA guidelines is more detailed than recommendations provided here. A copy of the Guidelines is available at <u>nurseryproductionfms.com.au/</u> <u>niasa-accreditation</u>.

Reliable identification of a disease is an obvious prerequisite for the successful application of management procedures. The Nursery & Garden Industry Queensland's (NGIQ) Pest Identification Tool <u>www.pestid.com.au</u> may assist in initial diagnosis. The tool is provided to assist nursery producers in identifying and treating pest insects, diseases, disorders and weeds. It also includes information on predatory insects and other beneficial species. You can view the information in the tool on your computer or mobile device. The tool is unique because it is electronic, portable and being updated on a regular basis.

However, do not rely on picture taxonomy to identify a problem with a plant pest; when in doubt nursery managers are advised to consult with a reputable diagnostic laboratory. Links to fact sheets specific to Australian production nurseries are provided where relevant.

A CHANGING NEED — A BRIEF HISTORY OF ANVAS

The Avocado Nursery Voluntary Accreditation Scheme (ANVAS) was originally introduced in 1977–78 because infestations of orchards suffering from Phytophthora cinnamomi often occurred as a result of planting infected seedlings. This was in part due to avocado nursery trees being sold that appeared healthy, but were actually infested with P. cinnamomi. ANVAS was therefore solely introduced to grow plants free from *Phytophthora*. In 1980 the virus tested tree registration program was introduced to address the presence of Avocado sunblotch viroid (ASBVd) and grow trees free of virus pathogens. The two programs worked independently for a time but were eventually amalgamated in 1984 to reduce administration. ANVAS was regulated by the Australian Avocado Growers Federation (AAGF) and government pathologists worked with nurseries to maintain and upgrade practices as required. In 2003, governance of ANVAS was given to Avocados Australia Limited (the first national avocado peak body).

Prior to 2018, ANVAS was last updated in 1996 and received little formal modernisation since then. A review of ANVAS in 2014 recommended important changes to strengthen the program such that they provide a holistic approach to producing pathogen free avocado seedlings within a robust administration system. Based on these recommendations and current best practice nursery production, the ANVAS program has received a complete overhaul.

Avocados Australia Limited still provide ANVAS accreditation services, however technical nursery production requirements of the ANVAS program now sit within the NIASA best practice management guidelines. As such, there is an expectation that ANVAS accredited nurseries will have a continual and progressive approach to improve growing practices, providing plants of the highest quality. NIASA 'High Health Avocado Production' guidelines are included as an appendix to the NIASA Guidelines and provide additional avocado specific guidance beyond that used generally to produce other nursery lines. These will ensure avocado seedlings have the highest chance of starting healthy and maintain conditions suitable for optimal growth and high health. While the program is mostly self-regulated, a modern audit system is in place to ensure that growers are using the guidelines and maintaining plant health to produce plants that are free of a wide range of pathogens*, not just *Phytophthora*. The program will easily allow new or emergent pathogens to be included as required.

* It is impossible to guarantee that all plants are free of all pathogens as this would require inspection and testing of every plant. Therefore, the approach taken was to strengthen measures to prevent infestation into the production nursery environment and to take steps to detect infestation should it be inadvertently introduced. The system provides a 95% chance of detecting infestation at or below 5% incidence if in fact an infestation is even present.

VIROIDS

Two viroid diseases are known to infect avocado, *Avocado* sunblotch viroid, and *Potato* spindle tuber viroid.

SUNBLOTCH

CAUSE

Avocado sunblotch viroid (ASBVd)

IMPORTANCE

A serious *Group 1* viroid that will threaten orchard production if trees are propagated from infected seed or scion wood.

SYMPTOMS

Infected trees may remain symptomless and leaves often will not show obvious symptoms. The most consistent symptom in the nursery will be white, yellow or pink streaks on young stems. Bleached or chlorotic areas may appear on leaves. Fruit have the most obvious symptoms and may appear similar to those caused by chimera.

SPREAD

Infected seed, cuttings and grafting wood; sap contaminated pruning blades, harvesting clippers and injection equipment; natural root grafting between trees. Pollen transmission is possible, but only the seed of the developing fruit is infected and not the fruit bearing tree.

MANAGEMENT

- » Test mother trees used for seed, cuttings, or grafting wood for the presence of ASBVd. ASBVd is systemic in infected avocado trees but its concentration varies widely between branches.
- All equipment (pruning tools, harvesting clippers, injection equipment) should be thoroughly cleaned and disinfected between trees.



Avocado stems (right) and fruit (above) from trees infected with ASBVd.

POTATO SPINDLE TUBER

CAUSE

Potato spindle tuber viroid (PSTVd)

IMPORTANCE

A *Group 2* viroid that requires further research to understand whether strains of PSTVd present in Australia will infect avocado. PSTVd has only been reported as a pathogen of avocado in Peru where infected potatoes were grown between rows of avocado trees.

SYMPTOMS

Many strains have been reported that cause symptoms ranging from mild to severe. The disease has been reported from Peru where potato and avocado are often interplanted. Trees are often symptomless, but where there is coinfection with sunblotch, they show bunchiness of the inflorescence, reduced fruit size and number, with eventual decline and death of the tree.

SPREAD

Mechanical transmission by sap contaminated pruning blades, harvesting clippers and injection equipment. No known insect vector.

MANAGEMENT

- » Only source cuttings or grafting wood from healthy trees.
- » Avoid growing solanaceous crops within or near avocado orchards.



SOILBORNE PATHOGENS

Root rots, caused by soilborne pathogens, are the most insidious, tenacious and damaging of all the diseases that can occur in the nursery. Generally, nursery trees infected with such pathogens will show no visible above ground symptoms until in the post-nursery stage. However even partial loss of roots can have dire consequences for the health of the tree. Root decay interferes with nutrient uptake and distribution in plant tissues, the incorporation of nitrogen into amino acids and the supply of growth hormones. Furthermore avocado feeder roots have very few or no root hairs which means that water uptake is poor; the entire root system needs to be active and healthy to produce vigorous trees.

It is critical that avocado nursery growers are mindful of the root health of their trees. Root systems must be observed directly several times during propagation. It should always be of the highest quality and quantity. At least 90% of the roots should have white, actively growing root tips; only young unsuberized roots are efficient in nutrient and water uptake. The root system should be well developed with uniform distribution from the top to the bottom of the bag or pot. If most of the roots are suberized it indicates that the plants are growing under stressful conditions. Avocado roots have a high oxygen requirement, are intolerant of waterlogging and are stressed by drought and cold.

Several pathogens may at times infect roots in an avocado nursery. They include *Verticillium*, *Rhizoctonia*, *Phytophthora*, *Phytopythium*, *Pythium*, *Calonectria* (previously *Cylindrocladium*) and *Dactylonectria* (previously included in the genus *Cylindrocarpon*); with the exception of *Calonectria* none are as serious as *Phytophthora*. Reliable identification of the pathogen is a prerequisite for the application of appropriate management procedures. Many other fungi may also be present but are not known to act as a pathogen of avocado roots, e.g. *Fusarium*.

For more information on the management of <u>soilborne</u> <u>diseases</u> in production nurseries refer to the management plan. Factsheets produced for the Australian production nursery industry are available for <u>Phytophthora</u>, <u>Pythium</u>, <u>Rhizoctonia</u>, <u>Calonectria (previously Cylindrocladium)</u> and <u>Fusarium</u>.



Suberized avocado roots with relatively healthy roots on top and unhealthy roots on the bottom. Note that all roots are uncut on the right (showing roots externally) and cut on the left to show internal vascular tissue. Externally, suberized roots can appear healthy even when vascular tissue is not.

PHYTOPHTHORA ROOT ROT

CAUSE

Phytophthora cinnamomi (Pc) and all species of *Phytophthora* are **Group 1** non-viroid pathogens. Other species of *Phytophthora* reported as causing root rot to avocado trees overseas include *P. niederhauserii*, *P. nicotianae* and *P. multivora*.

IMPORTANCE

Pc is undeniably the most serious disease problem of mature avocado trees. Pc rarely kills trees in a nursery, and nursery trees can often tolerate a degree of root rot with no obvious effect on above ground tree health. The pathogen may not be present in an orchard until it is introduced with infected nursery plants and can kill mature avocado trees.

SYMPTOMS

Infected feeder rots are black, firm and brittle compared to suberized healthy roots. The entire root system may be invaded, and white feeder root tips may be absent or few in number. There may be yellowing and drooping of leaves beginning at the base, or leaves may wilt rapidly, remaining attached to the plant.

SPREAD

Phytophthora swimming spores may spread in splashing water drops and infested irrigation water; in contaminated soil, tools, foot-ware, vehicles, and with infected seed taken from fruit in contact with the soil. It only takes a single propagule (swimming spore or resting spore) to initiate a new infection if environmental conditions are favourable.

This will give a single lesion (<1mm) on a root that will quickly give rise to a new centre of infestation. *Phytophthora* can build-up inoculum rapidly in the nursery. *Phytophthora* can also be spread by insects such as fungus gnats and shore flies.

MANAGEMENT

Take every precaution to exclude the pathogen from the nursery.

- » Use clean seed for propagation.
- » Only use media with good aeration and drainage that is free of pathogens.
- » Disinfest irrigation water and regularly monitor the level of disinfectant in treated water.
- » Maintain a high standard of nursery hygiene.
- » Grow plants under optimal conditions; do not overwater.
- » Grow plants on raised benches, or otherwise totally isolated from soil and with free drainage.
- » Submit plants to a diagnostic laboratory to confirm the identity of the pathogen in question.
- » Effective fungicides are available, but should not be used routinely. They should only be used to reduce inoculum levels during containment of a disease outbreak, or to protect healthy plants at high risk stages. It is not recommended to sell infected plants; prior to applying fungicides all obviously diseased plants must be removed and destroyed.
- » Examine root systems and test for the presence of the pathogen regularly during all phases of propagation.
- » For more information refer to the <u>soilborne diseases</u> pest management plan and <u>Phytophthora</u> factsheet.

PYTHIUM ROOT ROT

CAUSE

Pythium species.

IMPORTANCE

Pythium is a water mould (same group as *Phytophthora*) that "nibbles" the feeder roots and is a *Group 2* non-viroid pathogen. This can reduce tree vigour if growing conditions are too wet due to poor drainage or excess irrigation. It is not a problem in mature trees because they quickly overcome root pruning by producing new roots.

SYMPTOMS

Pythium species cause necrosis of white feeder root tips. At times symptoms are difficult to distinguish from those caused



Roots infected with Phytophthora cinnamomi.

by Pc, but root damage is less severe. *Pythium* infection will at times produce a soft watery rot of feeder root tips.

SPREAD

By infested irrigation water and water splash; contaminated soil adhering to nursery tools and footwear; insect transmission by fungus gnats or shore flies.

MANAGEMENT

Control measures for *Pythium* root rot are similar to those for *Phytophthora* root rot. Species of *Pythium* that produce resting spores (oospores) which withstand dry conditions, can become nursery "residents" in dirty pots and flats, benches, hoses and pathways. Cultural practices that reduce the prevalence of *Pythium* should be rigorously implemented if plant growth is being impacted. Refer to *Phytophthora* management above, however, plants infected with *Pythium* may grow into healthy, thriving mature plants when grown under optimal conditions and treated with care if planted in the field. For more information refer to the <u>soilborne</u> <u>diseases</u> pest management plan and <u>*Pythium*</u> factsheet.

PHYTOPYTHIUM ROOT ROT

The genus *Phytopythium* is a new genus that was separated from *Pythium* using molecular based evidence in 2015. It currently has 18 formally characterized species, including *Pp. vexans*. Most *Phytopythium* species are also important pathogens causing root rot and damping off of many ornamental plants. Their exact role in causing root rot symptoms is not fully understood, but *Pp. vexans* has been detected from avocado production nursery seedlings in Australia and overseas. Morphologically, *Phytopythium vexans* appear to be a cross between *Pythium* and *Phytophthora*, which can complicate identification of all three genera.

Research overseas has shown that the severity of root rot due to *Pp. vexans* varies significantly with the exact isolate ('strain') in question. In other words, some isolates of *Pp. vexans* cause very limited root disease symptoms and others can be as pathogenic as *P. cinnamomi*. As such, *Phytopythium* species have not been categorised as either a *Group 1* or *Group 2* until such a time as more information is available.

Symptoms, spread and management are as per *Phytophthora* and *Pythium*.

BLACK ROOT ROT

CAUSE

Calonectria ilicicola and various species of *Dactylonectria*. These species have been recently renamed, with advances in DNA sequence-based data and improvements in fungal naming rules. *Calonectria* used to be known as *Cylindocladium*. The genus *Cylindrocarpon* should no longer be used and has been split into a number of genera including *Neonectria*, *Ilyonectria*, *Cylindrodendrum*, *Cylindrocladiella*, *Dactylonectria* and others. Only *C. ilicicola* and a number species of *Dactylonectria* are known pathogens of avocado seedlings.

IMPORTANCE

These fungi are serious *Group 1* non-viroid pathogens of avocado nursery plants. They are very damaging to the root system of nursery trees and young trees in the field; they are not known as pathogens of mature trees.

SYMPTOMS

In the nursery infected plants will have brown to black lesions along the feeder roots which coalesce to completely destroy the root system. It is difficult to distinguish between *Phytophthora* root rot and black root rot. Nursery plants may be stunted and wilted, and when infected stock is planted in the field without chemical intervention, trees may die within a year of planting.

SPREAD

Infections are initiated by germination of various types of spores that can be splash dispersed from rainfall or overhead irrigation, spread with air currents, fungus gnats and shore flies. Infected plant material and infested media will also spread the pathogens, e.g. residual roots or soil adhering to pots which have not been steam sterilised.



Seedlings infected with *Calonectria ilicicola* (left and middle) compared with healthy plant (right). Photo by Louisa Parkinson, UQ.



Seedling infected with *Dactylonectria macrodidyma*. Photo by Louisa Parkinson, UQ.

MANAGEMENT

- » Take every precaution to exclude these pathogens from the nursery. Strict hygiene, pasteurised growing media, water disinfestation and good growing conditions are essential.
- » Submit plants to a diagnostic laboratory to confirm the identity of the pathogen in question.
- » Spread of the disease can be reduced by drenching healthy plants with registered fungicides, provided the disease is detected and identified early.
- » Remove diseased plants from the nursery, and discard old nursery stock that may be acting as a reservoir of the pathogen.
- » Planting infected nursery stock in the orchard will contaminate the field site, and healthy replacements may become infected.
- » For more information refer to the <u>soilborne diseases</u> pest management plan and <u>Calonectria (previously</u> <u>Cylindrocladium)</u> nursery paper.



Healthy roots (left) and roots infected with Calonectria (right).



Avocado roots infected with Calonectria.

RHIZOCTONIA ROOT ROT

CAUSE

Rhizoctonia solani

IMPORTANCE

Rhizoctonia damage is rarely seen in avocado nurseries today due to aerated steam treatment of growing media, seed picked directly from trees, and good nursery hygiene to ensure that seedlings do not come in contact with contaminated soil/ media. It is a *Group 2* non-viroid pathogen.

SYMPTOMS

Prior to the use of pasteurised growing media, the fungus was often recorded attacking the seed cotyledons, embryo and radicle of young avocado seedlings. The pathogen can attack the feeder roots. Roots become encrusted with growing media that is held together by threads of tough brown mycelium. It rarely invades the stem or becomes aerial through the leaves in an avocado nursery. Rhizoctonia can be found in the field on the roots of mature trees, but the attack is not severe and regeneration of roots proximal to regions of infection quickly occurs.

SPREAD

Spread depends on scattering of contaminated soil or plant fragments. There is no important airborne phase. *Rhizoctonia* can spread via infected organic material and fungal growth within or above the growing media.

MANAGEMENT

- » Good nursery hygiene and collection of healthy plant material.
- » If introduced it can become a nursery "resident" due to the formation of long-lived sclerotia. If the disease problem persists decontaminate the entire growing area. Fungicides can be used to help protect healthy plants and stop the spread of fungal growth.
- » For more information refer to the <u>soilborne diseases</u> pest management plan and <u>*Rhizoctonia*</u> factsheet.



Minor lesions typical of black root rot that are easily overlooked.

VERTICILLIUM WILT

CAUSE

Verticillium dahliae

IMPORTANCE

The disease is very rare in avocado nurseries. It is a *Group 2* non-viroid pathogen.

SYMPTOMS

Young avocado trees wilt and generally die. In older trees in the field, leaves on one or more branches suddenly wilt, and dead brown leaves remain attached to the branch for several months. When the bark is peeled back dark brown streaks in the xylem tissue are clearly visible. Often the affected tree sends out new shoots and the tree recovers completely.

SPREAD

The soilborne fungus invades the tree through the roots; mycelium and spores move upwards in the xylem causing a sudden wilting and collapse of young trees. It is possible to transmit the disease during grafting; graft wood from an infected tree may contain spores of the fungus. However such grafting wood rarely survives in the nursery.

MANAGEMENT

Mother trees with a history of the disease must not be used as a source of graft wood or cuttings. Fungicide sprays are not effective. Remove any dead seedlings from the growing area regardless of the cause.



Dieback caused by Verticillium.



Discoloured stem caused by *Verticillium* (above) compared to a healthy stem (below).

SEED DECAY PATHOGENS

Seed needs to be free of decay organisms such as fungi belonging within the family Botryosphaeriaceae and species within the genus *Colletotrichum*. Seed extracted from ripe fruit with anthracnose or stem end rot, are likely to be infected with these organisms. *Rhizoctonia solani* may infect seed if it is extracted from fruit on the ground, or if it is planted in *Rhizoctonia* infested growing media. *Botrytis cinerea* is able to infect seed in cool moist conditions, particularly where the seed coat has not been totally removed.

IMPORTANCE

Seed decay pathogens are **Group 1** non-viroid pathogens. Loss of seedlings may occur if infected seed are used. Further research is required on fungi from the family Botryosphaeriaceae that are probably seedborne; use of seed infected with these fungi may increase risk of graft incompatibility and/or branch dieback after the seedling has been planted in an orchard (perhaps without showing symptoms in the nursery).

MANAGEMENT

- » Only extract seed from fruit without symptoms of disease such as anthracnose and stem end rot.
- » Only take seed from hard unripened fruit. This removes the seed coat (husk), which increases the speed of germination, as well as the percentage germination.
- » Do not plant seed extracted from immature fruit, which can increase risk of producing unhealthy seedlings.
- » Mature fruit, intended as a seed source, should be harvested directly from the tree, avoiding contact with the ground, which can increase the risk of infection of a range of soilborne pathogens, including *Phytophthora*.

- » Store seed appropriately.
- » Hygienically remove plants growing from seed showing signs of pathogen infection.



Avocado seed from which fungi from the family Botryosphaeriaceae were isolated.



Lesions on seed caused by Colletotrichum.

STEM AND GRAFT CANKERS

ANTHRACNOSE

CAUSE

Species within the genus Colletotrichum

IMPORTANCE

Colletotrichum is well known as the cause of the postharvest fruit disease anthracnose, and of the field disease Pepper Spot). It can also cause seed decay, stem lesions and death of the graft union in the nursery (*Group 1* non-viroid pathogen). Stem and graft infection is very serious as it can cause the death of nursery plants.

SYMPTOMS

Pink or orange spore masses develop on stem lesions or at the graft union in humid weather. The fungus infects young stems in the field, but remains quiescent until the tissue becomes injured. There can also be direct infection by spores of the fungus through wounds on young stems, and grafted scion pieces in the nursery. Grafts will die.

SPREAD

Spores produced on infected tissue are spread by water splash. Seed, cuttings and scionwood used for propagation may also carry the pathogen.

MANAGEMENT

- » Grafting material should be taken from young, healthy Mother Trees which have been sprayed with registered fungicides, preferably about two weeks prior to taking cuttings.
- » Do not cut scion material in the rain (not even when slightly drizzly), in foggy conditions or other situations in which plant material may be damp, moist or wet.
- » Disinfest secateurs regularly.
- » Do not injure the stems of young plants in the nursery.



Avocado seed infected with *Botrytis*. Externally black, raised sclerotes may be present (left), internally there may be dark discolouration. Fuzzy fungal growth may also occur over the surface of the lesion (right).

» Refer to the latent fungal infections nursery paper for

more information.

fungicide.

» Refer to seed decay management actions where Colletotrichum is acting as a seed pathogen and the anthracnose section where it as acting as a leaf spot pathogen.

» Sunburn exacerbates stem lesions; put plants under an

and surrounding plants sprayed with an appropriate

appropriate shade cloth density for their age.

» Nursery trees with symptoms should be destroyed,



Stem necrosis and internal cortical vascular discolouration caused by *Colletotrichum*.



Minor symptoms of *Colletotrichum* graft necrossis (above) that could easily lead to more severe symptoms. This tree also has stem necrosis in the scion. Advanced *Colletotrichum* graft necrosis (below).

GRAFT CANKERS AND DIEBACK

CAUSE

Fungi in family Botryosphaeriaceae

IMPORTANCE

These fungi are *Group 1* non-viroid pathogens that may cause cankers at the graft union, or stem dieback with an associated browning of leaf margins. The latter is more likely to occur in plants kept well after the intended dispatch date. They can also exist in nursery trees as latent pathogens, and attack mature trees years later especially when the trees are stressed. With changing climatic conditions, particularly higher temperatures, changes in rainfall patterns, and more catastrophic environmental events (drought, flooding) these diseases are likely to increase in importance to the avocado industry.

SYMPTOMS

A brown discolouration is evident at or near the graft union, and there may be wilting of the scion. Older trees may have dieback and marginal leaf necrosis. Young trees with latent or wound infections at the graft union may not develop cankers until after field establishment. This is most likely to occur when such trees are stressed (e.g. from drought, sunburn, nutrient deficiency, waterlogging, extreme temperatures, damage by insects or other pathogens).

SPREAD

Spores are released from dead twigs and branches during rain and water dispersed. Some spores are fired into the air and are wind dispersed or spread in water. The fungi can be present in plant tissue without showing obvious symptoms, thus they can spread in asymptomatic nursery plants.

MANAGEMENT

- » Do not source seed, cuttings and scion wood from Mother Trees with dead twigs and branches. Source propagation material from young, healthy, non-stressed trees.
- » Do not collect cuttings or scion wood in wet weather.
- » Disinfest secateurs regularly.
- » Remove all vegetative debris from the nursery and immediate surroundings.
- » Destroy all nursery plants with necrotic tissue at or near the graft union.

- » Maintain good vigour and avoid water stress.
- » Protect pruning and grafting wounds and any bark splits with a registered fungicide.
- » Refer to the <u>latent fungal infections nursery paper</u> for more information.



Stem and graft necrosis caused by fungi in the family *Botryosphaeriaceae*.



Leaf spots caused by Pseudocercospora purpurea

LEAF DISEASES

The main leaf diseases are cercospora spot and anthracnose. Fungi in the family Botryosphaeriaceae can sometimes be found sporulating on necrotic leaf tissue but their role in leaf spot development is not known in avocado.

CERCOSPORA SPOT

CAUSE

Pseudocercospora purpurea

IMPORTANCE

Cercospora spot is currently confined to the Atherton Tablelands and may impact other growing areas if moved. Besides causing a leaf disease, it is a serious fruit pathogen and is a *Group 1* non-viroid pathogen. While this pathogen is unlikely to cause the death of avocado nursery or field trees, presence on fruit may impact on market access; New Zealand does not have this pathogen.

SYMPTOMS

Small angular leaf spots (1–5mm) develop that are purple to brown in colour and are generally surrounded by a chlorotic halo. Lesions may coalesce to form large dead areas on the leaf. Spores are produced in abundance on infected leaves in warm, rainy weather and germinate readily in a film of water.

SPREAD

Spores produced on infected leaves are spread by wind, splashing rain, irrigation water and insects to initiate new infections.

MANAGEMENT

Grafting material should be taken from young, healthy Mother Trees which have been sprayed with fungicides, as per recommendations in stem and graft canker pathogen section.

- » Do not move affected nursery trees from Atherton Tableland to other growing areas in Australia.
- Take propagation material from young, healthy Mother
 Trees that have been sprayed with a registered fungicides.
- » Remove dead organic matter from the growing area to reduce inoculum levels. Remove infected material that has fallen from plants and infected leaves attached to plants where possible.
- » Reduce the length of time leaves remain wet following irrigation.
- » Increase ventilation and plant spacing to assist in leaf drying.

- » Apply an appropriate fungicide to protect healthy plant material.
- » For more information refer to the fact sheet on fungal leaf spot pathogens.

ANTHRACNOSE

CAUSE

Species within the genus Colletotrichum.

IMPORTANCE

Anthracnose is a *Group 2* non-viroid pathogen causing leaf spots. It can be a problem during an extended period of rainy weather or where leaf wetness is otherwise maintained for extended periods, e.g. with frequent overhead irrigation.

SYMPTOMS

The fungi cause chlorotic spots followed by necrotic brown spots. Spots may coalesce to produce a dead tip on the leaf and may cause marginal necrosis.

SPREAD

The fungi produce conidia on dead leaf tissue which are spread by water splash.

MANAGEMENT

- Take propagation material from young, healthy Mother Trees that have been sprayed with appropriate fungicides.
- » Remove dead organic matter from the growing area to reduce inoculum levels. Remove infected material that has fallen from plants and infected leaves attached to plants where possible.
- » Reduce the length of time leaves remain wet following irrigation.
- » Increase ventilation and plant spacing to assist in leaf drying.
- » Apply an appropriate fungicide to protect healthy plant material.
- » For more information refer to the fact sheets on <u>Colletotrichum</u> and <u>fungal leaf spot pathogens</u>.

This fact sheet was written by Ken Pegg and Andrew Manners (Department of Agriculture and Fisheries) in 2018 as part of the production nursery levy and Hort Innovation funded project "Implementation of Recommendations from the Avocado Nursery Voluntary Accreditation Scheme Review, AV16013)." Thanks to Elizabeth Dann and Louisa Parkinson (both the University of Queensland) for use of photos. All other photos were taken by DAF.



Anthracnose on avocado leaves. Photo by Elizabeth Dann, UQ.

BIOSECURITY

Accurate identification of plant diseases attacking avocado nursery trees is essential when selecting effective management options and in maintaining biosecurity preparedness. Economically significant diseases which are not present in Australia, include scab (*Sphaceloma perseae*), and Laurel wilt (Raffaelea lauricola) which is spread by the Redbay ambrosia beetle (Xyleborus glabratus). A number of species of Phytophthora have been reported as pathogens of avocado and are not known to occur in Australia including, P. heveae and P. mengei. Other exotic diseases of lesser importance are powdery mildew (Oidium sp.), silver spot (Mycosphaerella perseae) and tar spot (Phyllachora gratissima). Any avocado nursery trees suspected of being affected with an unknown disease should be reported to their state department of agriculture, primary industries or the Plant Health Australia hot line (1800 084 881).

REFERENCES

Baker KF 1957. The UC system for producing healthy container-grown plants through the use of clean soil, clean stock and sanitation. Edited by Kenneth F Baker. 332p

Dann EK, Ploetz RC, Coates LM, Pegg KG 2013. *In : The Avocado : Botany, Production and Uses*, 2nd Edition. Eds B.Schaffer *et al*. 380–422.

Ernst AA, Whiley AW, Bender GS 2013. Propagation. In : *The Avocado : Botany, Production and Uses*, 2nd Edition. Eds B.Schaffer et al. 234–267.

Parkinson LE, Shivas RG, Dann, EK 2017. Pathogenicity of nectriaceous fungi on avocado in Australia. *Phytopathology*. 107:1479–1485.

Rodriguez-Padron C, Siverio F, Perez-Sierra A, Rodriguez A 2018. Isolation and pathogenicity of *Phytophthora* species and *Phytopythium vexans* recovered from avocado orchards in the Canary Islands, including *Phytophthora niederhauserii* as a new pathogen of avocado. *Phytopathologia Mediterranea*. 57: 89–106.