Pacific Horticultural and Agricultural Market Access Program (PHAMA)

Technical Report 27: Development of and Training on Taro Production and Pack House Standards (FIJI05)

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Abbreviations

Abbreviation	Description
ACIAR	Australian Centre for International Agricultural Research
BAF	Biosecurity Authority of Fiji
DAFF	Department of Agriculture, Fisheries and Forestry (Australia)
MAWG	Market Access Working Group
MPI	Ministry of Primary Industries
PHAMA	Pacific Horticultural and Agricultural Market Access Program
URS	URS Australia Pty Ltd

Executive Summary

Activity FIJI05 was conducted through multiple short-term inputs over a period of approximately 20 months (October 2011 – May 2013). The timeframe for completing the activity was extended by approximately 6 months due to the redeployment of Fijian Government and Pacific Horticultural and Agricultural Market Access Program (PHAMA) Short-Term Advisor resources to other high priority activities.

Version 1 of a taro production and processing operational guidelines document for use by the taro export supply chain was issued on 7 May 2013 following extensive consultation with industry and Government in Fiji. The guidelines document was delivered to supply chain participants in Taveuni on 9 May 2013 through an introductory workshop with key industry representatives. Industry and Government comments on the guidelines document, the introductory workshop and the consultative process through which the guidelines document was developed were positive.

Now that the taro production and processing operational guidelines document has been issued, the Biosecurity Authority of Fiji (BAF) has taken ownership of the document and holds responsibility to ensure it is amended and controlled as needed. BAF and Ministry of Primary Industries Extension will work together to ensure that future training for the taro export supply chain incorporates the information provided in the taro production and processing guidelines document.

Carriage for the development of awareness and extension material (along with conducting workshop activities) to supplement the operational guidelines document has been passed to the Australian Centre for International Agricultural Research (ACIAR) Developing Cleaner Export Pathways for Pacific Agricultural Commodities project (PC/2007/118). This division of effort was previously agreed to during planning for this activity and the ACIAR project in order to enable both activities to conduct complementary work rather than duplicate efforts.

1 Introduction

While trade in Fijian taro with Australia and New Zealand has been occurring for many years, quality and phytosanitary issues have continued to hinder this trade and result in reduced returns for taro supply chain participants. The ongoing issues experienced in this trade were summarised in the report for Pacific Horticultural and Agricultural Market Access Program (PHAMA) activity FIJI01 conducted in 2011.

A major impediment to improving trade outcomes for the Fiji taro export supply chain has been a lack of standardised production and processing procedures for the pathway. Without these procedures, it is difficult to ensure that industry participants understand their roles and responsibilities in the pathway, along with the requirements for producing, processing and exporting taro corms to meet the quality and phytosanitary requirements of the Australian and New Zealand markets.

Activity FIJI05 was initiated to address these impediments and comprised multiple inputs by a Short-Term Advisor over a period of approximately 20 months (October 2011 – May 2013). The timeframe for completion of the activity was extended during the course of the activity due to the need for the Biosecurity Authority of Fiji (BAF), Ministry of Primary Industries (MPI) and Short-Term Advisor resources to focus on other, higher priority work as identified by the Fiji Market Access Working Group (MAWG).

Specific inputs during the course of activity FIJI05 included:

- Input 1: Meeting with a Department of Agriculture, Fisheries and Forestry (DAFF) Senior Professional Officer to discuss issues with Australian imports of taro from Fiji and potential mechanisms to address these issues (August 2011).
- Input 2: Meetings with Fijian industry and Government participants in the export taro pathway in Suva and preparation of draft operational guidelines for taro production and processing (October 2011).
- Input 3: Participation in the Australian Centre for International Agricultural Research (ACIAR) Developing Cleaner Export Pathways for Pacific Agricultural Commodities project (PC/2007/118) planning workshop in Suva to coordinate and streamline ACIAR and PHAMA activities in addressing issues with taro exports to Australia and New Zealand (February 2012).
- Input 4: Meetings with taro growers, middle buyers, transporters, pack houses / exporters and Government officials in Taveuni and Suva to further assess the taro supply chain and continue development of the draft operational guidelines (June/July 2012).
- Input 5: Meetings with taro supply chain participants (industry and Government) and finalisation of the draft taro production and processing operational guidelines (October 2012).
- Input 6: Issuance of the taro production and pack house operational guidelines and delivery of training to farm group leaders in Taveuni (May 2013).

2 Input Summaries

2.1 Input 1: Meeting with a DAFF Senior Professional Officer

The Short-Term Advisor travelled to Lismore in New South Wales, Australia, to meet with a DAFF Senior Professional Officer who had recently undertaken a review of taro imports into Australia, including an audit of DAFF import clearance procedures in Brisbane and Sydney. The meeting proved valuable in ascertaining the extent of the phytosanitary issues being identified during the inspection and clearance of Fijian taro in Australia, as well as in providing useful context as to how these issues have changed over time.

2.2 Input 2: Meetings with Fijian Industry and Government Participants in the Export Taro Pathway in Suva and Preparation of Draft Operational Guidelines for Taro Production and Processing

Meetings with industry and Government participants in the taro export pathway were conducted to discuss the objectives of the activity, seek inputs from participants on what is needed in the operational guidelines, and identify issues associated with meeting Australian and New Zealand requirements. Following the meetings, all comments and suggestions were analysed and, where applicable, included in the first draft of the operational guidelines for taro production and processing that was developed during the visit.

2.3 Input 3: Participation in the ACIAR Developing Cleaner Export Pathways for Pacific Agricultural Commodities Project (PC/2007/118) Planning Workshop in Suva

During the workshop, the Short-Term Advisor briefed participants on the objectives and scope of activity FIJI05, was updated on progress with ACIAR project PC/2007/118, and contributed to planning for the upcoming 12-month period for the ACIAR project. A sub-activity of Project PC/2007/118 involves developing production and pack house standards for taro exports, and the workshop provided a good opportunity to ensure that this sub-activity and activity FIJI05 were carried out in a complementary manner rather than duplicating each activity. It was decided during the workshop that PHAMA activity FIJI05, which was already in progress, would have primary carriage for developing the taro production and processing operational guidelines, whereas the ACIAR project would take carriage of developing extension material to support the operational guidelines.

2.4 Input 4: Meetings with Taro Growers, Middle Buyers, Transporters, Pack Houses / Exporters and Government Officials in Taveuni and Suva to Further Assess the Taro Supply Chain and Continue Development of the Draft Operational Guidelines

These meetings, and associated field visits, provided an opportunity for the Short-Term Advisor to observe the taro supply chain, from the point of production and harvest through to load-out of packed product into shipping containers for export to Australia and New Zealand. It also provided an opportunity to identify further issues with the existing pathway for which inclusions in the draft

operational guidelines were needed, and allowed the Advisor to assess the practicalities of implementing the draft guidelines in the taro supply chain.

2.5 Input 5: Meetings with Taro Supply Chain Participants (Industry and Government) and Finalisation of the Draft Taro Production and Processing Operational Guidelines

A one-day workshop was held in Suva with representatives of the taro supply chain (growers, middle buyers, exporters, MPI extension officers, BAF inspection staff) to finalise the draft operating guidelines. The Short-Term Advisor facilitated the participants to work through the draft guidelines section-by-section and decide where and what changes to the draft guidelines were needed. Following the workshop, the Short-Term Advisor amended the draft guidelines to produce the final draft for submission to the Fiji MAWG, BAF and MPI, and for which training would be developed.

2.6 Input 6: Issuance of the Taro Production and Pack House Operational Guidelines and Delivery of Training to Farm Group Leaders in Taveuni

Following deliberations by the Fiji MAWG, BAF and MPI, Version 1 of the finalised taro production and pack house guidelines was issued on 7 May 2013. Through earlier consultations with BAF and MPI, it had been decided that the guidelines should initially be delivered to industry in Fiji by way of an introductory workshop rather than by formal training. The Short-Term Advisor met with key representatives of BAF and MPI, along with two taro exporters, in Suva on 7 May 2013 to conduct a pilot session of the introductory workshop that would be delivered in Taveuni. The participants responded positively to the pilot session and thought it was appropriate for delivery to industry. The Short-Term Advisor also took the opportunity to canvass participants on the content of extension material to support the guidelines.

The Short-Term Advisor and Fiji National Market Access Coordinator subsequently travelled to Taveuni and delivered the introductory workshop to farm group leaders on 9 May 2013. The participants at the workshop had been chosen by the Taveuni MPI Extension Officer as those best able to absorb the information and pass it along to the farmers they represented. The participants responded positively to the workshop and commented that it had provided them with a clear overview of the entire pathway, as well as an understanding of Australian and New Zealand requirements for imported taro, which they felt they did not have in the past. The Short-Term Advisor again took the opportunity to canvass participants on the content of extension material to support the guidelines.

Version 1 of the taro production and processing guidelines is included at Appendix A. The PowerPoint presentation used to deliver the guidelines to industry in Taveuni is included at Appendix B. A preliminary draft pack house poster to submit to ACIAR Project PC/2007/118 for consideration is included at Appendix C.

3 Activity Discussion

In the initial stages of the activity, a review of the existing Fijian legislation, standards, procedures and informative instruction was undertaken to establish the present level of regulation and instruction for the taro export pathway. The Biosecurity Promulgation 2008 provides the authority to regulate premises where inspection, testing and treatment of regulated articles can take place. Two pack house standards (Pack house design and facilities, and Pack house and facilities standard) provide specifications as to how these premises are regulated. A Fiji MPI Farmer's leaflet (2009) provides basic guidance on good practice for growing taro for the Australian, New Zealand and United States export markets.

However, as had been anticipated from previous reviews, little guidance was available to taro supply chain participants as to what the Australian and New Zealand phytosanitary requirements for taro are, and how to manage the supply chain in a manner to ensure these requirements will be met. It was also evident that prior to the point of packing there is no mandate for the Government to regulate the supply chain; accordingly, the industry must take greater responsibility for ensuring that the quality and phytosanitary status of taro corms are maintained/improved throughout the pathway.

Therefore, the operational manual was developed in terms of a "guidance" document rather than a standard or "procedural" document. Regulatory responsibility for each component of the supply chain is clearly identified in the guidelines. For example, the Fijian Government does not regulate taro production and the guidelines clearly identify that industry is responsible for self-regulating taro production in order to ensure taro corms produced for export meet importing country requirements.

The draft taro production and processing operational guidelines went through a rigorous consultation process with Fiji Government and industry before being finalised and issued on 7 May 2013. The issued document was delivered to key industry representatives at a workshop in Taveuni on 9 May 2013.

It had been identified during the ACIAR project PC/2007/118 Developing Cleaner Export Pathways for Pacific Agricultural Commodities workshop in February 2012 that there were areas of overlap between that project and PHAMA activity FIJI05 in terms of developing guidance material for the Fijian taro industry. Accordingly, a division of labour was formulated to ensure that neither of the projects replicated work of the other project—initially FIJI05 would have primary carriage for developing the taro production and processing operational guidelines, whereas ACIAR project PC/2007/118 would then take carriage of developing extension material to support the operational guidelines. To effect the handover from FIJI05 to ACIAR PC/2007/118, the final stages of FIJI05 were used to garner information and ideas from taro export supply chain contributors on the content of extension material to support the taro production and processing guidelines and to provide recommendations on this to the ACIAR project.

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Appendix A

Appendix A Taro Production and Processing Guidelines (Version 1, 7 May 2013)

Taro growing and processing

Guidelines for exporting taro to Australia and New Zealand

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1. PURPOSE

These Guidelines provide an outline of the processes and procedures to be implemented by growers, middle buyers, transporters, packhouse operators, exporters, Ministry of Primary Industries and Biosecurity Authority personnel in the export taro pathway. In particular, the Guidelines detail the roles and responsibilities, legislated components and management principles that underpin the phytosanitary requirements for trade in taro with Australia and New Zealand.

The Guidelines comply with the International Standards for Phytosanitary Measures (ISPMs) prepared by the Secretariat of the International Plant Protection Convention (IPPC) as part of the United Nations Food and Agriculture Organization's global program of policy and technical assistance in plant quarantine.

2. SCOPE

These Guidelines provide detailed information regarding the regulated and non-regulated processes and procedures in the taro export supply chain. Specific processes include production, harvest, transport, grading and packing, and phytosanitary inspection and certification.

3. REFERENCES

Biosecurity Promulgation 2008	Biosecurity Promulgation 2008 (Promulgation No. 28 of 2008). Anon. (2008) Interim Government of the Republic of the Fiji Islands.
ICON database	DAFF Biosecurity ICON database [search date 8 July 2012].
Dalo farmer's leaflet	Growing dalo for export – Farmer's leaflet 2009. Anon. (2009) Fiji Ministry of Primary Industries.
MAF BNZ Standard 152.02	MAF Biosecurity New Zealand Standard 152.02 – Importation and clearance of fresh fruit and vegetables into New Zealand. Anon. (2012) MAF Biosecurity New Zealand.
Packhouse design and facilities	Packhouse design and facilities. Anon. (no year) Biosecurity Authority Fiji.
Packhouse and facilities Standard	Standard for general packhouse and facilities for export goods. Anon. (no year) Biosecurity Authority Fiji.

4. DEFINITIONS AND ABBREVIATIONS

CEPM	Committee of Experts on Phytosanitary Measures.
Consignment	A quantity of plants, plant products or other articles being moved from one country to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or

	more commodities or lots). (FAO, 1990; revised ICPM, 2001).
Contaminating pest	A pest that is carried by a commodity and, in the case of plants and plant products, does not infest those plants or plant products (CEPM, 1996; revised CEPM, 1999).
FAO	Food and Agriculture Organization.
Inspection	Official visual examination of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations (FAO, 1990; revised FAO, 1995).
ICPM	Interim Committee on Phytosanitary Measures.
IPPC	International Plant Protection Convention.
ISPM	International Standards for Phytosanitary Measures.
National Plant Protection Organization	Official service established by a government to discharge the functions specified by the IPPC (FAO, 1990).
Non-quarantine pest	Pest that is not a quarantine pest for an area (FAO, 1995).
Official	Established, authorized or performed by a National Plant Protection Organization (FAO, 1990).
Phytosanitary certificate	Certificate patterned after the model certificates of the IPPC (FAO, 1990).
Phytosanitary certification	Use of phytosanitary procedures leading to the issue of a Phytosanitary Certificate (FAO, 1990).
Phytosanitary measure	Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 1995; revised IPPC, 1997; ISPM, 2002).
Phytosanitary procedure	Any official method for implementing phytosanitary measures including the performance of inspections, tests, surveillance or treatments in connection with regulated pests (FAO, 1990; revised FAO, 1995; CEPM, 1999; ICPM, 2001; ICPM, 2005).
Phytosanitary regulation	Official rule to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests, including establishment of procedures for phytosanitary certification (FAO, 1990; revised FAO, 1995; CEPM, 1999; ICPM, 2001).
Quarantine pest	A pest of potential economic importance to the area endangered thereby

	and not yet present there, or present but not widely distributed and being officially controlled (FAO, 1990; revised FAO, 1995; IPPC 1997).
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party (IPPC, 1997).
Regulated article	Any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved (FAO, 1990; revised FAO, 1995; IPPC, 1997).
Regulated pest	A quarantine pest or a regulated non-quarantine pest (FAO 2007).
Treatment	Official procedure for the killing, inactivation or removal of pests or for rendering pests infertile (FAO 2007).

5. RESPONSIBILITY

The Biosecurity Authority of Fiji, with input from the Ministry of Primary Industries, retains responsibility for issuing, amending and updating these Guidelines. Growers, transporters, middle buyers, packhouses, exporters, Ministry of Primary Industries and Biosecurity Authority officials are responsible for implementation of the Guidelines.

6. LEGAL POWERS AND AUTHORITY

Part 2, Section 9 of the Biosecurity Promulgation 2008, provides an overview of the functions and authority of the Biosecurity Authority of the Fiji Islands.

Part 11, Section 88 (1) of the Biosecurity Promulgation 2008, provides for the approval of premises where the inspection, testing and treatment of regulated articles can take place. Section 88 (1) further provides for approval of specified action being taken in relation to all regulated articles, or specified articles, while they are in the approved premises.

Part 13, Section 105 (1) of the Biosecurity Promulgation 2008, provides for the specification of documents and forms for use with the Promulgation. It further provides for specifying all other matters than can or must be specified, as provided for in the Promulgation.

7. OVERVIEW OF AUSTRALIAN AND NEW ZEALAND CONDITIONS FOR IMPORTED TARO CORMS

7.1 Australia's phytosanitary requirements for imported taro corms

7.1.1 Generic import conditions

The following, generic, import conditions are applicable to imports of all fruits and vegetables into Australia:

- An import permit is required. Additional conditions may be specified on the permit.
- Phytosanitary certification must accompany each consignment.
- Consignments must be free of live insects, disease symptoms, trash, contaminant seeds, soil and other debris.
- Consignments must be insect-proofed and packed in clean, new packaging material.

7.1.2 Specific import conditions

The following, specific, import conditions are applicable to imports of taro corms from Fiji:

- Only the variety *Colocasia esculenta* var. *esculenta* (large corm variety taro) can be imported into Australia from Fiji at the present time. *Colocasia esculenta* var. *antiquorum* (small corm taro) is not permitted entry into Australia from Fiji. In order to ensure that var. *antiquorum* does not inadevertently enter Australia fresh taro corms must conform with the morphological criteria particular to *Colocasia esculenta* var. *esculenta*, being:
  - Corms must be at least 15cm in length or at least 7cm in diameter at the widest point,
  - Corms must be at least 300g in weight,
  - Corms must be free of lateral buds or shoots,
  - Corms must lack shaggy hairs.

Note: the above morphological criteria relating to the size and weight of corms are used by Australia to confirm that imported taro is of the large corm variety (*Colocasia esculenta* var. *esculenta*). From a commercial perspective taro corms larger than these minimum sizes will generally be required.

- Each consignment must be accompanied by a phytosanitary certificate endorsed with the following additional declarations:
  - "The taro in this consignment is *Colocasia esculenta* var. *esculenta* and not *Colocasia esculenta* var. *antiquorum*." AND,
  - "The tubers have been sourced from Fiji, which is free of taro leaf blight (*Phytophthora colocasiae*)." AND,
  - "The tubers have been inspected and are topped and free from all foliage including petiole bases, and free from sprouting suckers and attached daughter corms."

7.2 New Zealand's phytosanitary requirements for imported taro corms

New Zealand's import requirements for taro corms are provided on a Country:Commodity basis; not all countries have access into New Zealand for this commodity. New Zealand's Import Health Standard for taro from Fiji is a 'roll over', meaning that it has been in existence for some time and predates the current IHS schedule arrangement used by New Zealand.

The following import conditions apply to taro from Fiji and are generic for imports of all fruits and vegetables into New Zealand:

- Phytosanitary certification must accompany all consignments.
- Consignments must be free of live insects, disease symptoms, soil, trash and other debris, and seed contaminants.
- Consignments must be packed in clean packaging material.

Each consignment of taro from Fiji must be accompanied by a phytosanitary certificate endorsed with the following additional declaration:

  - "The taro in this consignment has been inspected in accordance with appropriate official procedures and found to be free of any visually detectable quarantine pests, as specified by the New Zealand Ministry of Agriculture and Forestry"

- Note: the generic phytosanitary certificate declaration contained on the phytosanitary certificate is considered to be equivalent to the above declaration.

8. PRODUCTION AND PROCESSING PROCEDURES

8.1 Growing taro

8.1.1 Responsibilities

Export taro production is self-regulated by industry participants in Fiji. While the Ministry of Primary Industries provides advice to the taro industry on taro production techniques and procedures it is the Grower's responsibility to make sure taro is produced to meet the quality and quarantine standards of the importing market. **Any failure in maintaining taro quality during production may result in deterioration of corms and subsequent rejections during quarantine import inspections.**

8.1.2 Procedures

Recommendations on export varieties, timing, site selection, land preparation, planting techniques, culturing and pest and disease management for export taro are provided by the Fiji Ministry of Primary Industries in the Farmer's leaflet (2009) *Growing dalo for export*. The key recommendations from this leaflet are summarised below.

Preferred export varieties

Taro exports are predominantly of the variety Tausala ni Samoa. Other recommended export varieties include:

- Samoa hybrid
- Samoa
- Kurokece
- Dalo ni Toga
- Wararasa
- Maleka Dina
- Vulaono
- Toakula
- Uro ni Vonu

Site selection

Fertile, well-drained, loamy soils rich in organic matter are preferred for taro production. The alluvial soils of the river valleys in the wet and intermediate zones are ideal. Steep slopes (>15° incline) should be avoided.

Planting time

Planting all year round is possible in the wet zones. The main taro harvest period is November to April, with May to October being the off-season. Regular monthly planting is recommended to ensure consistent supply.

It should be noted that Tausala ni Samoa is susceptible to dry seasons whereas Samoa hybrid, Samoa and Wararasa can withstand dry conditions.

Land preparation

Soil should be loosened by digging with a fork or by ploughing and harrowing. On flat land allow excess water to adequately drain prior to planting as any excess water will encourage corm rot.

Growers should consider Ministry of Primary Industries recommendations in relation to crop rotation and fallowing during land preparation planning.

Planting material

Large, healthy suckers of 5 cm diameter should be chosen for planting material. Ensure clean planting material is used. In areas infested with Papuana beetle treat planting material in accordance with Ministry of Primary Industries recommendations.

Planting

On hilly slopes it is recommended that plants be spaced at 1.0 m x 1.0 m intervals to ensure large corms will be produced. This spacing can be reduced to 1.0 m x 0.6 m on flat lands. Where suitable levels of moisture are available spacing may be further reduced. Planting in rows makes weeding, fertilising and hoeing easier.

Place suckers in the bottom of holes approximately 15 – 20 cm deep. Press excess soil firmly around suckers.

Fertilising

Fertiliser applications at the time of planting, and during the growth of the crop, should be made on the basis of soil analysis results.

Weed control

Good land preparation prior to planting will effectively reduce weeds. It is recommended that a herbicide is used to manage weeds during land preparation.

During production it is recommended that weeds are also controlled by the application of a herbicide at label-specified rates. It is critical to ensure spray drift does not reach taro plants, therefore, weed control should be conducted during still parts of the day. Use a spray shield as necessary and spray close to weeds.

Pests and diseases

Pests and diseases should be managed in accordance with the latest Ministry of Primary Industries recommendations.

8.2 Harvest

8.2.1 Responsibilities

Export taro production and harvest is self-regulated by industry participants in Fiji. While the Ministry of Primary Industries provides advice to the taro industry on taro harvesting techniques and procedures it is the Grower's responsibility to make sure taro is harvested in a manner that will ensure it meets the quality and quarantine standards of the importing market. **Any failure in maintaining taro quality at the time of harvest may result in deterioration of corms and subsequent rejections during quarantine import inspections.**

8.2.2 Procedures

Taro corms should be harvested at full maturity when the root mass has reduced and water content has lowered. Harvesting before corms have reached full maturity can lead to increased risk of damage to the corms because of the larger root mass, along with an increased risk of spoilage due to the high water content.

Harvesting should occur in dry conditions during the morning or late afternoon when temperatures are cooler. Care must be exercised during harvest to minimise physical injury to taro corms as bruising and other damage can result in increased post-harvest disease in the corms which in turn can cause quarantine issues and result in decreased shelf life of the product. Plants should be carefully removed from the ground to minimise damage to the corms and effect minimal disruption to suckers that will be used as planting material. Where soil has been compacted significantly it may be necessary to loosen surrounding soil prior to harvesting corms.

Headsets should be cut to approximately 5 cm in length. Any less may allow corms to dry out during transport and handling. Excess soil, older petioles and other extraneous material should be gently removed in the field. It is typical at this point to leave some fibrous root material attached to the corms to provide protection during subsequent handling. Each corm should be examined at the time of harvest to ensure it conforms to market and quarantine requirements. Any corms that are deformed, physically damaged, have symptoms of rot or pest

infestation, or are undersized for the particular market should be removed from the export pathway at the time of harvest.

Corms should be packed in a manner that will minimise damage during handling and transport to the packhouse or middle buyer. Plastic field bins are preferable, however, these will not be practical in all situations (eg. where taro need to be removed from the field by horse). In these situations it will likely be necessary to use traditional polypropylene sacks or similar means of packaging. Great care must be exercised to ensure corms are not damaged or overpacked in the sacks.

Collection points should be sited in a shady location that is protected from the elements and free from contaminants such as weed seeds and insects. Where sacks are used they should be stacked in a manner that will reduce the risk of damage (crushing, for example) to corms. If the taro is covered to keep it cool ensure that clean, seed-free material is used to cover the corms.

Ideally, corms should be harvested, packaged and stored at collection points in a timeframe that minimises the amount of time they remain at the collection point prior to collection.

8.3 Transport to the middle buyer premises

8.3.1 Responsibilities

Export taro transportation is self-regulated by industry participants in Fiji. While the Ministry of Primary Industries provides advice to the taro industry on taro transport techniques and procedures it is the transporter's responsibility to make sure taro is handled and carried in a manner that will ensure it remains in export quality condition and meets the quality and quarantine standards of the importing market. **Any failure in maintaining taro quality during transport may result in deterioration of corms and subsequent rejections during quarantine import inspections.**

8.3.2 Procedures

It is typical, at least in the major production area of Taveuni, for a middle buyer to be a part of the taro export supply chain. The middle buyer essentially acts between the grower and exporter and performs an intermediate grading function. Growers may deliver taro to the middle buyers premises, or alternatively, middle buyers may collect harvested taro from the grower's collection points and transport the corms to their own premises.

Transport vehicles should be clean and fit for purpose. Packaged taro should be loaded onto the transport vehicle gently to minimise the risk of damage to the corms. Where polypropylene sacks are used they should be stacked in a manner that will reduce the risk of damage (crushing, for example) to the corms. Nothing should be placed on the top of the stacked taro that will increase the risk of damage to the corms. It is recommended that the tray and sides of the transport vehicle be covered with rubber or another cushioning material to lessen the risk of damage to corms due to vibration and jarring of the vehicle.

Depending on the distance and environmental conditions through which the corms must be transported it may be necessary to cover the load for transport to protect it from the elements and minimise contamination by dust, debris and insects. A light-coloured covering should be used to minimise heat absorption in the load. During

transport, the smoothest transport route possible should be chosen to reduce the risk of taro being damaged in transit.

8.4 Middle buyer processing

8.4.1 Responsibilities

Export taro processing by middle buyers is self-regulated by industry participants in Fiji. While the Ministry of Primary Industries provides advice to the taro industry on taro processing techniques and procedures it is the middle buyer's responsibility to make sure taro is sorted and graded in a manner that ensures it remains in export quality condition and meets the quality and quarantine standards of the importing market. **Any failure in maintaining taro quality during processing may result in deterioration of corms and subsequent rejections during quarantine import inspections.**

8.4.2 Procedures

Upon receival, packages should be gently removed from the transport vehicle and corms removed from their packaging in a way that will ensure they are not bruised or otherwise damaged. Corms should be unpacked onto a clean, smooth surface for sorting and grading. Export taro should be segregated from non-export product.

Corms are sorted and graded to remove any that do not meet export quality or quarantine requirements. Any corms that are deformed, damaged, under- or over-sized, infested or have symptoms of rot are removed from the export pathway at this point.

Following sorting and grading corms are repackaged for transport to the packhouse. Plastic bins are ideal as they lessen the risk of damage to the corms. However, given the relatively high cost of plastic bins and that lower volumes of corms can be packed in a given space, the economics of the packaging material used will need to be considered. Polypropylene sacks are often used as they are relatively inexpensive and can accommodate more corms.

Packaging material should be clean to lessen the risk of contaminating the graded corms. Care must be excercised to ensure corms are not damaged during repackaging. Particular emphasis should be placed on ensuring polypropylene sacks are not over-packed which may increase the likelihood of damage to the corms ; over-packed sacks are heavy and difficult to handle and result in rough handling. It is recommended that sacks are packed to a maximum weight of 30 kg.

Where it is necessary to store product prior to transport to the exporter's packhouse corms should be held in a cool, well-ventilated location that is protected from the elements. The product should be secured to prevent contamination from insects, weed seeds and debris.

8.5 Transport to the packhouse

8.5.1 Responsibilities

Export taro transport is self-regulated by industry participants in Fiji. While the Ministry of Primary Industries provides advice to the taro industry on taro transport techniques and procedures it is the transporter's responsibility to make sure taro is carried in a manner that ensures it remains in export quality condition and

meets the quality and quarantine standards of the importing market. **Any failure in maintaining taro quality during transport may result in deterioration of corms and subsequent rejections during quarantine import inspections.**

8.5.2 Procedures

Transport vehicles should be clean and fit for purpose. Packaged taro should be loaded onto the transport vehicle gently to minimise the risk of damage to the corms. Where polypropylene sacks are used they should be stacked in a manner that reduces the risk of damage (crushing, for example) to the corms. Nothing should be placed on the top of the stacked taro that will increase the risk of damage to the corms. It is recommended that interior surfaces of the transport vehicle payload area be covered with rubber or another cushioning material to lessen the risk of damage to corms due to vibration and jarring of the vehicle.

Depending on the distance and environmental conditions through which the corms must be transported it may be necessary to cover the load for transport to protect it from the elements and minimise contamination by dust, debris and insects. A light-coloured covering should be used to minimise heat absorption in the load. During transport, the smoothest transport route possible should be chosen to reduce the risk of taro being damaged in transit.

8.6 Packhouse operations

8.6.1 Responsibilities

Part 11, Section 88 (1) of the Biosecurity Promulgation 2008, provides for the approval of premises where the inspection, testing and treatment of regulated articles can take place. Approval can only be given following receipt of a written application by the owner or occupier of the premises and payment of the prescribed fee. Section 88 (1) further provides for approval of specified action being taken in relation to all regulated articles, or specified articles, while they are in the approved premises.

Part 13, Section 105 (1) of the Biosecurity Promulgation 2008, provides for the specification of documents and forms for use with the Promulgation. It further provides for specifying all other matters than can or must be specified, as provided for in the Promulgation.

Specifications for facilities and operators are detailed in *BAF Standard for general packhouse and facilities for export goods: Requirements for facilities and operators*.

8.6.2 Procedures

Receival

Upon receival, packages should be gently removed from the transport vehicle and corms removed from their packaging in a manner that ensures they are not bruised or otherwise damaged. Export taro must be segregated from non-export product during packhouse operations. The level of processing at the packhouse will be dependent on the destination market.

Trimming corms

Corms must be trimmed in accordance with the particular export market requirements:

Australia

The headset (including petiole bases), lateral buds and shoots must be completely removed from each corm. Extraneous root material must also be removed.

New Zealand

Headsets should be trimmed with a clean, straight cut to a length of 5 cm. Extraneous root material must also be removed.

Cleaning of corms

Taro corms for all markets must be washed in clean water to remove all soil, insects, root fiber, and other extraneous material. It may be necessary to use pressurised water or soft brushes to ensure all matter is removed from the corms. Packhouse staff must visually examine corms during washing and remove any corms from the export pathway that do not meet export quality or quarantine requirements. Particular attention should be given to immature, misshapen, physically damaged, and under- or over-sized corms, as well as corms displaying disease symptoms.

Following washing operations corms must be moved to an insect and contaminant free area for drying. Corms should be placed on a clean mesh-type rack that allows adequate air circulation around the corms. It is important that corms are not packaged wet as this will lead to an increased incidence of post-harvest fungal infections of the corms in the receiving country, which in-turn may lead to quarantine issues and reduced shelf life of the product.

Packaging

Upon drying, corms are packed in new, clean, packaging. Woven polypropylene sacks are generally used for exported taro. Laminated polypropylene sacks have an advantage over non-laminated sacks in that they assist in reducing moisture loss, resulting in fresher corms arriving at the destination market. Corms should be packed in a manner that ensures sacks are not overfilled. Once packed, sacks should be sewn/tied closed to prevent contamination. Where sacks are not transferred directly into a refrigerated sea container or airway container they must be stored in a clean area free from insects and other contaminants.

Quality inspection

A final quality inspection must be undertaken by the exporter, or exporter delegate (quality controller), prior to the BAF export inspection. A representative sample of packaged taro corms is drawn randomly from the consignment by the quality controller. The size of the sample must be such so as to provide the quality controller confidence that the sample is truly representative of the consignment. Particular attention should be given to immature, misshapen, physically damaged, and under- or over-sized corms, as well as corms displaying disease symptoms or signs of pest infestation. Magnification (eg. a low power hand lens or maggylamp) should be used to investigate any suspect corms. Where it is found that corms do not meet the quarantine standards of the importing country the consignment must be rejected for export. The consignment must be treated or reconditioned (as appropriate) before it can be submitted for BAF export inspection. Alternatively, the consignment can be diverted to another market.

Records detailing the inspection must be retained by the exporter. The following information should be recorded as a minimum:

- Inspection date
- Exporter's name
- Inspector's name
- Number of units inspected
- Total number of packages for export
- Number of units with pests
- Additional comments

Labelling

Each package (sack) will be labelled with enough information to clearly identify all packages in an individual consignment. The following minimum information must be included on the label:

- Date of packing
- Net weight
- Exporter name

Loading

Air containers and sea containers used for freighting taro must be clean and fit for purpose. Before loading ensure containers are free from insects, soil and other debris. If breaches are found in air containers that will allow the entry of insects or other contaminants these must be sealed (eg. taped) prior to loading.

Sacks of taro should be loaded and stacked gently into containers to minimise damage to the corms. Taro is susceptible to injury at cold temperatures; refrigerated containers should be maintained at approximately 8–10° throughout storage and shipping.

8.7 Phytosanitary inspection and certification

8.7.1 Responsibilities

Part 6, Sections 41-46 of the Biosecurity Promulgation 2008, detail Fiji's biosecurity export procedures. In particular, Section 41–(1) specifies..."Every outgoing regulated article or consignment is liable to biosecurity export inspection…". In the Promulgation Interpretations "regulated article" includes any plant or plant product.

Section 42 of the Promulgation specifies…"An article intended for export to a receiving country that requires – (a) a sanitary or phytosanitary certificate for importation into that country…must have biosecurity export clearance for export to that country." Section 43 provides details of what is required from a person in order to obtain a phytosanitary certificate.

Part 2, Section 9 of the Biosecurity Promulgation 2008, provides an overview of the functions and authority of the Biosecurity Authority of the Fiji Islands.

8.7.2 Procedures

Before commencing phytosanitary inspection and certification for the Australian market it is the responsibility of the Biosecurity Officer to check the conditions on the respective import permit to ensure they do not vary from the conditions detailed in these Guidelines and the DAFF Biosecurity ICON database.

Inspection facilities

Inspection facilities must be adequate for the purpose of phytosanitary inspections. Recommended minimum standards for inspection facilities include:

- An inspection bench of adequate size with a hard, durable and impervious surface.
- An inspection tray for holding produce and dislodging insects onto.
- 600 lux minimum artificial or natural light at the inspection bench surface.
- A level of hygiene that ensures the inspection facility remains clean and does not present a risk of cross infestation to the product being inspected.

Inspection equipment

Standard equipment for inspecting taro corms should include at a minimum:

- Hand lens, microscope or other device of at least 4x (preferably 10x) magnification to aid in the detection of pests and contaminants.
- Specimen bottles with preservative material such as 70% ethanol for preserving samples.
- Knife for cutting to investigate the presence of pests and contaminants.
- Fine tipped paint brush for collecting insect specimens.
- Inspection records.

Sample size

In order to establish the quarantine status of exported taro corms it is necessary for the intensity of the phytosanitary export inspection to approximate that of the on-arrival phytosanitary confirmation inspection in the importing country. It is therefore recommended that phytosanitary export inspections approach the rigor of that undertaken by DAFF Biosecurity when inspecting export consignments of taro corms.

DAFF Biosecurity sample size for imported taro is dependent on consignment size. For consignments greater than 1000 units (where a unit is a single corm) a sample of 600 units is drawn and inspected. For consignments of between 450 and 1000 units a 450 unit sample is drawn and inspected. For consignments less than 450 units a 100% inspection is undertaken.

Sample sizes are summarised below:

Consignment size	> 1000 units	450 – 1000 units	< 450 units
Sample size	600 units	450 units	100% of units

Magnification

Both DAFF Biosecurity and the New Zealand Ministry of Primary Industries typically use magnification to supplement their visual inspection of taro corms. Magnification is particularly useful for examining holes and crevices in the surface of corms where contaminating organisms are suspected to be harboured.

To reflect a similar level of rigour in inspection that will be applied to taro corms on arrival in Australia and New Zealand it is recommended that Fiji Biosecurity Officers use a minimum 10x magnification to supplement their visual inspections. A hand lens or maggylamp could be used for this purpose.

Inspection

Choose the appropriate sample size based on the amount of units in the consignment. For example, if there are approximately 20 – 25 taro corms per sack then 25 – 30 sacks will be needed for a 600 unit inspection. Choose the sample at random from across the consignment. Empty the entire contents of each sack gently on the inspection bench. Examine the sack both internally and externally for insects and contaminants before inspecting the corms.

During the inspection it is important to examine holes and crevices on the corms, as this is where most contaminating organisms will be found. It may also be necessary to cut corms to inspect for internal feeders (eg. caterpillars and beetle larvae) on occasions where symptoms of these organisms are found. Any material or debris dislodged from corms during inspection should also be inspected under magnification for insects, nematodes, mites and weed seeds.

Export inspection records

The results of all phytosanitary export inspections must be recorded. The following information should be recorded as a minimum:

- Inspection date
- Place of inspection
- Exporter's name and registration number
- Inspector's name
- Number of units inspected (ie. the sample size)
- Total number of packages for export
- Number of units with pests
- Pest identification
- Phytosanitary certificate number
- Additional comments

Detection of pests and/or contaminants

Where pests or contaminants (including weed seeds) are detected during phytosanitary inspection their quarantine status for the specific export market must be determined. This may necessitate taxonomic identification to determine the identity of the pest. If it is determined that any detected pests or contaminants are non-regulated for the intended export market phytosanitary certification can be provided. If it is determined that detected pests or contaminants are regulated for that market the entire consignment must be rejected for

phytosanitary certification and export. Rejection details must be recorded on the export inspection record (an example of a completed export inspection record is provided at Attachment 1).

Depending on the nature of the pest or contaminant it may be possible to recondition the consignment for the intended market. Reconditioning may involve treating, re-sorting or re-washing the corms. It will be the person responsible for the consignment's decision (generally the exporter) whether to:

- Treat the consignment, OR,
- Recondition and represent the consignment for inspection, OR,
- Withdraw the consignment from export.

Where it is not possible, desirable, or cost-effective to treat or recondition a consignment it may be diverted to an alternate (eg. domestic) market.

Recondition procedures

Where an exporter nominates to recondition a consignment that has failed inspection a Recondition record must be completed and signed by the exporter and provided to the Biosecurity Officer undertaking reinspection of the product. An example of a completed Recondition record is provided at Attachment 2. This example details the reconditioning measures undertaken for the failed consignment in the example export inspection record provided at Attachment 1. A further example export inspection record, detailing the results of re-inspection of the consignment following reconditioning, is provided at Attachment 3.

Phytosanitary certification

Once satisfied through inspection that the consignment meets with importing country requirements an international phytosanitary certificate will be issued by the Biosecurity Officer. Additional declarations, as at August 2012) for the Australian and New Zealand markets are as follows.

Additional declarations - Australia

a. "The taro in this consignment is *Colocasia esculenta* var. *esculenta* and not *Colocasia esculenta* var. *antiquorum*." AND,

b. "The tubers have been sourced from Fiji, which is free of taro leaf blight (*Phytophthora colocasiae*)." AND,

c. "The tubers have been inspected and are topped and free from all foliage including petiole bases, and free from sprouting suckers and attached daughter corms."

Additional declaration – New Zealand

a. "The taro in this consignment has been inspected in accordance with appropriate official procedures and found to be free of any visually detectable quarantine pests, as specified by the New Zealand Ministry of Agriculture and Forestry"

Note: the generic phytosanitary certificate declaration contained on the phytosanitary certificate is considered to be equivalent to the above declaration.

9. SUMMARY OF KEY POINTS

Following is a ready reference of the key points made throughout the Guidelines. Photographic representation of some of these points is provided at Attachment 4.

9.1 Growing

- Weeds must be controlled before planting and during taro growth to ensure that competition does not reduce corm size and impact on sucker production.
- Herbicide spraying of weeds should be conducted during still parts of the day to minimise spray drift. Plant shields should be used as necessary.

9.2 Harvest

- Corms should be harvested in the cooler parts of the day.
- Plants should be carefully removed from the ground to minimise damage to corms.
- Corms that are deformed, physically damaged or have symptoms of rot or pest infestation should be removed from the export pathway at the time of harvest.
- Headsets should be trimmed to a length of approximately 5 cm at the time of harvest.
- Excess soil and plant material should be removed from corms at the time of harvest.
- Corms should be stored in a manner that will prevent contamination with weed seeds and insects.
- Care should be taken during handling to minimise damage to corms.

9.3 Transport to middle buyer premises

- Corms should be handled gently during loading and unloading to minimise physical damage to the corms.
- Where polypropylene sacks are used they should be loaded and stacked in a manner that will reduce the risk of damage (crushing, for example) to the corms.
- Corms should be covered during transport to prevent contamination with weed seeds and insects. It is recommended that a light-coloured covering is used to minimise heat absorption in the load.
- During transport the smoothest route possible should be chosen to lessen the risk of physical damage to corms during transit.

9.4 Middle buyer processing

- Corms should be handled gently during unpacking, grading and repacking to minimise physical damage.
- Export taro corms should be segregated from non-export corms at all times.
- Any corms that are deformed, damaged, under- or over-sized, infested or have symptoms of rot are removed from the export pathway during grading.
- Corms should be repacked into clean packaging material to minimise the risk of contaminating the graded corms.
- Where polypropylene sacks are used, they should be packed to a maximum weight of 30 kg to enable careful handling of the sacks.
- Graded and repackaged corms should be held in a cool, well-ventilated location that is protected from the elements and free from contaminants.

9.5 Transport to the packhouse

- Corms should be handled gently during loading and unloading to minimise physical damage to the corms.
- The tray and sides of transport vehicles should be covered with rubber or another cushioning material to lessen the risk of damage to corms due to vibration and jarring of the vehicle.
- Where polypropylene sacks are used they should be loaded and stacked in a manner that will reduce the risk of damage (crushing, for example) to the corms.
- Corms should be covered during transport to prevent contamination by dust, debris and insects. It is recommended that a light-coloured covering is used to minimise heat absorption in the load.
- During transport the smoothest route possible should be chosen to lessen the risk of physical damage to corms during transit.

9.6 Packhouse operations

- Corms should be handled gently during unloading and unpacking to minimise physical damage to the corms.
- Export taro corms must be segregated from non-export corms at all times.
- For the Australian market, the headset (including petiole bases), lateral buds, shoots and extraneous root material must be completely removed from each corm.
- For the New Zealand market, headsets should be trimmed to a length of 5 cm with a clean, straight cut, and extraneous root material should be removed.
- Corms must be washed in clean water to remove all soil, insects, and extraneous plant material. Use pressurised water or soft brushes as necessary.
- Corms must be visually inspected during washing and any corms that do not meet export quality or quarantine requirements must be removed from the pathway.
- Following washing, corms must be moved to a contaminant free area for drying. Corms should be placed on a clean rack that allows adequate air circulation around the corms.
- New, clean, packaging must be used for export taro. Packages must be sewn or tied closed and labeled. Prior to loading, store packaged corms in a clean area free from arthropods and other contaminants.
- A final quality inspection must be undertaken following packing. Any corms that do not meet export quality or quarantine requirements must be removed from the export pathway. The use of low power magnification to investigate suspect corms is recommended. Inspection records for each consignment of taro must be retained.
- Sea and air containers must be free of soil, insects and other contaminants prior to packing. Ensure air containers are sealed to prevent the entry of pests and other contaminants.
- Maintain refrigerated containers at 8 - 10°C during storage and shipping.

9.7 Phytosanitary inspection and certification

- For the **Australian market** it is important to check the conditions on the import permit prior to phytosanitary inspection and certification.
- Ensure inspection facilities are adequate and suitable inspection equipment is available.
- Determine the number of corms in the consignment and the corresponding sample size.
- Draw samples randomly from across the consignment.
- Examine the inside and outside of sacks for contaminants.

- During inspection it is important to examine holes and crevices in the surface of corms. Use low power magnification to supplement visual inspection as necessary.
- Where there are symptoms of internal feeders cut the taro corms to assist inspection.
- Examine any material or debris dislodged from corms during inspection for the presence of insects, nematodes, mites and weed seeds.
- Detailed inspection records must be maintained.
- Ensure the correct additional declarations are included on the phytosanitary certificate.

Attachment 1: Example inspection record

Biosecurity Authority of Fiji Export Inspection Record

Date of Inspection: 01/09/2012	
Place of Inspection: Fiji Goodness, Sigatoka	
Name of BAF Inspector: Andrew J Smith	Packhouse Registration No: FJ221
Exporter: Fiji Goodness	Inspection Method: ☑End-point
Exporter Registration No: E279	Inspection Rate: ☑ 600 Unit ☐ 100% Inspection
Phytosanitary Certificate No: -	Total Number of Bins/Packages: 315 sacks

Unique identifier	Number of Packages	Total Number of Units	Comments/Findings & Number of units rejected
Fiji Goodness	30 sacks	600	38 units incorrectly topped as per Australian requirements.
Pass	Fail ✓	Signature of BAF Inspector: Andrew J Smith	

Actions resulting from detection of a suspect quarantine pest

Attachment 2: Example recondition record

Recondition Record

Date of reconditioning: 01/09/2012			
Place of reconditioning: Fiji Goodness, Sigatoka			
Exporter: Fiji Goodness		Packhouse Registration No: FJ221	
Exporter Registration No: E279		Total Number of Bins/Packages: 315 sacks	
Reason for rejection: Taro corms incorrectly topped as per Australian requirements			
Distinguishing marks	Number of Packages	Waste (removed)	Comments/Findings & Number of units rejected
Fiji Goodness	315 sacks	79	Consignment re-topped and trimmed according to Australian requirements. 79 corms removed for soft rots.
Pass ✓	Fail	Signature of Exporter/Delegate: R. N. Singh	

Attachment 3: Example inspection record following reconditioning

Biosecurity Authority of Fiji Export Inspection Record

Date of Inspection: 02/09/2012			
Place of Inspection: Fiji Goodness, Sigatoka			
Name of BAF Inspector: Andrew J Smith			Packhouse Registration No: FJ221
Exporter: Fiji Goodness			Inspection Method: ☑End-point
Exporter Registration No: E279			Inspection Rate: ☑ 600 Unit ☐ 100% Inspection
Phytosanitary Certificate No: FJ9012254			Total Number of Bins/Packages: 311 sacks
Unique identifier	Number of Packages	Total Number of Units	Comments/Findings & Number of units rejected
Fiji Goodness	30 sacks	600	Product was reconditioned following inspection on 01/09/2012 and re-presented for export inspection. Taro corms meet Australian requirements.
Pass ✓	Fail	Signature of BAF Inspector: Andrew J Smith	
Actions resulting from detection of a suspect quarantine pest			

Attachment 4: Photographic representation of some key points made in the guidelines

Figure 1. Adequate weed control is essential to maintaining corm size and strong sucker development.

Figure 2. Competition from weeds will result in reduced corm size and reduced sucker production.

Figure 3. Taro plants should be carefully lifted to minimise damage to corms and suckers. The soil around the corms should be loosened where necessary prior to lifting the plant.

Figure 4. Excess soil and plant material should be removed from corms at the time of harvest.

Figure 5. Headsets should be trimmed to a length of approximately 5 cm at the time of harvest.

Figure 6. Where economically feasible plastic bins should be utilised for handling corms.

Figure 7. Middle buyer operations provide the second level of grading and processing.

Figure 8. The tray and sides of transport vehicles should be covered with protective material to prevent damage to corms.

Figure 9. The level of processing required at the packhouse will be in accordance with importing country requirements.

Figure 10. Taro should be thoroughly washed following processing to remove soil, debris and contaminants.

Figure 11. Following washing taro should be thoroughly dried prior to packing for export.

Figure 12. Taro corms processed for export to New Zealand.

Figure 13. Taro corm processed to meet New Zealand's phytosanitary requirements (ie. free of live insects, disease symptoms, soil, trash and other debris, and seed contaminants).

Figure 14. Taro corms processed for export to Australia.

Figure 15. Taro corm processed to meet Australia's phytosanitary requirements (ie. free of live insects, disease symptoms, trash, contaminant seeds, soil and other debris; at least 15 cm in length or 7 cm in diameter at the widest point, at least 300 g in weight and free from later buds/shoots and shaggy hairs).

Figure 16. Taro corm processed to meet Australia's phytosanitary requirements showing topping of the corm.

Figure 17. Taro corm processed to meet Australia's phytosanitary requirements showing how the base of the corm and associated roots have been removed.

Figure 18. Where taro corms do not meet Australia's phytosanitary requirements (topping and freedom from soil in this case) they may be reconditioned (where possible), re-shipped or destroyed.

Figure 19. Where taro corms do not meet Australia's phytosanitary requirements (shaggy hairs/root material in this case) they may be reconditioned (where possible), re-shipped or destroyed.

Figure 20. It is important to ensure corms are kept free of weed seeds during harvest and subsequent components of the pathway, as detection of weed seeds may result in them being reconditioned (where possible), re-shipped or destroyed.

Appendix B

Appendix B Taro Production and Processing Guidelines Workshop Presentation

Taro growing and processing

Guidelines for exporting taro to New Zealand and Australia

Taro growing and processing guidelines

- History
  - The need for a taro production and processing manual was identified by the Fiji MAWG in 2011:
  - Quality and quarantine status of taro arriving in New Zealand and Australia had been extremely variable;
  - Significant volumes of taro being held for further identification of suspect pests;
    - Numerous consignments subject to re-export or destruction on arrival in Australia;
    - Most consignments subject to treatment on arrival in New Zealand.

Taro growing and processing guidelines

- A three-pronged approach to resolving the problem:
  - Fiji05 (taro growing and processing manual):
    - Attempts to document and standardize growing and processing procedures for consistent, quality outcomes;
  - PHAMA:
    - Consulting with Australia and New Zealand to improve taro imports policy;
  - ACIAR PC/2007/118 (Cleaner pathways):
    - Looking at practical solutions to address quality/quarantine issues pre- and post-harvest;

Taro growing and processing guidelines

- New Zealand's phytosanitary conditions
  - Generic conditions
    - Phytosanitary certification must accompany all consignments;
    - Consignments must be free of live insects, disease symptoms, soil, trash and other debris, and seed contaminants;
    - Consignments must be packed in clean packaging material.
  - Additional declaration
    - "The taro in this consignment has been inspected in accordance with appropriate official procedures and found to be free of any visually detectable quarantine pests, as specified by the New Zealand Ministry of Agriculture and Forestry"

Taro growing and processing guidelines

Taro processed for the New Zealand market

Taro growing and processing guidelines

- Australia's phytosanitary conditions
  - Generic conditions
    - Import permit is required. Additional conditions may be specified on the permit;
    - Phytosanitary certification required for each consignment;
    - Consignments must be free of live insects, disease symptoms, trash, contaminant seeds, soil and other debris.
    - Consignments must be insect-proofed and packed in new, clean packaging material.

Taro growing and processing guidelines

- Australia's phytosanitary conditions (cont.)
  - Specific conditions
    - Only the variety *Colocasia esculenta* var. *esculenta* (large corm taro variety) can be imported into Australia from Fiji at the present time. *Colocasia esculenta* var. *antiquorum* (small corm taro) is not permitted entry into Australia from Fiji. In order to ensure that var. *antiquoum* does not inadvertently enter Australia fresh taro corms must conform with the following morphological criteria:
      - Corms must be at least 15cm in length or at least 7cm in diameter at the widest point,
      - Corms must be at least 300g in weight,
      - Corms must be free of lateral buds or shoots,
      - Corms must lack shaggy hairs.

Taro growing and processing guidelines

- Australia's phytosanitary conditions (cont.)
  - Specific conditions (cont.)
    - Each consignment must be accompanied by a phytosanitary certificate endorsed with the following additional declarations:
      - "The taro in this consignment is *Colocasia esculenta* var. *esculenta* and not *Colocasia esculenta* var. *antiquorum*." AND,
      - "The tubers have been sourced from Fiji, which is free of taro leaf blight (*Phytophthora colocasiae*)." AND,
      - "The tubers have been inspected and are topped and free from all foliage including petiole bases, and free from sprouting suckers and attached daughter corms."

Taro growing and processing guidelines

Taro processed for the Australian market

Taro growing and processing guidelines

Taro processed for the Australian market

Taro growing and processing guidelines

- The guidelines document……
  - Focuses on systems related to Taveuni
    - Bulk of export production
    - Bulk of issues experienced in New Zealand and Australia.

Taro growing and processing guidelines

- Taro growing
  - Self-regulated by industry
  - Fiji MPI Farmer's Leaflet "Growing dalo for export" (2009)
  - Many farmers have generations of experience
  - Key points:
    - Adequate weed control
    - Application of herbicides needs to be undertaken in a manner that minimises spray drift

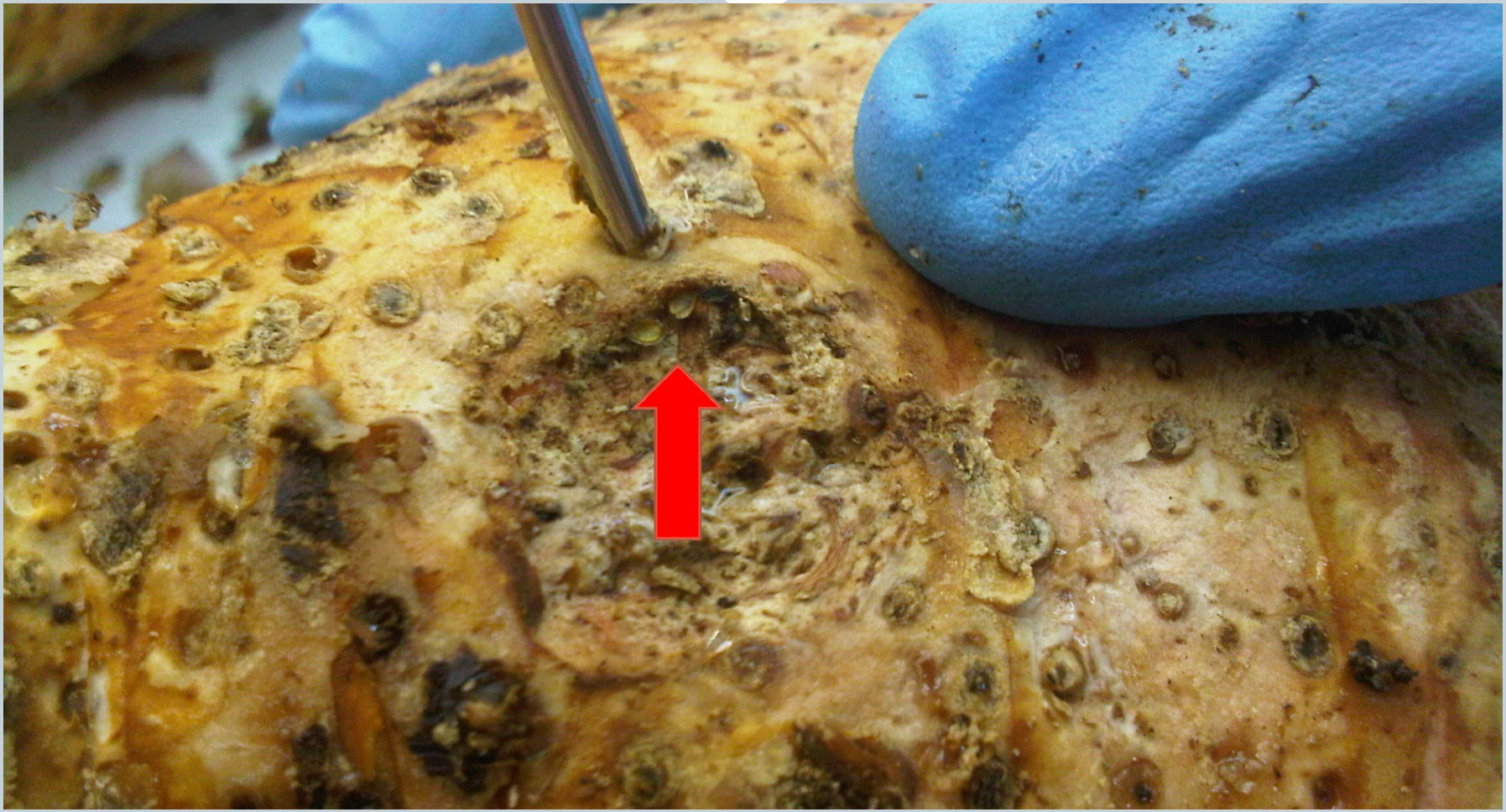
Taro growing and processing guidelines

Poor weed control results in competition and poor corm production

Taro growing and processing guidelines

- Harvest
  - Self-regulated by industry
  - Carefully harvested during cooler parts of the day
  - Corms that are physically damaged or have symptoms of rot or pest infestation removed from the pathway
  - Headsets trimmed to approximately 5cm at harvest
  - Excess soil and plant material removed from corms
  - Corms stored in a secure manner that prevents contamination with weed seeds and insects
  - Handled in a way to prevent damage to corms

Taro growing and processing guidelines



Weed seeds lodge in crevices on the surface of a corm

Taro growing and processing guidelines

- Transport to Middle Buyer
  - Self-regulated by industry
  - Handle gently to minimise physical damage to the corms
  - Sacks stacked in a manner to minimise damage (eg. crushing)
  - Cover during transport to prevent contamination
  - Choose smoothest route possible to minimise physical damage to the corms

Taro growing and processing guidelines

- Middle Buyer processing
  - Self-regulated by industry
  - Handle corms gently during unpacking, grading and repacking to minimise physical damage to corms
  - Segregate export corms from non-export corms at all times
  - Corms that are deformed, damaged, under- or over-sized, infested or have symptoms of rot removed from pathway
  - Corms repacked into clean packing material to minimise the risk of contamination
  - Where sacks are used they should be packed to a maximum weight of 30kg to enable careful handling
  - Corms held in cool, ventilated location protected from the elements and free from contaminants

Taro growing and processing guidelines

Oversize bags are difficult to handle, resulting in increased damage to corms

Taro growing and processing guidelines

- Transport to Packhouse
  - Self-regulated by industry
  - Handle gently to minimise physical damage to the corms
  - Sides and tray of transport vehicle should be covered with rubber or other cushioning material lessen risk of damage to corms
  - Sacks stacked in a manner to prevent damage (eg. crushing)
  - Cover during transport to prevent contamination
  - Choose smoothest route possible to minimise physical damage to the corms

Taro growing and processing guidelines

Transportation without adequate protection may result in damage to corms

Taro growing and processing guidelines

Overloading during transport can result in damage to corms

Taro growing and processing guidelines

- Packhouse operations
  - Handle gently to minimise physical damage to the corms
  - Export taro must be segregated from non-export product
  - **Australian market** – headsets, lateral buds, shoots and extraneous root material must be completely removed
  - **New Zealand market** – headsets should be trimmed to a length of 5cm with a clean, square cut. Extraneous root material should be removed
  - Corms washed in clean water to remove all soil, insects and extraneous plant material
  - Visual inspection of corms during washing – remove non-conforming corms from the pathway

Taro growing and processing guidelines

- Packhouse operations (cont.)
  - Corms dried in a contaminant free area
  - Quality inspection of corms – non-conforming corms removed from the pathway. Use low power magnification as needed
  - New, clean packaging must be used. Packages sewn or tied closed and labeled
  - Sea and air containers must be free of soil, insects and other contaminants. Breaches in air containers sealed to prevent the entry of pests and other contaminants
  - Maintain refrigerated containers at 8-10° C during storage and shipping

Taro growing and processing guidelines

Corms must be thoroughly washed for both the Australian and New Zealand markets

Taro growing and processing guidelines

Corms must be thoroughly dried before packing and export

Taro growing and processing guidelines

- Phytosanitary inspection & certification
  - **Australian market** – check conditions on import permit prior to inspection and certification
  - Inspection facilities must be adequate for purpose and suitable inspection equipment must available
  - Determine approximate number of corms in consignment and corresponding sample size
  - Draw samples randomly from across the consignment
  - Examine inside and outside of packaging for contaminants
  - During inspection it is important to examine holes and crevices in the surface of the corms. Use low power magnification as necessary

Taro growing and processing guidelines

- Phytosanitary inspection & certification (cont.)
  - Taro should be cut to investigate symptoms of internal feeders
  - Any material or debris dislodged from inspected taro should be examined for the presence of pests and contaminants
  - Detailed inspection records should be maintained
  - Ensure correct additional declarations are included on the phytosanitary certificate

Appendix C

Appendix C Preliminary Draft Pack House Poster for ACIAR Project PC/2007/118

Exporting taro to Australia and New Zealand

	Taro corms for export to **Australia** must be topped and free of all foliage including petiole bases. Corms must be free of soil, lateral buds, shoots and shaggy hairs.		Taro corms for export to **New Zealand** must be free of soil, trash and other debris. Trim the headsets to approximately 5cm to maintain the quality of the taro. Remove the older petioles.
	Corms must be thoroughly washed in clean water. Use pressurised water and a brush as necessary to remove soil and other debris.		Corms must be thoroughly dried before packing to reduce the incidence of post-harvest fungal infections on the corms.
[Insert photo of deformed taro corm with evidence of rot]	Deformed corms or corms with symptoms of rots must be rejected for export.	*[Insert photo of taro corm with insect (taro beetle) damage]*	Corms with insect or other physical damage must be rejected for export.
[Insert photo of biosecurity export inspection being conducted on a white inspection bench]	Inspection facilities must be suitable for purpose, and include: • Inspection bench with a hard, durable and impervious surface. • A white inspection tray for holding produce and dislodging insects into. • 600 lux minimum lighting at the inspection bench surface. • A suitable level of hygiene to prevent cross-contamination.	*[Insert photo of biosecurity inspection equipment]*	Standard equipment for inspection should include: • Magnification of at least 4x (preferable 10x) magnification. • Specimen bottles with preservative material. • Knife for cutting to investigate the presence of pests and contaminants. • Fine tipped paint brush for collecting arthropod specimens. • Inspection records
[Insert photo of packaged and labelled taro]	Taro corms must be packaged in new (for Australia), clean sacks for export. Sacks must not be overfilled. Sacks must be sewn or tied closed and stored in a clean area free from insects and other contaminants.	*[Insert photo of a label]*	Each package must be labelled with enough information to clearly identify all packages in a consignment. The following minimum information should be included: • Date of packing. • Net weight. • Exporter's name.
[Insert photo of a packed sea container]	Containers must be clean and free of soil, insects and other contaminants. Sea containers should be maintained at approximately 8-10°C for storage and shipping.		Consignments of taro that do not meet with importing country quarantine requirements may be reshipped, destroyed or treated (where applicable)
Australia's quarantine requirements for imported taro Consignments must be free of live insects, disease symptoms, trash, seeds and other debris Consignments must be insect-proofed and packed in new, clean packaging material. Corms must be at least 15cm long or at least 7cm in diameter at the widest point. Corms must be at least 300g in weight. Corms must be free of lateral buds, shoots and shaggy hairs. Corms must be topped and free from all foliage including petiole bases.		**New Zealand's quarantine requirements for imported taro** Consignments must be free of live insects, disease symptoms, soil, trash and other debris, and seed contaminants. Consignments must be packed in clean packaging material.	

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