

**ACIAR PROJECT FST/2001/045**

**FOREST HEALTH SURVEILLANCE IN SOUTH PACIFIC**

**COUNTRIES AND AUSTRALIA**

**INITIAL SURVEY REPORT (2003)**

**TONGA**



FHS Pathologist Michael Ramsden with Forester Graham Malae'fo'au; CSIRO Entomologist Adam Slipinski and Forester Sione Kanfusi inspecting a fence line planting of Mahogany on Vava'u Island.

# COUNTRY PLAN FOR TONGA

Main Samoan contact: Taniella Hoponoa (Forestry@kalianet.to)

Main Australian contact: Michael Ramsden ([Michael.ramsden@dpi.qld.gov.au](mailto:Michael.ramsden@dpi.qld.gov.au))

## 1. Framework for country plan (done at Fiji Workshop)

### WHY

- To detect new incursions of exotic pests and pathogens
- To monitor the health of the plantations

### WHAT

- Exotic species plantations/trials/demonstrations
  - *Pinus caribaea*
  - *Toona ciliata*
  - *Swietenia macrophylla*
  - *Cedrela odorata*
  - *Agathis robusta*
  - *Terminalia catappa*
  - *Cocos nucifera*
- Multi-purpose tree species for agroforestry
  - *Leucaena leucocephalla*
  - *Callandra spp*
  - *Gliricidia sepium*
- Port surround surveillance
- Timber import/export
- Forest nurseries

### WHERE

- Plantations on 'Eua Island
- Boundary plantings on Tongatapu and 'Eua
- Plantations on Vava'u island

### WHO

- MAF Forestry Division (Mr Sione Kaufusi; 50%)
- MAF Research and Extension
- MAF QQMD
- ACIAR Project country visits

### WHEN

- Initial ACIAR country visit, April, 2003
- Quarterly in first year
- Port inspections of timber shipments
- Mid term ACIAR country visit

### HOW

- Roadside surveys
- Ground surveys for boundary plantings
- Lookout points for 'Eua plantations
- Container inspections by QQMD

## 4. Itinerary for initial country visit

### Friday 4 April

- Liaison with Mr Halafihi Tu'ifua, Quarantine Officer to discuss the Project objectives and the importance of building Quarantine awareness of pests and diseases which threaten Forestry.
- Surveillance around the port environ.
- Site reference/interception collections examined and assessed.
- Make field surveillance arrangements for the following days.

### Saturday 5 April

- Fly from Tongatapu to Vava'u Island.
- Develop a schedule for Nursery inspections, Port surveys and at least two agroforestry plots to be surveyed.

### Monday 7 April

- Liaison with Ms Leody Vainikolo, Officer-in-Charge, Ministry of Agriculture & Forestry, Vava'u Branch and Mr Graham Malae'fo'ou, Forester Vava'u to discuss Project objectives.
- Nursery inspections, coconut palm sawmill inspections, port inspections and woodlot inspections.

### Tuesday 8 April

- Travel from Vava'u Island to Tongatapu Island.
- Nursery inspection.
- Liaison with Ms Siutom Tupou, Entomology Technician to discuss the Project objectives.
- Inspection of the MAF laboratories and insect collection.
- Travel from Tongatapu Island to 'Eua Island.

### Wednesday 9 April

- Meeting - J. McDonald, Villiami Niua, MAF Entomologist & Sela Topou Niua, MAF Plant Pathologist to discuss the Project objectives & activities.
- Nursery inspection - J. McDonald and Osai Tukumoiatu, Forester.
- Surveillance in the *Pinus* plantation on Eua island - M. Ramsden, A. Slipinski and S. Kanfusi.
- Demonstration of GIS skills - Stephen Hamani, OIC Forestry, Eua.

### Thursday 10 April

- Fly from Tonga to Vanuatu

## Actions / Milestones by mid term visit

### 1. Report from initial ACIAR Team visit, including initial project plan.

Who: M. Ramsden and J. McDonald

When: End of June

CC: Report to Heads of Forestry, MAFF

### 2. Port surveys:

Who: Sione Kaufusi and Graham Maleo'fo'ou

When: Half yearly

Locations: S. Kaufusi to arrange half yearly inspections of port surrounds with Quarantine officers in Nuku'alofa. G. Maleo'fo'ou to arrange half yearly inspections of port surround with Quarantine officers in Vava'u.

Targets: Commercially important species within 1 km of port. Surveys to ensure collections are made of pests/pathogens.

### 3. Plantation surveys (General detection)

Who: G. Maleo'fo'ou to organise field assistance and conduct surveys throughout government owned and community owned plantations on Vava'u Island. S. Kaufusi to organise field assistance and conduct surveys in Government owned and community owned plantations on Tongatapu and Eua Islands.

How: Using the survey techniques demonstrated by the ACIAR Australia team during the initial country visit.

### 4. Nursery surveys.

Who: G. Maleo'fo'ou to organise assistance and conduct nursery surveys on Vava'u Island. S. Kaufusi to organise assistance and conduct nursery surveys on Tongatapu and Eua Islands.

How: Using the nursery survey techniques demonstrated by the ACIAR Australia team during the initial country visit.

### 5. Reporting

Who: S. Kaufusi and G. Maleo'fo'ou to prepare a presentation of the outcomes of the surveys for the mid-term visit.

## Infrastructure for Project

### Equipment purchased from ACIAR funds

- GPS
- Basic field equipment: Back pack; hand lens; collection bottles; paper bags; note book; pens & pencils; field sheets & folder.

### Equipment required

- Digital camera
- Government & community owned plantation maps

### Equipment currently available for use by the project.

#### Tongatapu Island

- Basic field equipment & tools
  - 4 x 4 vehicles (old)
- MAF Research Centre: Well equipped entomology laboratory & insect collection with air-conditioner, display cases & cabinets, microscopes, computers, work benches etc.

#### Vava'u Island

- Basic field equipment and tools.
- 4 x 4 vehicle.

#### Eua Island

- Basic field equipment & tools.
- 4 x 4 vehicle.
- GIS facilities & knowledge

MAF Research Centre: well equipped pathology laboratory with ovens, freezer, stereo & compound microscopes, incubators, computers, air-conditioning, work benches etc.

## Training needs

### Main needs

- How to conduct surveys

- Recognising and describing damage symptoms
- How to collect and handle specimens (pathogens, insects)
- Management of significant pest / disease problems
- Extension of FHS to Village communities

### **Plan**

- Initial country workshop to introduce project to relevant MAFFM staff and provide opportunity for feedback on country training needs
- Initial project workshop and country visit to provide training on specific survey techniques and sample collection / processing to principal country participants
- Illustrated field guides to be completed and sent by the end of June 2003.
- Sione and Graham to provide training to other regions to assist them in doing surveillance.
- Review surveillance in Community forests at mid-term visit and develop hand-over plan including appropriate extension material.
- Explore the possibility of holding community workshops with plantation owners on all islands, extra funding may be required.

### **Linkages**

- Strong linkages were made between the Australian collaborators and Tonga Forestry Staff i.e. Mr Taniela Hoponoa (Head of Forestry), Mr Sione Kaufusi (Head of Division, Forestry), Mr Graham Malao'fo'ou (Forester, Vava'u Island) and Mr Stephen Hamani (OIC Forestry, Eua Island).
- Important linkages were established with Mr Villiami Kami (Entomologist) and Ms Siutom Topou (Entomology technician) whom are both based at the MAF Research Centre, Nuku'alofa. Villiami and Siutom are extremely interested in the Project and would be an ideal team to establish and maintain the Forestry Insect Collection.
- Ms Sela Topou (Pathologist) from the MAF Research Centre is also enthusiastic about the Project and offered her services. She would be an important asset to the Pathological side of the Project.
- Australian and Tongan Project participants made important contact with Quarantine officers on Tongatapu and Vava'u Islands.

### **Communication**

#### **Within Forestry Division**

- There is a need for regular contact between the Islands. Need to ensure that progress of the Project within Districts/Islands is discussed at meetings attended by Foresters.

#### **With Community Plantation Owners**

- Need to consider developing extension material on forest pests and diseases for the community.
- Could possibly hold community workshops for plantation owners.

#### **Between ACIAR project partners**

- Give country surveillance report to Ross Wylie.
- Keep in contact via email with Tonga Forestry staff and have regular updates re surveillance.

### **Report Following Initial Country Visit**

#### **Objectives of initial country visit**

- Inspect the main commercial forests and port facilities to determine the surveillance needs and develop appropriate methods.
- Detect, describe and where possible, identify pests and diseases affecting the main commercial forestry species.
- Train key Tongan project members in survey methods and techniques including specimen and data collection, insect rearing and preparing herbarium specimens.
- Develop an action plan for initial implementation of forest health surveillance by Tonga.

#### **Institutional support for project**

- Strong support for the project at all levels within the Forestry Department. Taniela Hoponoa, Head of Forestry indicated the importance of *Cocus nucifera* (Coconut Palm) as a timber species in Tonga, not just an agricultural species.
- Ms Leody Vainikolo, OIC Forestry Vava'u Island indicated strong support for the project and would like to become more involved.
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#### **Background**

See Country Report for Tonga presented at initial project workshop held in Suva in April 2003.

## Surveys conducted

### Port environs

- Tonga is serviced by two sea ports, one in Nuku'alofa on Tongatapu Island and the other in Neiafu on Vava'u Island) and one international airport which receives international freight and passengers. Nuku'alofa port is the main freight shipping port and Neiafu port primarily caters for large cruise ships.
- A meeting was scheduled with Mr Sione Foliaki (Head QQMD) at the Nuku'alofa Port. Due to his unavailability the meeting was held with Quarantine Officer Mr Halafihi Tu'ifua. The Australian participants discussed the Project objectives and the importance of building Quarantine awareness of pests and diseases that threaten the Forestry industry. Mr Tu'ifua was interested in the project and it was agreed that more communication between Tonga Forestry staff and Quarantine is needed to build the desired Forestry P & D awareness.
- A tour of the port facility was undertaken with pest and disease entry pathways being discussed and site interception / reference collections being examined. The port facility was small and no timber products e.g. dunnage were observed. The interception / reference collection was small but contained some interesting specimens e.g. longicorn and scarab beetles, larvae, moths, weeds and seeds. (see A. Slipinski for more detail). Specimens kept in ethanol were in good condition but dried specimens were poor.
- There were very few trees within and surrounding the port facility in Nuku'alofa. The trees that were present were inspected but no symptoms of recent damage were seen.
- Vava'u Port facility at Neiafu was very small and comprised one administrative / inspection building and a small enclosure where containers and dunnage were stored. There was no vegetation within the Port surrounds therefore a general survey of vegetation was not undertaken. Australian participants demonstrated survey techniques and general observation methodologies. Dunnage and packs of CCA treated timber were inspected for presence of insects and fungi.

### Ground surveys

#### Vava'u Island

- Numerous exotic tree species were observed within rural and urban environments on the island. Most species were plantation species either locally or internationally.
- Species identified: *Casuarina* sp., *Eucalyptus* sp., *Grevillia robusta*, *Toona ciliata*, *Araucaria cunninghamii*, *Araucaria heterophylla* and *Pinus caribaea*.
- Plantations of *T. ciliata* were inspected for signs of the damaging tip boring insect (*Hypsipyla robusta*). Multi-stemming of *T. ciliata* was frequently observed which suggested that *H. robusta* may be present, but physical evidence of the insect was not found. (*Severe galling and deformity of foliage within the upper crown of T. ciliata was observed within the grounds of the Paradise motel, and samples were collected.*)
- Survey techniques, including beating, sweeping, bagging and shaking of foliage and the examination of foliage and stems for the presence of insects, fungi and galls, were demonstrated by the Australian participants. This training was carried out within a wide variety of plantation types i.e. roadside agroforestry research



Michael Ramsden & Graham Malae'fo'ou inspecting a mahogany fence line planting.

planting, a farm fence-line planting of Mahogany, a Kauri and Mahogany agroforestry plantation, *Araucaria cunninghamii* bush plantation. Multi-stemmed Red Cedar was also growing in this plantation but again evidence of the tip-moth could not be found. From these sites a number of insect specimens, including a leaf-eating beetle (*Rhyparida* sp.) on Red Cedar, were collected and preserved.

### Eua Island

- Eua island was largely planted with *Pinus caribaea* (344 ha). Other species on the island were: *Toona ciliata*, *Tectona grandis*, *Swietenia macrophylla*, *Eucalyptus* spp., *Agathus robusta*, *Cupressus lusitanica*, *Cordia alliodora*, *Cedrela odorata* and *Santalum yasi*.
- Specific survey techniques for collecting insects from pine foliage were demonstrated. The *Pinus caribaea* was generally extremely healthy and was achieving extraordinary growth rates.
- There was some foliage burn in areas exposed to wind and salt spray.
- Red Cedar tip moth was not detected within planted and wild Cedar, while Mahogany plantations were healthy and free from pests and diseases. Sandalwood was a common understorey plant within the Pine plantations.
- Island residents were still clearing remnant native forests in order to establish subsistence plantings. Very little of the original vegetation is remaining on the island.
- Collections were made of male and female wood boring bostrichids in flight. These have subsequently been identified as *Xylothrips religiosus* (Boisduval)
- Guava *Psidium guajava* was a common wilding on the island and instruction was therefore provided on how to inspect Guava foliage for the presence of Guava Rust fungus (*Puccinia psidii*). This fungus is a threat world wide to species within the Myrtaceae Family, including many important plantation species.

### **Nursery inspections**

#### Vava'u Island

- Forester Graham Malae'fo'ou was in charge of the Forestry Nursery. *A. robusta* was a predominant species in the nursery but were "held over" for too long allowing the trees to grow to 60 – 90 cm in height. Many of the *A. robusta* had diseased leaders and this is apparently a common problem. Following the death of the leader, multiple shoots are produced resulting in an undesirably formed tree. (Samples of the leader dieback were not collected due to Quarantine concerns but protocols for the collection and transport of this material back to Australia for identification will be determined prior to the surveys in November 2003.
- Defoliation of young *Swietenia macrophylla* (American Mahogany) foliage was also observed within the Nursery. It was noted that a sap-sucking bug similar to that found on Mahogany in Fiji (*Leptocoris ?acuta*) was also present on Kauri Pine in this nursery. Forestry staff were encouraged to record the GPS position of important sites e.g. nurseries for inclusion onto pest and disease distribution maps.
- The nursery appeared to be generally under maintained with oversize plants, extensive weed problems in and around potted plants, insect activity and apparent disease in young Mahogany. "Bush soil" was used for all potting and this could present a disease risk if soil was

inadvertently taken from a forest site infested with *Phytophthora*. “Pots” were made from black plastic wrap and this combined with the non-porous nature of the potting soil seemed to limit free drainage causing root rot and plant mortality. All potted plants within the nursery were placed directly onto the ground, which creates an avenue for the transmission of disease within the nursery and from there into the field. Simple nursery modifications such as placing pots onto gravel or coral mounds would aid aeration, draining and weed & disease suppression. More systematic attention should be given to regular weeding, spacing of pots, removal of diseased and insect infested plants and the non-retention of old stock. These practices would quickly enhance this nursery’s ability to produce healthy pest and disease free stock.

### Tongatapu Island

- Tokomololo Forestry Nursery was in better condition than the nursery on Vava’u Island as it was well maintained and set out. Bush soil mixed with sawdust was used as potting mix. NPK fertilizer was used within the Nursery but breakdown percentages of NPK were not listed on the packets. This particular fertilizer was dissolved in water and applied to the potting soil. The pots were made from black plastic wrap that were also sitting on the ground. Overall the plants were healthy with minimal insect damage and disease free. Some young Kauri Pine plants were chlorotic with the cause most probably being poor pot drainage. Spiraling whitefly *Aleurodicus dispersus* Russell was observed on the foliage of various young trees in the nursery.

### **Sawmill surveys**

- An inspection of the Coconut Palm sawmill located within the grounds of the MAF Vava’u Branch was carried out at the request of Mr Taniela Hoponoa, Head of Forestry. Inspections of the lumber revealed that it had been exposed to weathering resulting in severe advanced decay. The decay produced was a white pocket rot with its fruiting bodies identified as *Ganoderma* sp. aff. *lucidum*. This fungus, which is a known tree pathogen, was also colonizing and fruiting on many Coconut stems lying on the ground within the surrounding area.

### **Inspections of Laboratories and insect herbariums**

- The laboratories at the MAF centre were well equipped with ovens, desiccators, stereo & compound microscopes, incubators, media preparation and insectaries. Most equipment appeared to be in good condition and the building was air-conditioned. Observations were that the insect herbarium was in good condition with some psocid activity. Collection boxes were also in good condition with modern entomological display and storage cases. The agricultural insect collection was large, consisting of 20+ cases.

### **General comment**

- Cyclone damage is a major threat to Forestry in the Kingdom of Tonga with recent damage seen in most plantations. Ms Leody Vainikolo OIC, MAF, Vava’u Branch indicated that *Agathis robusta* (Kauri Pine) was a favoured plantation species as it performed well during cyclones and did not sustain stem breakage whereas *Araucaria* spp. was easily damaged. She indicated that this is an important selection criteria for plantation species within the cyclone prone Pacific.

### **Important detection**

- An exotic pine aphid *Essigella* sp. prob. *californica* was found on *Pinus caribaea* on ‘Eua Island. This aphid is originally from North America and has recently been discovered in Australia where it is causing severe damage to *Pinus radiata* in some southern States. The genus is not

known from the Pacific. Definite species identification was not possible because the specimens collected were all nymphs. Further collections will be made.