



**Forestry and Protected
Area Management**
GEF-PAS FPAM
-Fiji - Niue - Samoa - Vanuatu



LANDCARE RESEARCH
MANAAKI WENUA

**Forest Conservation and Protected Area Management
Niue 2017 Activities and Fiji Biodiversity Teaching Kit
Final Report – 30 June 2017**



**Food and Agriculture
Organization of the
United Nations**



**Forest Conservation and Protected Area Management
Niue 2017 Activities and Fiji Biodiversity Teaching Kit
Final Report – 30 June 2017**

Contract No. SC1603

Contract No. SC1701

Peter Newsome

Landcare Research

Prepared for:

The Food and Agriculture Organisation of the United Nations

Sub-regional Office for the Pacific Islands
Private Mail Bag
Apia
Samoa

June 2017

*Landcare Research, Massey University, Private Bag 11052, Palmerston North 4442,
New Zealand, Ph +64 6 353 4800, Fax +64 6 353 4801, www.landcareresearch.co.nz*

Contents

1	Project and Client	1
2	Objectives	1
3	Activities and Timeline	2
4	Achievement against Objectives	3
4.1	Protected Areas	3
4.2	Communications.....	5
4.3	Geographic Information Systems	7
4.4	Sustainable Land Management	11
4.5	Forestry.....	12
4.6	Management and Reporting	14
5	Summary and Recommendations	14
6	Acknowledgements	16
7	References	17

1 Project and Client

The FAO, with financial support from the Global Environment Facility (GEF), is assisting the Government of Niue with the Forest Conservation and Protected Area Management (FCPAM) project. The project's main objectives are to strengthen biodiversity conservation and reduce forest and land degradation and to enhance the sustainable livelihoods of local communities living in and around protected areas.

The Niuean Department of Environment, with the Director of Environment as Project Director is responsible for local coordination of project activities.

The primary objective of Landcare Research (LCR), under Contract Numbers SC1603 and SC1701, is to implement activities enabling the Niuean communities to conserve biodiversity and manage their forests resources in protected areas and to sustainably manage their land in and around the protected areas.

In addition to work under the above two contracts, Landcare Research assisted in the delivery of tourism activities under subcontract to RUN Ltd.

2 Objectives

The 2016 project was managed and reported under the following five workstreams:

1. **Protected Areas.** This workstream, contracted under SC1603, had three activities:
 - a. To research, workshop and report on alternatives for financing protected areas in Niue.
 - b. To assist in the drafting of the Huvalu Forest Conservation Area (HFCA) management plan(s) once DoE has infilled and workshopped the 'zero draft' among government and community stakeholders.
 - c. To design and assist Taoga Niue in the compilation of a historic and cultural sites database, beginning in the HFCA.
2. **Communications.** This workstream, contracted under SC1701, was active in the Fiji sector of FPAM. In collaboration with Fiji colleagues and institutions, Landcare Research extended and adapted the Niue biodiversity teaching curriculum and resource kit, prepared in 2015/16, for use by schools in Fiji.

Outside any contractual arrangement, Landcare Research also spent considerable time devising, discussing and scoping-out a cluster of work focused on a biodiversity/conservation display in the Niue Tourism office, nature trails in HFCA and a mural between the airport arrival and departure lounges. This work was eventually contracted to a publicity agency (RUN) with Landcare Research assisting.
3. **Geographic Information Systems.** This workstream, contracted under SC1603, reinforced the capability of the Department of Justice Lands and Survey (DJLS), Department of Environment and Taoga Niue to manage biodiversity, the land and its resources by:

- a. Arranging a two-week study visit in New Zealand for the DJLS GIS analyst. During this visit he received dedicated, elementary to advanced level, training in Q-GIS, followed by applications practice in partnership with a Landcare Research analyst
- b. Delivering a 3-4 day elementary training course in Q-GIS for staff from DJLS, DoE and Taoga Niue.
- c. Developing the Niue Land Cover Database Version 3, a verified, multi-temporal, land cover database for the years 1994, 2001 and 2008.

4. Sustainable Land Management. This workstream, contracted under SC1603, undertook to further encourage best practices in sustainable land management via three activities:

- a. Originally, by facilitating the printing of a sustainable land management guide compiled under an earlier project, but, when recovered by DAFF, this was found to be insufficient and inappropriate for its intended use. Instead as decided between FAO, DAFF, and Landcare Research, a larger document, on managing soil fertility in Niue was printed.
- b. Designing, writing and delivering a 3-day workshop in soil fertility management for DAFF and invited practitioners
- c. Recovering, rewriting and reprinting a teaching booklet “The Soils of Niue”, written by ACS Wright in the 1960’s

5. Forestry. This workstream, contracted under SC1701, focussed on assessing the present state of Niue’s plantation forests and building capability in DAFF to advise and support landowners interested in establishing and managing farm woodlots via three activities:

- a. A report on Niue plantation forests, their state and future
- b. A training video on establishing and managing forest woodlots in Niue (focussing on mahogany)
- c. Establishing demonstration woodlots and undertaking capacity-building training among DAFF staff and interested landowners

3 Activities and Timeline

Project activities were implemented over a ten month time-frame from August 2016 to June 2017.

Most of the work under SC1603 was undertaken during the 2016 calendar year with deliverables passed over in 2017. SC1701 was signed in very late January 2017 and precipitated intense work in the Forestry and Fiji teaching kit during the period Feb-June 2017.

Task	2016					2017					
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Project Summary	[Progress bar]										
Protected Areas	[Progress bar]										
PA Financing	[Progress bar]										
HFCA management plan	[Progress bar]										
Cultural sites database	[Progress bar]										
Communications	[Progress bar]										
Fiji Biodiversity teaching kit	[Progress bar]										
Geographic Information Systems	[Progress bar]										
NZ 2-week Q-GIS study visit	[Progress bar]										
Niue Q-GIS training	[Progress bar]										
Niue Land Cover Database	[Progress bar]										
Sustainable Land Management	[Progress bar]										
Managing Soil Fertility handbook	[Progress bar]										
Managing soil fertility workshop	[Progress bar]										
Soils of Niue teaching booklet	[Progress bar]										
Forestry	[Progress bar]										
Niue plantation forests report	[Progress bar]										
Forestry training video	[Progress bar]										
Demonstration woodlots and training	[Progress bar]										

4 Achievement against Objectives

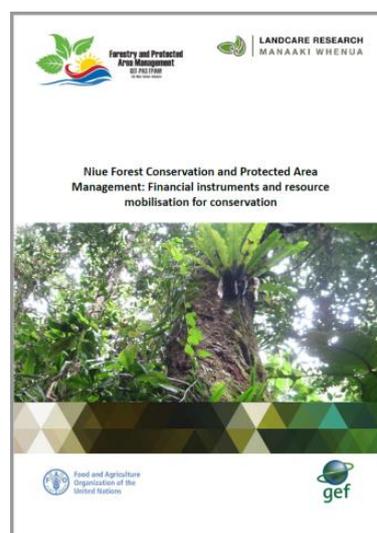
4.1 Protected Areas

- a) The **Protected Areas Financing** study to investigate ways to support conservation in Niue was undertaken by Landcare Research economist Florian Eppink, with assistance from Logo Seumanu (Niue-DoE) Josie Tamate (Dir Min Nat Res), other government officials, and the local community.

The work began with a review of market-based conservation instruments informed by knowledge of the Niuean context pertaining to; the economy, communities, the land, and threats to biodiversity conservation. Reinforcing the theoretical discussion, world examples were sought, considered and described. The process of planning for conservation financing is also examined.

This preparatory research informed a series of meetings and a workshop in Niue in mid-October. The workshop broadly followed the steps of a conservation business case: the participants assessed current and future risks for the HFCA, determined conservation needs and expected outcomes, and explored financial instruments and their viability. Several revenue-generating instruments were discussed, ranging from simple instruments that can be implemented in the short term, to more complex ones that would require significant investment and institutional support.

Recommendations arising from the workshop included;



- that in the short term, funding to stop the illegal hunting of lupe and peka in the HFCA should be the primary objective, and implementing a mechanism by which families share costs and benefits from HFCA management is a goal for the medium term,
- a forest ranger to monitor the HFCA is estimated to cost in excess of \$20,000 annually and with about 10,000 tourists visiting Niue annually for a minimum of three nights, a bed tax or bed levy of just \$1 per person per night could easily cover the costs of a forest ranger.

This component of our work is documented in Eppink (2017).

b) **Development of the HFCA management plan** was not achieved. Early in this final year of the project, project coordinator Logo Seumanu (Niue-DoE) was diagnosed with a serious illness requiring treatment in New Zealand. This event, coupled with further staff loss, rendered DoE unable to contribute the essential Niue-led precursors to this activity. Attempts, by FAO and Landcare Research, to assist DoE by proposing local contractors, and gauging their interest, were unsuccessful. In a recent email exchange among key people involved, Landcare Research listed the following alternatives for progressing the draft plan:

- Compilation in-house by DoE as originally planned
- Compilation by a contracted Niuean under supervision of DoE or R2R
- Compilation by a contracted Niuean in intense collaboration with Landcare Research (either in NZ or Niue) i.e. they come to NZ for a couple of weeks or LCR go there, to guide them through the process

c) Initiating the **Niue cultural sites database** was an activity jointly undertaken by Peter Newsome and Anne Sutherland from Landcare Research in collaboration with Moira Enetama (Dir) and Zarn Kavisi from Taoga Niue.

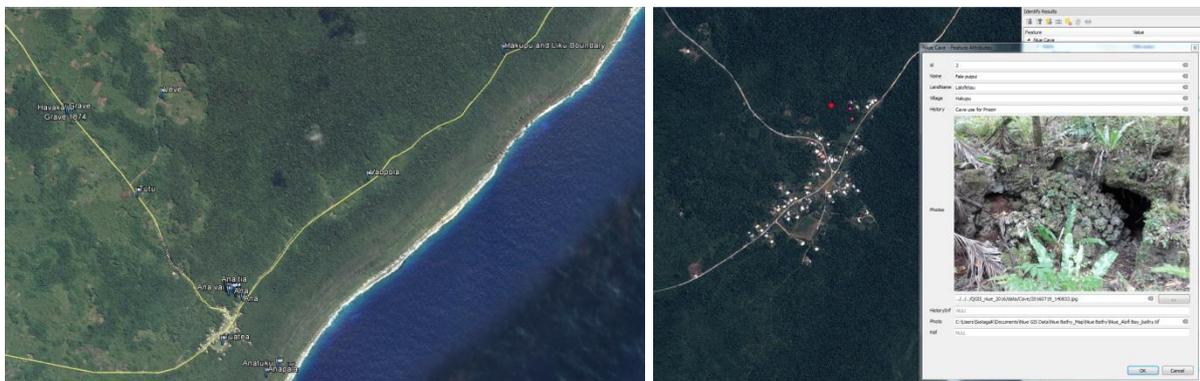
The key design considerations were; the need to accommodate and display location, image and text information, and a desire for simplicity and portability that expanded the capability of Taoga Niue without locking them into a proprietary system. Taoga Niue was already interested in developing a geographic dimension to their work and participated in both the GPS and GIS



capability-building activities of FPAM. Discovering that Q-GIS (our chosen GIS freeware package) could link external files to geographic features, made this our preferred vehicle for the cultural sites database. This utility was explored, enabled on local computers, and became one of the foci of the Q-GIS training discussed in the next section.

Taoga Niue initiated dialogue with local communities, focussing on Liku and Hakupu villages (the main stakeholders in the HFCA). Engagement to date has been tentative from Liku village but more forthcoming from Hakupu. In early March 2017 a field trip was organised including personnel from Departments (DoE, DJLS, DAFF, Taoga Niue), the Ridge to Reef programme and approaching 20 villagers. Over a dozen sites were visited. These were located; along the Liku-Hakupu Rd, Hakupu-Alofi Rd and Pangopango Tk. Sites were accurately located (by GPS), photographs taken, and descriptions, narrations and videos recorded.

Since collecting the data, Taoga Niue has initiated the database by compiling it into

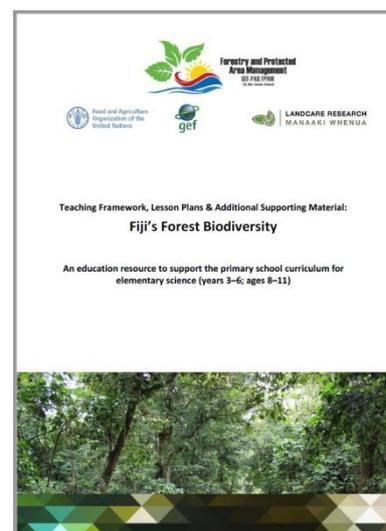


the Q-GIS framework. Taoga Niue has plans for further field data collection with elders from Hakupu. Participation by Liku remains in discussion. From these beginnings, Taoga Niue intends eventually to expand the database over the whole island. This database resides with Taoga Niue.

4.2 Communications

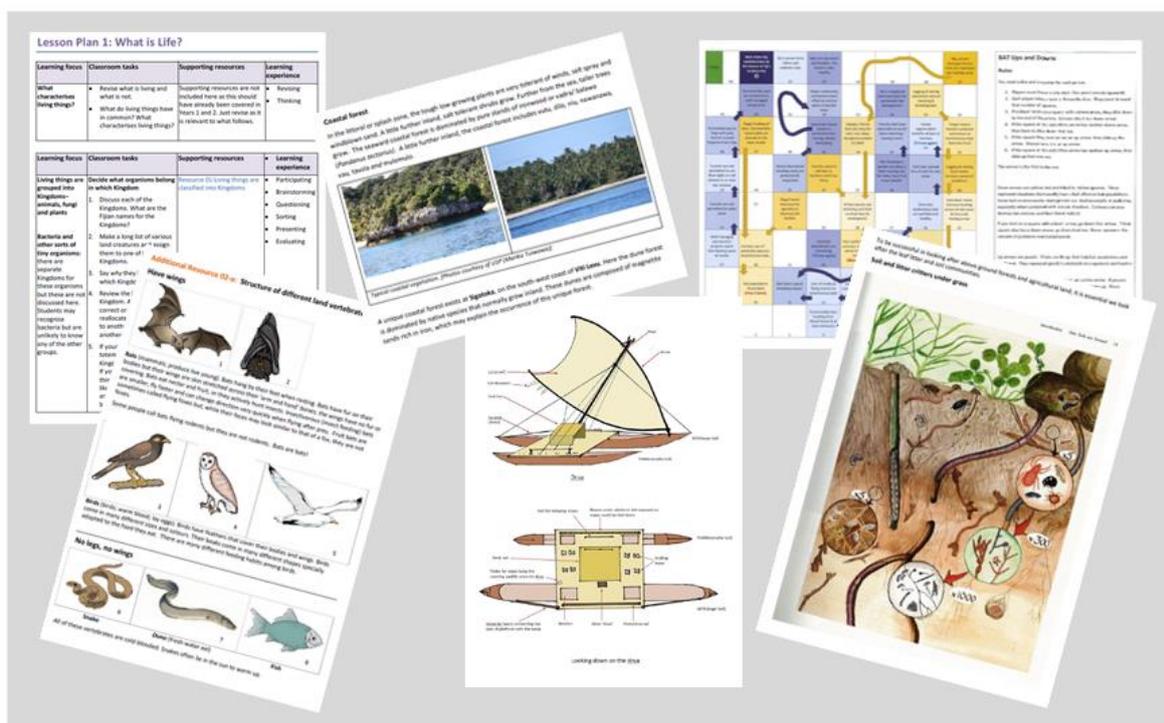
The sole activity in the Communications Workstream was focussed on the Fiji sector of FPAM and conducted by Judy Grindell, with assistance from Mr Ilaisa Tulele (FPAM-Fiji National Project Coordinator) and numerous people in government and other agencies in Fiji.

The **biodiversity teaching kit** is a significant contribution to the ‘Living things and the Environment’ strand of the Fiji teaching curriculum. It originates, but is heavily adapted for the Fiji context from a similar kit prepared under FPAM in 2015 for Niue. Both resource kits have been compiled for education at senior primary-aged level with a goal of enhancing community awareness of nature and the importance of biodiversity conservation in our future.



This teaching kit looks at the whole of the natural world. It divides its approximately 160 pages into eight ‘topics’ (not necessarily equivalent to class sessions), as follows:

- 1 What is life?
- 2 Subgroups of classification
- 3 Plant Diversity (Part A, Recognising Plant Diversity)
- 4 Plant Diversity (Part B, Traditional Uses of Plants)
- 5 Animal Diversity (Part A, Vertebrates)
- 6 Animal Diversity (Part B, Invertebrates)
- 7 Connectivity
- 8 The Value of biodiversity



Each topic is supported by teaching resources comprising such material as suggested classroom activities and discussions, information sheets, experiments and activities, illustrations and diagrams, colouring activities and games all with a Fijian focus and context.

The kit was developed following consultation particularly with the Fiji Ministry of Education, the Fiji Department of Forests, and also the Department of Environment, USP staff, Conservation International and NatureFiji. These agencies will continue to review and refine the material for use by Ministry of Education and also the Department of Forests. The Fiji Museum Library assisted with locating excellent historical reference material on Fiji canoes. The education resource was formally released by the Ministry of Education Director of Exams, Mr. Seci Waqabaca (pictured below), in a ceremony in Suva on 22 May 2017. This was followed by an afternoon training and discussion session delivered by Judy Grindell for

about 20 staff from the Ministry of Education’s Curriculum Development Unit (CDU) and the Department of Forests Training Centre.

The CDU plans to work with teachers in August to tailor the resource to various parts of the curriculum and to adapt for classroom teaching for different aged students.

The Forestry Training Centre is developing a series of biodiversity education modules for forestry officer trainees and for use in working with communities, such as in the Wakatu Project. Parts of the education resource are relevant to this and indeed some of their officers had already using elements (food web connectivity) from the Niue resource in community discussions.

This component of our work was released as Grindell (2017).



4.3 Geographic Information Systems

The Geographic Information Systems Workstream was led by Peter Newsome, actively assisted by Anne Sutherland (LCR) and Richard Siataga (Niue-DJLS).

The two components were focussed on up-skilling staff in three Departments in the use of geographic information systems (GIS). The purpose of this was two-fold; to facilitate a higher level of operation in an alternative (freeware) system by DJLS and, to spread a low-level capability among other staff in DJLS and also in DoE and Taoga Niue. These two components are discussed below:

- a) **A two-week study visit to New Zealand** was arranged for the DJLS principal GIS analyst, Richard Siataga. DJLS uses both MapInfo (its primary, but not maintained, software platform) and Q-GIS (an increasingly powerful, freeware package). Without advocating replacement of the MapInfo system, this study visit focussed on reinforcing the utility of Q-GIS in the DJLS context.

The study visit was hosted by Landcare Research at its Palmerston North site. LCR arranged for an external trainer to deliver a three-day training course covering Q-GIS from elementary to advanced level. Niuean data was used for much of the course and particular Niuean applications prototyped on the final day. The balance of the two week visit was working in



partnership with LCR analyst, Anne Sutherland doing revision and practise from the training and working up some Niuean applications as a test of the utility of Q-GIS in daily operations in DJLS.

- b) **A 4 day elementary training course in Q-GIS** was delivered to selected staff from DJLS, DoE and Taoga Niue. The training was delivered by Anne Sutherland with assistance from Richard Siataga. Six trainees were nominated by their departments and the course was delivered in the week 14-18 November 2017.

Attendance over the four days was patchy. As a consequence, the aim of the training was not fully achieved. Taoga Niue benefitted most, with their nominee being a keen and enthusiastic participant throughout. DoE nominated two staff but one only attended the first two days so the benefit to the department was perhaps only half achieved. DJLS nominated three staff (including the Director) but one was unable to attend due to illness and another attended only one day. So, while it was very gratifying to have the support and attendance of the DJLS Director for the training, and satisfying to know that Q-GIS capability now resides in a second member of staff, it is slightly disappointing to realise that we probably have not achieved our goal of building underpinning GIS support in DJLS for Richard Siataga.

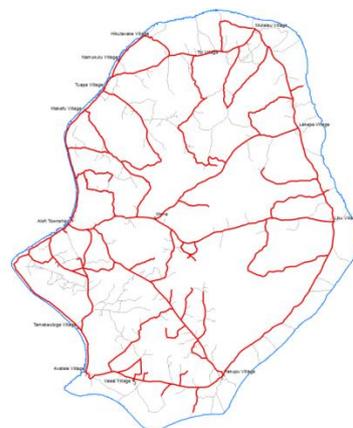


It is pleasing, however, to hear comments from DJLS that the training has made them appreciate the functionality of Q-GIS which, in some applications, can more efficiently deliver the department's service than (their, now old version, of) MapInfo. And Taoga Niue has embraced Q-GIS as a platform on which to develop their Cultural Sites Database, as well as to do rudimentary map compositions of their own.

The training notes produced for this component are cited as Sutherland (2017)

- c) **The Niue Land Cover Database Version 3** is an evolution of the 2008 provisional land cover map of Niue (compiled under FPAM in 2015/16).

Niue, like other sovereign states, has an obligation, under a number of international conventions and protocols, to monitor and report on the state and change of their environment. To date this has been impaired by ad-hoc and outdated land cover mapping. Under FPAM 2105/16, LCR took advantage of the opportunity provided by relatively recent high-resolution satellite imagery (acquired for the recent topographic map update), to compile a provisional new land cover layer of the island (corresponding to c2008).



In the current FPAM year, we verified that layer in the field to the extent allowed by travelling 210km of Niue's 386km of roads and bush tracks and making GPS-located observations.

Back in the office, with the benefit of further satellite imagery at various dates we:

1. Corrected and added detail to the layer to represent verified land cover at nominally 2008.
2. By referring to two earlier dates of imagery, we back-cast the layer to also represent two earlier dates; 2001 and 1994.

The result of this work is a functioning, multi-temporal database representing land cover of Niue (at sub-hectare resolution) for three dates in time. This is achieved with one set of polygons, and different attributes corresponding to each time-step.

Within the same structure, additional time-steps can be accommodated as new imagery is acquired (and it would be timely to consider acquiring that imagery now, so that the interval between dates is roughly consistent).

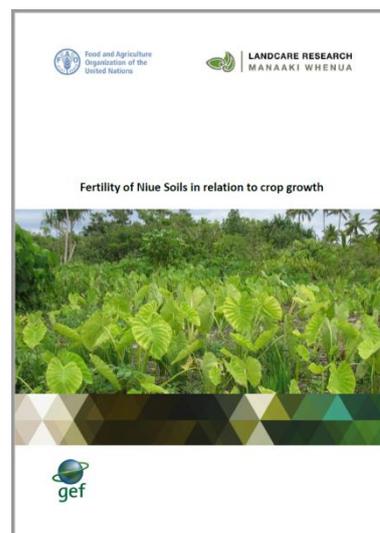
We therefore recommend an update of the Niue Land Cover Database as soon as possible to continue the established temporal sequence of land cover state and change.

4.4 Sustainable Land Management

The Sustainable Land Management Workstream was led by Peter Newsome, but substantially-delivered by two retired staff, now engaged as independent contractors; David Leslie and John Widdowson.

The three components of this activity were originally unconnected but subsequently, one component proved impractical and so a substitute was agreed in the form of an over-delivery from another component, as discussed below:

- a) **The Fertility of Niue Soils in relation to crop growth.** Printing of the sustainable land management guide, originally planned under this component, was deemed impractical early in the year's work. The material intended for the guide was really compiled for another purpose, was incomplete as a guide to sustainable land management in Niue, had some irrelevant content, and was written in language inappropriate for its intended readership. Writing a guide from scratch was beyond the scope and budget of this activity so consideration was given to a substitution. John Widdowson, in preparing for the soil fertility workshop (see the next component below) had written a very comprehensive handout on soil fertility management. This document was agreed between DAFF, FAO and LCR as a more-than-sufficient substitute deliverable. This document discusses:
1. Soil Fertility and its Assessment
 2. Diagnosis of Nutrient Deficiencies in Soils
 3. Nutrient Deficiency – A Niue Example
 4. Glasshouse Pot Trials and their Application to Soil Fertility Problems
 5. Fertiliser Requirements of Crops
 6. Types of Fertilisers

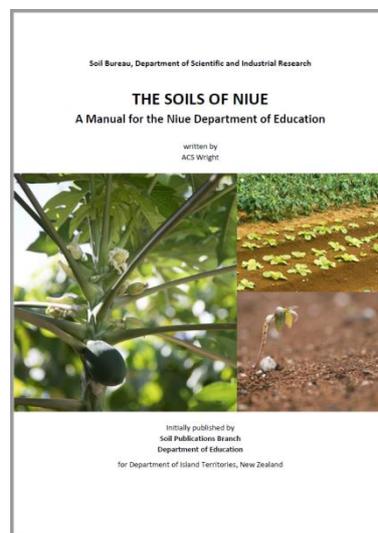


Accordingly this document was compiled as a project report and cited here as Widdowson (2017).

- b) **A workshop in soil fertility management** was hosted by DAFF and delivered by John Widdowson in early October 2016. This need for such a workshop was identified from feedback on the DAFF-hosted, Soil Resources Workshop funded by FPAM in 2015. John Widdowson has knowledge of soil chemistry, including that relating to the soils of Niue, dating back 50 years. He was able to design and compile a three-day workshop that drew upon this wealth of accumulated knowledge and present it in both the theoretical and practical setting. The workshop format included two days presentation and discussion in the DAFF offices, followed by a day in the field viewing different land uses and crops (including taro, yams, kumara, banana, citrus and vanilla), identifying nutrient deficiency symptoms, and indicating suitable remedies. Between 15 and 20 people attended the workshop, comprising both landowners (including members of NIOFA (Niue Island Organic Farmers Association) and staff from DAFF and other government agencies. Details of this visit and workshop were reported in the Mission Report to FAO.

A document containing thumbnail images of the slides used in the workshop is cited in the references as Widdowson (2016)

- c) **The Soils of Niue by ACS Wright.** Another outcome of the DAFF-hosted, Soil Resources Workshop funded by FPAM in 2015 was the realisation that this teaching booklet published in the 1960s had disappeared from circulation both in Niue and New Zealand. This booklet was written by New Zealand's, now disestablished Department of Scientific and Industrial Research and published by the NZ Department of Education for use in Niue schools. With FPAM support, David Leslie recovered a copy (in English) from the National Library in NZ. He re-typed the content and Landcare Research re-created the figures and re-compiled the booklet. Our editors modified some of the more out-dated language but otherwise left the booklet unaltered. We have re-printed 100 copies of this booklet in A5 format with spine stapling – being only 28 pages, it would be quite 'floppy' as A4, and the smaller format will be easier to handle in schools.



The deliverable from this component is cited in the references as Wright (1965)

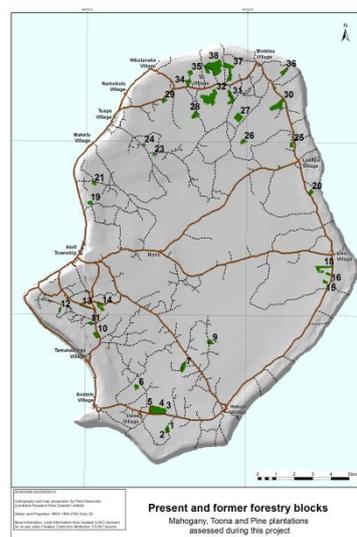
4.5 Forestry.

The Forestry Workstream was led by Peter Newsome, but substantially delivered by Russell Coker (Forester) and Daniel Tobin (Videographer) with guidance, support and close collaboration from Poi Okesene (Dir DAFF) and the DAFF Forestry Section. There were three activities in this workstream:

- a. To survey and report on the present state of Niue's plantation forests,
- b. To prepare a training video on establishing and managing forest woodlots in Niue (focussing on mahogany), and
- c. To establish one or two demonstration woodlots and undertake capacity-building training among DAFF staff and interested landowners

Because of the very tight time constraints imposed by contracting SC1701 in late January, with less than a 5-month timeframe, these activities occurred more-or-less concurrently.

In the first of two visits under this workstream we visited most of the old plantations (the remainder were visited subsequently). Sadly, most were found to be of poor form, ill-conditioned, untended, and moribund, and sometimes completely gone. Our impressions formed during this survey



were:

- The idea of growing food crops between widely-spaced rows of timber trees is unlikely to be successful anywhere on Niue because the trees grow with poor form and are vulnerable to wind-throw, wind damage, and root disturbance. Also, cropping is not sustainable at one site for more than a couple of years so reversion occurs between cycles, leading to neglect of the timber trees and the need for damaging clearance for the next cropping cycle.
- Many of the former plantations seem to have been established on poor or shallow soils that have stunted growth.
- Pine plantations are almost unrepresented and Toona plantations exhibit very poor form (perhaps by their nature in these conditions or from poor seed stock).
- Mahogany, under regular spacing (say 800 stems/ha) with side shade and regular tending will develop valuable timber in something like a 50 year rotation. Equally, indigenous species like Kafika, Moota and Toi have potential for successful plantation management. The mahogany plantation at DAFF's Vaipapahi demonstration farm show encouraging form and, with tending, the potential to yield good timber upon maturity



The remainder of the first visit was devoted to capacity-building in the DAFF Forestry section. A number of subjects were covered and practiced including; stand assessment and measurement, site selection and woodlot design, seed and seedling collection, planting and tending, pruning and thinning. These activities and the plantation survey) were captured on video by Daniel Tobin. Initially, there was some question about the focus of the video – whether it was to simply record the FPAM activity, promote



forestry as a land use, or function as a training medium for foresters and landowners. DAFF determined that it should be the latter so, in close consultation with Director, Poi Okesene, other DAFF staff and Russell Coker, a training video was produced on establishing and managing mahogany plantations in Niue <https://youtu.be/LOr0ySzxCvc>.

A procurement specification for forestry equipment was written very early in this activity and delivered to FAO for action. This equipment was delivered just in time for our second (and final) visit under this workstream. The equipment included a chainsaw, a pole-chainsaw, slashers, scrub-cutters, machetes, secateurs, loppers, pruning saws, ladders and personal safety equipment. Most of this final visit was again devoted to capacity-building among DAFF Forestry staff. The mahogany demonstration woodlot begun in the first visit was completed, root-cut seedlings assessed and planted and bagged, a demonstration woodlot of sandalwood was initiated, and staff trained in the safe use of the equipment. An 'open-day'

was advertised among landowners to share the knowledge gained in this activity and to screen the video on managing mahogany.

The final deliverable of this workstream is the technical report on the plantation survey, lessons learned and capacity-building component cited here as Coker (2017).



4.6 Management and Reporting

Progress reports were tendered quarterly, nominally on the 30th day of the last month. This final report, containing a certified and signed financial statement (Appendix 1) was delivered at the end of the twelfth month.

5 Summary and Recommendations

Landcare Research has successfully delivered almost all components of the work programme under Contract Nos. SC1603 and SC1701. During this work a number of recommendations have been made by the four workstreams. These are better read in the context of their respective reports where they are articulated in greater detail.

5.1 Recommendations

The protected areas financing workshop recommended;

- in the short term, funding to stop the **illegal hunting of lupe and peka** in the HFCA should be the primary objective,
- implementing a mechanism by which families **share costs and benefits from HFCA** management is a goal for the medium term,
- a bed tax of say \$1 per tourist per night would cover the estimated >\$20,000 annual cost of a **forest ranger to monitor the HFCA**

Completing the HFCA Management Plan is a matter of urgency. Sensibly, this should be led and owned by Niue using the zero-draft compiled by Landcare Research. Appreciating DoE's staffing constraints, we recommend expediting completion by resourcing a contracted Niuean to work in intense collaboration with Landcare Research (either in NZ or Niue) to **compile a draft HFCA Management Plan** for consultation with government and communities.

Similar urgency attends **completion of the Niue Cultural Sites Database**, not just as an academic reference, but a cultural keystone, an underpinning basis for land management, and to prevent further degradation of Niue's heritage from unthinking

development (e.g. at least one significant cave passes under a road scheduled for widening and resealing using heavy machinery).

We commend the biodiversity teaching kit into the care of Fiji Ministry of Education and recommend that:

- a **photograph library** be created to provide additional graphic material for teachers using the Kit
- **maps in simplified form** (sourced from Department of Forestry for example) be collated for use in teaching biodiversity conservation
- use of **vernacular and local dialect** for plant, animal and other names be encouraged and supported with lists
- the Ministry of Education to **work closely with organisations** like; Nature Fiji – Mareqeti Viti, Kula Wild Adventure Park, Live and Learn, Sigatoka Sand Dunes National Park, to recognise and incorporate their work and experiences as the Ministry continues to develop their educational resources.

Q-GIS is a powerful and inexpensive GIS platform. We recommend:

- DJLS continue to **explore its uses** and incorporate it alongside MapInfo where it can improve efficiency.
- DJLS use the training material provided by Landcare Research (some of it generic and some customised for Niue) to reduce their ‘1-person-deep’ vulnerability by **training others in the department** in its use.
- DoE and Taoga Niue exploit their advantage in equipment, data and training to **use GIS on a daily basis** by producing maps and spatial analyses to back up their advocacy and management work. It is said that over 80% of information has a spatial dimension so GIS should be almost as frequently used as word-processing software...

We recommend an **update of the Niue Land Cover Database** as soon as possible to continue the established temporal sequence of land cover state and change.

Plantation forestry struggles to establish a foothold in Niue in the face of landowner indifference, little market and mills in various states of disrepair. However, forest woodlots (or either exotic or indigenous species) have a place alongside traditional cropping systems to provide **specialist timbers and craft-wood**. We recommend:

- The DAFF Forestry Section at the Vaipapahi Agricultural Farm should have a few seedlings on hand at all times to either sell or give away to **encourage farmers and landowners to plant trees**.
- DAFF **maintain the demonstration forest stand and sandalwood trial** in accordance with schedules and training set out in Coker (2017) and the video.
- **Sandalwood** seed should be collected, germinated, grown in bags, and **triated with likely host plants**, including noni and *Tipolo Iapani* imported from the closest source.
- The **video should be screened regularly** by DAFF and made freely available for viewing by other government departments and individuals with computer access.

6 Acknowledgements

Throughout this project, Landcare Research has had the support of Rudolf Hahn, FAO Chief Technical Advisor and Manager of the GEF-PAS Forestry Conservation and Protected Area Management project in Fiji, Samoa, Vanuatu and Niue. The Landcare Research Team also acknowledges the support given in-country by Sauni Tongatule, Director, Department of Environment, and in particular the assistance from in-country project coordinator, Logo Seumanu. Richard Siataga of the Department of Justice Lands and Survey greatly assisted the GIS workstream. Poi Okesene of the Department of Agriculture Forestry and Fisheries, provided valuable assistance to the SLM and Forestry workstreams.

In Fiji, The Landcare Research Team acknowledges the support provided by Mr Ilaisa Tulele (FPAM-Fiji National Project Coordinator) and Mrs Sereana Davui (Ministry of Education).

7 References

- Coker R. 2017. Niue Forest-land Restoration for improvement of productivity and sustainable utilization – design, methodologies, practice and recommendations. FPAM contract: SC1701. Unpublished Landcare Research report LC2818, for Food and Agriculture Organisation of the United Nations. 40pp
- Eppink F. 2017. Niue Forest Conservation and Protected Area Management: Financial instruments and resource mobilisation for conservation. FPAM contract: SC 1603. Unpublished Landcare Research report LC2707, for the Food and Agriculture Organisation of the United Nations. 44p.
- Grindell J. 2017. Fiji’s Forest Biodiversity and Conservation – An educational resource to support the Fiji school curriculum). FPAM contract: SC1701. Unpublished Landcare Research teaching kit developed for Food and Agriculture Organisation of the United Nations. 160pp.
- Newsome PF. 2017. Niue Land Cover Database Version 3. FPAM contract: SC 1603. Unpublished Landcare Research report LC2736, for the Food and Agriculture Organisation of the United Nations. 32p.
- Sutherland MA 2017. Niue, Q-GIS 2016, Basic Training Beginners Guide. Unpublished Landcare Research teaching notes. Food and Agriculture Organisation of the United Nations, Apia, Samoa. 53 p.
- Widdowson JP. 2016. Soil Fertility Management workshop slides. [presented in a workshop, Alofi, Niue, Oct 2016] 18 p.
- Widdowson JP. 2017. Fertility of Niue Soils in relation to crop growth. FPAM contract: SC 1603. Unpublished Landcare Research report LC2771, for the Food and Agriculture Organisation of the United Nations. 46p.
- Wright ACS. 1965. The Soils of Niue, A Manual for the Niue Department of Education. Reprinted (with editorial edits) in 2017, by Landcare Research NZ Ltd with financial support from the Food and Agriculture Organisation of the United Nations under the Forestry and Protected Area Management project (FPAM).

Appendix 1. Certified Financial Statement

04 July 2017

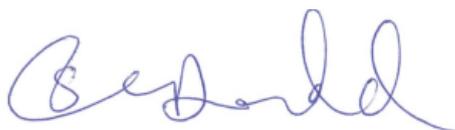
Financial summary for the projects completed by Landcare Research (all figures are in NZ\$ and are exclusive of GST):

Activities enabling the Government and communities of Niue to plan develop and manage their protected areas and forest resources sustainability – **Contract Number SC1603**

Activities enabling the Government and communities of Niue (and Fiji) to conserve biodiversity and manage their forests resources in protected areas and to manage their land sustainably – **Contract Number SC1701**

	Total Project costs	Total Project costs
<i>Contract Number</i>	SC1701	SC1603
Landcare Research consultancy fees	60,740	153,560
External consultants -		
Dave Leslie		2,400
John Widdowson		14,400
Tobinmedia Video	11,200	
Russell Coker	16,500	
Travel	3,620	11,246
Printing	490	2,820
Training		250
Sundry operating costs	120	764
Total costs for project	92,670	185,440

Yours Sincerely



Iain McDonald
 Management Accountant
 Landcare Research