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Cover

Lake Lanuto'o of the Lake Lanuto'o National Park, Samoa (Photo: MNRE)

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Fe'ese'esea'iga i aiga ma nuu o Samoa – aafiaga o le tōfa i Tuana'i ma Saanapu*

Tu'u'u Ieti Taule'alo[†]

O le tamā o lo'u tamā o Taule'alo Lesā, e sau mai Saanapu. Usu Taule'alo ia Uluolefā Su'eleata le afafine o Luafatāsaga Misi i Tuana'i, faaee le gafa e matua le teine o Giga, faasolo mai ai lea o tama o Luafatasāga Misi, sosoo lo'u tamā o Ietitaia sa faife'au ae laititi Luafatāsaga Su'e. O lo'u piitaga lea i o'u aiga o Lesā i Saanapu ma Luafatāsaga i Tuana'i ona o lo'u tamā. Oo mai ua ou matua ua ou aafia foi i le faafoeina ma le tausiga o o'u aiga i nei afioaga.

Ua ou tusia lenei pepa e faamatala ai fe'ese'esea'iga o loo vevesi tele ai o'u aiga i Tuana'i ma Saanapu i le taimi nei i le vā ma isi aiga, ma ua oo ina aafia ai ma le nuu atoa. E foliga mai ua faaogaina e nisi le pule mamalu a Alii ma Faipule e una'ia ai mataupu tau tagata taitoatasi, ae ua afaina ai le to'afilemū ma le nofo lelei o aiga ma nuu atoa. O loo vaava'ai i mafua'aga faavae o nei fe'ese'esea'iga ma le aafiaga o Alii ma Faipule o nuu taitasi. Ua faamatala ai foi ma metotia e ono fofō ai ma faafō'ia nei faafitāuli i le lumana'i.

Fe'ese'esea'iga i Tuana'i

O le tausaga e 1994, na malilie ai lo'u aiga, Sa Luafatāsaga, i Tuana'i e tofia Manumaleuga Logologo (tino o a'u) ma Taitu'ave Maanaima (le isi tino o lo'u aiga) la te umia le suafa Luafatāsaga e tausia lo'u aiga; ave ai loa faasalalau i le Savali. Peitai sa tetee iai nisi o le matou nuu, sa latou faatutū mai isi sui e toalua e faasuafa. Na taufai faaulu matou talosaga i lalo o le Tulafono o Fanua ma Suafa 1981, e lagolago ai le mau a le vaega lava latou. O Setema 1995 na suesueina ai lenei mataupu e le Faamasinoga, ma faamaonia ai o le pule o le suafa Luafatāsaga ua iai lo'u aiga; faamaonia foi ma le tofia o Logologo ma Maanaima la te umia le suafa Luafatāsaga. Na toe apili le faaiuga e itū na malolo, ma o Me 2002 na fofoga ai le Faamasinoga Apili talosaga mo se faatagaga e toe iloilo ai lea faaiuga; o le faaiuga na teena se faatagaga e toe iloilo.

Na fuafua loa e lo'u aiga e faatino matou nofo i le faaiuga o Ianuari 1996, ae te'i ua maluu faafuase'i Logologo iā Tesema ona toe sui lea o le tonu e faataunuu na o le nofo a Maanaima ae faataatia le nofo a lo'u tino se i toe filifili suli. Peita'i sa maitauina le amata faavevesi e itū na faia'ina o mataupu e aafia ai lo'u aiga, ma latou taulāmua e tetee i tulaga e aafia ai lo'u aiga i le va ma le nuu. E lē i manana'o le toatele o le nuu e 'auai i le saofa'i a Maanaima, peita'i na toe masuiga mālie lea tulaga ma usu ai le nuu i lea aso e ui e lē o se aso fiafia e pei ona masani ai saofa'i faaSamoa. I le fonotaga a le nuu na sosoo ai ina ua a'e atu iai Luafatāsaga Maanaima, e lē i faigofie foi aua sa lē i lagolagoina e nisi le iai o Luafatāsaga i le fonu a le nuu. Peita'i na toe teuteu lea tulaga ma faatasi atu ai loa Luafatāsaga i le fonu a le nuu.

O le amataga o Ianuari 1998 na fuafua ai e faatino la'u nofo i le suafa Luafatāsaga ina ua lagolagoina a'u e le matou tino ou te sui iā Logologo. Peitai na 'au'autasi le matou nuu e lē usu i la'u saofa'i; e ui sa fainuu uma le Sa'o ma isi matai o lo'u aiga, toe saunoa le Alii Matua o le nuu e usu le nuu. Sa tau māua se finagalo o le nuu e lē auai i sa'u saofa'i vaganā ai ua toe

* Family and village conflicts in Samoa – Implications for governance at Tuana'i and Saanapu

[†] Dr. Taule'alo o le Pulesili o le Matagaluega o Puna'oa Faanatura ma le Siosiomaga

faalelei lo'u aiga potopoto. Peita'i o le faaiuga o le 1995, na faamaonia ai e le Faamasinoga le Aiga Potopoto o Luafatāsaga - na o laina e lua o lo'u aiga e aofia ai - ae lē lavea ai se tasi o i latou sa talosaga tetee. Ma o nei sulī o le Aiga Potopoto o Luafatāsaga sa latou lagolagoina uma le tofia o 'au.

Na faataunuu pea la'u nofo e pei ona fuafua ae sa solitū le nuu e lē i 'auai. Sa faatino la'u saofa'i faatasi ma isi nofo i suafa tulafale, o pitovao o Luafatāsaga. E lē i saunia e le Pulenuu matou pepa saofa'i e pei ona manaomia i le Tulafono ae sa faatumu i le Ofisa i Mulinuu ma faasalalau ai i le Savali. E uma le taimi faatapulaa e tolu masina o faasalalaua, ua faalavelave Alii ma Faipule i matou saofa'i uma sa faia. O le mafuaaga autū o le latou faalavelave, ona e lē i usu le nuu.

Sa toe saunia talosaga a lo'u aiga e faasaga i le taofiga o matou nofo. Ma o Tesema 1999 na fofoga ai e le Faamasinoga le mataupu e uiga i suafa tulafale o lo'u aiga; o le faaiuga na soloia uma ia nofo, ma o loo apili le faaiuga e lo'u aiga. A'o Iulai 2000 na fofoga ai e le Faamasinoga le faalavelave i la'u nofo; o le faaiuga na faamaonia lo'u matai, ma o loo apili e le nuu lea faaiuga. I le faamaonia o la'u nofo na talitonu le Faamasinoga sa usita'ia tulaga uma o loo manaomia e le Tulafono e uiga i le tofia tatau o a'u e ave ma matai.

O le aso lava na lau ai le faaiuga ua faamaonia lo'u matai, na tū ai le tootoo o le nuu iā Luafatāsaga Maanaima e faate'a ma le nuu; o le mafuaaga ua ia faatāsina Alii ma Faipule i luma o le Faamasinoga. Sa ou mafaufau e ave se talosaga i le Faamasinoga e tetee i le faate'aga o Luafatāsaga Maanaima i lalo o le Tulafono o Fono a Nuū 1990 aua e leai se amioga matuiā na faia e Luafatāsaga Maanaima ua faate'a ai fua ma le nuu. Peita'i sa toe faataatia lea tulaga ona ua vevesi tele le mataupu, ma atili ai le aliali faalaua'itele o mea lava e patino i le matou nuu. E oo mai lava i le faai'uga o le 2003 o loo faate'a pea lo'u aiga.

Talu mai le faate'aga o Luafatāsaga Maanaima sa faatū ai loa ma le matou pitonuu e aofia ai matai o lo'u aiga ma isi aiga na faate'a muamua. Sa faia a matou fonu i aso Toonai mulimuli o masina ta'itasi; sa faatino ai foi ma le nofo i le suafa Saena i le matou faiganuu, ma ua uma ona resitara. Sa matou taumafai malosi e fesoota'i ma le nuu tele e toe faalelei le nuu atoa; peita'i e oo mai lava iā Novema 2003 o loo malepe pea le nuu.

I le tula'i mai o fe'ese'esea'iga i le vā o lo'u aiga ma isi aiga ma aafia ai ma le nuu, na mautinoa ai e lē o se mataupu fou a'o se tulaga ua leva ona tupu mai. O le tausaga e 1947 na faamasino ai lo'u aiga ma aiga o i latou na matou faamasino i le 1995; o le faaiuga na mālo lo'u aiga ma faamaonia ai le tofia o Luafatāsaga Misi le uso o lo'u tamā ma Luafatāsaga Fina'i o le tino o Luafatāsaga Maanaima. Oo mai i le tausaga e 1952 toe faamasino ai foi lo'u aiga ma nisi o aiga lava nei; o le faaiuga na mālo lo'u aiga ma faamaonia ai le tofia o le uso laititi o lo'u tamā o Luafatāsaga Su'e. I lona aotelega lautele o se mataupu ua ova i le 50 tausaga o fesoua'ina ai finagalo o nisi na matou faamasino i le 1995, e pei ona aafia ai foi o latou mātua ua maliliu. O lona uiga e iai nisi na soifua mai lava o faafeagai pea ma lenei mataupu e uiga i le pule o le suafa Luafatāsaga. Ua ilitata ma afaina loto o itū na malolo ona ua faatolu ona taumafai mai ae lē manuia a latou talosaga e ui sa pa'i suafa nisi o latou mātua.

Fe'ese'esea'iga i Saanapu

I le amataga o le tausaga e 2000 na taumafai ai le aiga o Lesu e fausia faamalosi le malumalu o le Ekalesia Metotisi i Sataoa i se vaega o le fanua o Tufu o lo'u aiga o Lesā i Saanapu. E mai iā Me 2000 ua faaulu le talosaga a Tuigamala - e tuaoi i sasa'e ma Lesu - ina ia taofia le galuega o le falesa sa faia i lona fanua. A'o Oketopa 2000 na faaulu ai le talosaga a lo'u aiga e taofia le falesa ua faia i le matou fanua; ae faaulu le talosaga a Lesu ia Novema 2000 ia

faamaonia o lona lava fanua o loo faia ai le falesa. Na faaulu foi le talosaga a Alii ma Faipule o Saanapu e lagolago ai le fanua o Lesā 'ae le aofia ai tua'oi o Saanapu ma Sataoa.

E taunuu mai i le amataga o le tausaga 2001 ua aafia nuu o Sataoa ma Saanapu i le mataupu o le fanua o loo fai ai le falesa – i se latou fonotaga tuufaatasi i le faaiuga o Ianuari na latou lagolagoina ai le faaauau o le galuega o le falesa. O Mati 2001 na fofogaina ai e le Faamasinoaga le mataupu o le fanua o le falesa. Na toe tatala le latou talosaga a Alii ma Faipule faatauanau ai e tatala uma ma isi talosaga. Peita'i e lē i tatalaina le talosaga a lo'u aiga, e lē i tatalaina foi le talosaga a Tuigamala. Na toe tolopo taualumaga o le Faamasinog ae oo i le fono a Saanapu i le amataga o Aperila 2001, ua faate'a lo'u aiga ma le aiga o Tuigamala mai le faigānuu.

Na teena e lo'u aiga le faasalaga a le nuu e faate'a matou aua e leai se matou agasala. Ona faaulu lea o le matou talosaga i le amataga o Me 2001 i lalo o le Tulafono o Fono a Nu'u e faasaga i Alii na Faipule o Saanapu, e leai se mafua'aga tataua na faate'a ai fua matou. Sa fofogaina lena mataupu i luma o le Faamasinoga iā Me 2002; o le faaiuga e lē i teena pe faamaonia le faate'aga o lo'u aiga ae taatia mai e toe iloilo iai Alii ma Faipule. E oo mai lava i le faaiuga o le 2003 o faaauau pea le faate'aga o lo'u aiga.

O le amataga foi o Ianuari 2001 na faataunuu ai nofo a lo'u aiga i Saanapu e aofia ai ma ni igoa fou faatoā faatino. E ui ina sa uia tulaga uma e tusa ai ma Tulafono ae uma ona faatino nofo ae fiu e talosaga le Pulenuu e saunia pepa saofai. Mulimuli ane sa faia na o pepa saofai o isi nofo fou a'o isi e oo mai lava i le faaiuga o le 2003 e lē i faia. O nofo fou na faia pepa saofai ma faasalalau e leai se faalavelave na tetee iai i totonu o le tolu masina faatapulaa, ona resitara loa lea i le Tusi e Faamau ai Matai. Ae oo mai iā Novema 2001 ua toe soloia i le pule a le Resitara o Fanua ma Suafa. E faapenā foi ma nofo fou e lē i faia pepa saofai, na soloia uma i le pule a le Resitara.

O le amataga o Aperila 2002 na faaulu ai talosaga a lo'u aiga e tetee i poloaiga a le Resitara na toe soloia ai matou matai sa resitara ma matai e le i saunia pepa saofai, ma o loo faatali le taimi e suesueina ai. A'o le faaiuga o Iuni 2003 na fofoga ai e le Faamasinoga le mataupu i le fanua sa tū ai le falesa Metotisi, ae oo mai i le faaiuga o 2003 e lē i maua se faaiuga. E lē gata la i le faate'a o lo'u aiga, ae sa soloia matou matai ona o le talosaga a Alii ma Faipule, toe fausia faamalosi ma le falesa i le matou fanua i le pule a le nuu.

I le talafaasolopito o le faafitauli sa feagai ma lo'u aiga i Saanapu, ua mautinoa ai o se mataupu foi ua leva ona tupu. O le tausaga e 1948 faataga ai Lesu e le uso o le tamā o lo'u tamā, Lesā Samuelu, e nofo i le vaega o le matou fanua sa finau ai. Oo mai i le tausaga e 1953 ua faatū ai e Lesu le lotu Metotisi a'o le 1956 na faasalalau ai e Lesu lana pule faamau i le fasi fanua lava lea. Ona faasolo mai ai lea o finauga ma le vevesi e tau mai i le 1965 sa fausia ai le falesa muamua, toe amata le vevesi i le 2000 ina ua tuu i lalo le falesa tuai ae fausia le falesa fou.

Aafiaga o le puleaga o nuu

E tele ni itū tāua ua alia'i mai i tala ua tāua i luga, ua maitauina foi le tulaga tutusa o mea na tutupu e ui o le suafa sa aafia i Tuana'i ao le fanua i Saanapu. Muamua, o ni mataupu ua leva ona finau ai – amata Tuana'i i le 1947 ae amata Saanapu i le 1953. Lua, o mataupu na amata i finauga o o'u aiga ma isi aiga ae i'u ina faifai tetele ua lavea ai ma Alii ma Faipule, oo ai lava ina matou faamasino ma le nuu. Tolu, faate'a o'u aiga faapea ua lē usitaia le finagalo o nuu.

Ma le fa, taofia isi suafa matai o o'u aiga e ui ua mae'a ona usitaia tulaga uma e tusa ai ma le Tulafono.

I fe'ese'esea'iga uma e lua, sa lagolagoina e Alii ma Faipule le talitonuga o isi itū ae teena mau a o'u aiga. Sa manino lelei e lē i tūto'atasi le finagalo o nuu ina ia tausia le nofo filemū o tagata uma, ma faatino le pule malosia a Alii ma Faipule e faamata'u ai o'u aiga ia usita'ia le fīngalo o nuu, ae tuu le mea na talitonu iai matou e ana nei measina. E lē gata i le faate'a ma le faigānuu a'o le lē usu i saofa'i, taofia o matai ma le faatūgaina o o'u aiga i tulaga tau faamasinoga. O ia tulaga uma sa tele taimi ma tupe a o'u aiga na alu ai. Peita'i na faaoga e Alii ma Faipule tupe faitele a nuu e tapena ai faamasinoga ma o'u aiga e lagolago ai isi itū. A'o se tulaga sa sili ona faigatā o le faamāmāsagia lea o 'ou aiga i le va ma nuu, itumalo ma le atunuu atoa, na aafia uma ai matai, fafine, taulele'a e oo lava i le fanau laiti.

O se tasi vaega matuiā sa feagai ma o'u aiga, o le leai o nisi metotia e ese mai i le Faamasinoga ma le finagalo o le nuu e mafai ai ona fofō ma teuteu nei fe'ese'eseaiga. Afai e 'au'aufaatasi Alii ma Faipule e faamalosi lona finagalo, e le mafai e se aiga se toatasi ona tetee iai. O lona uiga a faate'a se aiga se iloga foi ua finagalo le nuu e faaa'e ona mafai lea ona toe fainuu. E moni o loo iai le Tulafono o Fono a Nuū e mafai ona faaulu ai ni talosaga tetee i se faasalaga, ae foliga mai i le matou faaiuga i Saanapu ma isi faaiuga faapea, o loo taumafai pea le Faamasinoga e amanaia le puleaga a Alii ma Faipule.

Manatu faai'u

I le tulaga faalaua'itele o tala i Tuanai ma Saanapu e foliga mai o fe'ese'esea'iga o aiga ma nuu, e iai ona tala'aga faasolopito ma o ni mataupu ua leva e lē fo'ia pe teuteu aloa'ia. O lona uiga e toatele nisi e soifua mai lava na o le vevesi lo latou silafia i mataupu faapea, ma alu ai le tele o taimi ma le malosia ae leai ni taimi e fuafua ai ma faatupula'ia manatu lelei e atina'e ai aiga ma nuu. Ou te talitonu e lē gafatia na o faaiuga a le Faamasinoga ona fofō tumau faafitauli tau fanua ma suafa Samoa; ae tatau ona iai ni faiga faavae e faaauau ai pea feutana'iga i le va o aiga ma nuu ina ia malamalama lelei itu uma i le mafuaaga o faaiuga. O lea tulaga e aofia ai ma ni faiga e soalaupule ai ma faamanino le tele o mataupu i lalo o le taitaiga a i latou ua iai tomā faapitoa e faafae ni feutana'iga, ma ia lē foliga o se finauga ae ia pei o ni faaleleiga.

Ina ia faaititia le faaogaina e nisi o le Faamasinoga e faafaigatā ma faatuai ai ona faatino le amiotonu i mataupu a aiga, e tatau ona iai ni faiga maoti e taofia ai talosaga e leai ni faavae maumaututū. O lona uiga ia mafai ona vave su'esu'e mataupu e faaulu mai i le Faamasinoga ina ia teena talosaga ua uma ona faia iai faaiuga poo itū e leai ni faia talafeagai ma se mataupu. E moni e taua le aiā tatau a soo se tagata e tetee ai i mataupu ae a faafefea le aiā tatau a i latou e patino tonu iai sea mataupu e puipuia ai mai le soona faatautala e isi e aunoa ma ni mafuaaga tatau.

O le puleaga a Alii ma Faipule o le fatu o le olaga faaSamoa, e faalagolago iai le soifua manuia o aiga ma nuu. Ma e pei foi o isi faigāfilifiliga ua tele suiga ua feagai ai ae maise silafia lautele ma manatu fou e foliga e faatautee i faiga tuai. E tāua le mafai e Alii ma Faipule ona silafia le uiga tonu o le pule ua latou umia, ia faia ma le amiotonu ma le alofa ae lē faaitu'au. O lona uiga e tatau ona iai ni avanoa e faaleleia ma faamalosi ai tiute ma matafaioi o vaega taitasi o nuu ae maise ai lava matai o loo taiulu i le pulea o aiga ma nuu. Afai e laugatasia tagata uma i le amiotonu o faaiuga ma tonu a matai o tausia nuu ona mafai lea ona puipuia lelei ma faasao measina a aiga taitasi. O le a faigofie ai fo'i ona talia ma lagolago e tupulaga fai mai le ta'ita'iga a Alii ma Faipule e pei ona soifua mai ai Samoa.

E tele foi se sao o le puleaga a Alii ma Faipule i le atina'e gafataulimaina o oloa faanatura ma le siosiomaga o nuu ma le atunuu atoa, latou te lagolagoina ai polokalame a le Mālo faapea taumafaiga 'ese'ese e una'ia ai le vaaia lelei ma le faaaogaina tatau o aseta faitete o le siosiomaga. Ona e sili atu i le valusefulu pasene o eleele o Samoa o fanua faaleaganuu e pulea e aiga ma nuu, o lona uiga o le tele o oloa faanatura e maua i nei fanua o loo i lalo o le puleaga a Alii ma Faipule. Ae afai e tele taimi poo tupe e faaalu ona o fe'ese'esea'iga faifai pea, ona matuā faigata lea ona maua ni avanoa e fuafua ai ma faufau galuega mo le lelei lautele o nuu. E lē mafai foi ona faatupula'ia le loto faatasi ma le felagolagoma'i e atina'e ai le manuia lautele o aiga ma tagata taitoatasi.

Some prospects for managing *peltata*.

*William Stuart Kirkham**

Introduction

Merremia peltata is a species of liana of the family Convolvulaceae that has been identified as an invasive species of environmental concern in several Pacific Island Countries, including Samoa (Meyer, 2000, Space and Flynn, 2002). This plant species is not well understood, especially in regard to its invasive behavior and how best to manage it. This paper presents preliminary results from a year-long research project investigating the distribution and vegetative communities of *M. peltata* across a lowland area of Samoa, in which the landscape has undergone several periods of disturbance, both natural and anthropogenic, and exhibits varying degrees of recovery and invasion. Studied by itself, *M. peltata* suppresses species diversity when it acts as ground cover and also aids the spread of other vines such as *Mikania micrantha*, but appears to support species diversity when it is in canopy. Furthermore, certain native pioneering tree species appear to be able to compete successfully with *Merremia peltata*, and the common lowland forest species *Pometia pinnata* appears to be resilient against the vine. When vegetation communities are analyzed on a landscape scale, plots dominated by *M. peltata* ground cover show a greater similarity to lowland rainforest than to plots located in the coconut zone, dominated by non-native invasive ground cover, more frequently disturbed by people and livestock, and showing different paths of succession. *M. peltata* thus appears to be a part of the succession inherent to lowland rainforest recovery more so than a species external to the rainforest ecosystem and invading it. Management options, ranging from the most labor and capital intensive to the least, including active planting of trees to shade out *M. peltata*, planting early successional trees such as *Macaranga harveyana* or *Cananga odorata* to uplift it from the ground, followed by planting of forest species at a later date, or simply letting succession occur at its own rate.

Background: *Merremia peltata*, disturbance ecology, tropical cyclones and Samoa

The biology and ecology of *Merremia peltata* are not well understood. While some regard the species as an exotic invader of Pacific Island ecosystems (Meyer, 2000), others identify the plant as a native species likely to be harmful to native ecosystems (Whistler, 1995a, 2002) or as either native or ancient Polynesian introduction behaving invasively (Space and Flynn, 2002). In Samoa, this species occurs up to an elevation of around 300 meters (Whistler 1995a), and thus only affects lowland ecosystems. This species increases its distribution and abundance in two ways, either vegetatively, by sprawling into neighboring areas and rooting from its nodes or by seeds, although early research in the Solomons observed a low seed viability rate, and creeping may thus be its primary means of reproduction (Bacon, 1982). *M. peltata* has apparently been in the Pacific for hundreds of years (Whistler, pers. com.) but has only become invasive in the years following tropical cyclones Ofa (1990) and Val (1991) according to comments from local government officials. Disturbance thus appears to be an ecological contributing factor to this invasion.

Disturbance is an important topic in regard to the ecology of invasions. The idea of the ecosystem is based in so-called “equilibrium-based” ecologies, where an ecosystem is viewed as a closed and bound assemblage of species that tends towards a stable equilibrium or

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climax community, and in such views, disturbance is regarded as destroying the ecosystem, whereas ecologists are beginning to widely study ecosystem function inclusive of disturbance (Botkin, 1990). Indeed, many definitions of invasive species are grounded in equilibrium perspectives (Meyer, 2000). Disturbance-based ecological perspectives are beginning to inform studies of plant invasions, suggesting, for instance, that island ecosystems are vulnerable to invasion not because of island species evolving under low competitive pressure but because island ecosystems are vulnerable to disturbances that boost soil nutrients and make island environments more accessible to a wider variety of species (D'Antonio and Dudley, 1995). The vulnerability of islands to disturbance relates to questions of scale.

The spatial and temporal scale of disturbances to the spatial and temporal scale of the affected ecosystem and its processes governs how the vegetation responds to the disturbance. Where the scale of the disturbance is greater than the landscape (such as tropical cyclones acting upon islands) and with greater frequency than successional rates, the ecosystem becomes constituted by those particular disturbance processes and is said to be part of a specific "disturbance regime." Where disturbance is small in relation to the spatial scale of an ecosystem and of short duration and frequency relative to ecosystem processes (such as tree fall), the disturbed areas are quickly reincorporated back into the ecosystem. Where disturbance is of a commensurable spatial and temporal scale to an ecosystem and its processes, transformation of the ecosystem can take place (Turner et al., 2001).

For cyclones, the pattern of disturbance typically relocates biomass and its attendant nutrients to the forest floor as well as increasing temperatures and light availability to the ground (Silver, et al., 1996), which can create opportunities for species invasion. Recovery of the canopy occurs in a few years at low levels of tree mortality (Scatena et al. 1996), and soil nutrients also rapidly return to pre-cyclone levels in a few months (Silver et al., 1996), so with cyclone disturbance, the window of opportunity for invasives to become established is short. Also, managed forest areas, where trees are planted in ways to maximize individual tree growth, show a higher rate of mortality than non-managed areas and different recovery paths (Fu, et al. 1996).

For Samoa, several vectors of disturbance have been acting on lowland ecosystems for several hundred years. Kirch (1984) indicates that Samoa, on an archeological time scale, has been subjected to a high frequency of cyclones. Whistler (1995b) describes the growth of tree height as being limited by frequent cyclones. It thus appears that the time between cyclones is shorter (even at one hundred year intervals) than the life span of the forest trees, and Samoa's ecology likely represents a cyclone disturbance regime. Most economic activity, from ancient time to present, has been concentrated in the lowland areas and has occurred on spatial and temporal scales similar to that of lowland forest ecosystems and their processes, and have thus been more transformative, possibly altering successional pathways and contributing to the diversity of lowland forest types (Mueller-Dombois and Fosberg, 1998). For the *Merremia peltata* invasion, the feedback between the social and biotic environments resulting from Cyclones Ofa and Val, the expansion of taro plantations for export and food security and the subsequent taro blight have all contributed to creating conditions for the invasion. The high mortality rates to trees from the cyclones, coupled with the loss of vertebrate dispersers and their habitat has likely slowed down recovery times and increased vulnerability to invasions (Elmqvist, et al., 1994). The expansion of taro plantations that peaked at the time of the blight occurred at a rate greater than population growth and represented the greatest disturbance to lowland rainforest ecosystems in at least the past century (Paulson, 1993). The disturbance was short-lived, relative to ecosystem

processes, and may not have occurred at a sufficient temporal scale to affect permanent change despite its occurrence on a commensurable spatial scale.

Study site and methods

Research was carried out in the village of Fa,ala on the island of Savai'i. Being a participant in the Tafua Peninsula Rainforest Preserve agreement, the village possesses land in the lowland region in various degrees of forestation, intensity of use and recovery. As such, it represents an ideal location for examining *Merremia peltata* across a wide range of habitats.

A total of 27 sample plots were studied across the village lands ranging from elevations just below 300 meters to lower elevations in the peninsula. Plots were selected randomly in a Geographic Information System and programmed into a handheld GPS unit. Plot size was 10 X 10 meters, and cover estimates were obtained by running transects diagonally across the quad, with 29 points separated by a distance of 1 meter each. Species occurring at each point were recorded as ground cover (below 2 meters height) or canopy (above 2 meters height). All stem diameters greater than 1 centimeter were also measured. Other environmental variables, such as physical and chemical soil properties and light availability, were also collected, but are not included in this preliminary analysis.

Analysis at this point centers around cover information for the species collected from each plot. The occurrence of each species at each transect point is expressed as a percentage of total points in the plot (species occurrence as a percentage of 29). One level of analysis involves constructing scatter plots of individual species against others species or against other factors such percentage of canopy in general or number of species. Another level of analysis examines the structure of the vegetation community in plots, disaggregating the data into classifications of vines, non-vine ground cover and non-vine canopy, plotting the number of species of each found at each transect point. A third level studies the plots on a landscape scale, generating a clustered dendrogram (using Euclidean distance measures and Ward's method of establishing linkages, McCune and Grace, 2002) to discern groupings of similarity of species communities. Finally, the diameter measurements of the various tree species were plotted against each other for each plot as a means of identifying successional stages. Combing these four levels of analysis provides a detailed understanding of how *Merremia peltata* functions in these lowland ecosystems.

Findings

The findings presented here suggest that while there may be some biodiversity concerns regarding *Merremia peltata* in the short term, this species appears to function as a successional component of lowland forest ecosystems. Viewed in this light, management concerns revolve around the question of how to quickly restore ecological services by accelerating successional processes.

Figure 1 depicts several scatter plots relating *Merremia peltata* cover in each plot to the total number of species in each, disaggregated by whether *M. peltata* acts as ground cover or as a component of the canopy, relating *M. peltata* cover to the amount of canopy, and also relating this species to *Mikania micrantha* cover. *Merremia peltata* occurred in 22 of the 27 plots and occurred in 52% of the total number of in-plot transect points. *Mikania micrantha* occurred in 24 plots and in 43% of transect points. By comparison, *Nephrolepis hirsutula* is the next most common species, occurring in 16 plots and 22% of transect points (Table 1 shows the frequency of occurrence and overall ground cover for the plant species representing at least 5% total ground cover). Of the 139 total species encountered, these two vines were the most frequent and accounted for the greatest amount of cover. The two vines are typically

concurrent, although *Mikania micrantha* shows a greater degree of shade tolerance than *Merremia peltata*, and where shading is present, *Merremia peltata* cover thins and *Mikania micrantha* becomes more dominant (note inverse relationship between the two vines at low levels of *Merremia peltata* ground cover, but a direct relationship at higher levels of cover). Note also the strong inverse relationship of *M. peltata* to canopy, except at high levels of canopy cover, where canopy can serve as habitat if the vine can become established. Also, where *M. peltata* ground cover is high, species diversity is low, but the trend is reversed when the vine is in the canopy. Field observations indicate that where the soil is characterized by an irregular bouldery surface (*soata*), or has decaying fallen tree trunks present, such that microclimatic spaces are created between the vine cover and the ground surface, that more species are present, often a wide variety of ferns that are commonly seen in forest understory. The further off the ground the *M. peltata* is, the better the biodiversity it seems. Indeed, when this vine is in the canopy, it appears to rapidly cover gaps, preventing light from reaching the forest floor and altering successional pathways in favor of more shade tolerant species.

Pometia pinnata appears to be one of those species that benefits from this arrangement. Early field observations appeared to indicate that the older *P. pinnata* trees, probably cyclone survivors, appeared to be somewhat resilient to vines, having few twining up their smooth trunks (often with a mound of vines at the base where the vine mass slipped off under its own weight), and with less in the canopy, or where it was in the canopy, not smothering it very efficiently. Given that *P. pinnata* is one of the most common lowland rainforest species, especially in this area (Whistler, 2002, Mueller-Dombois and Fosberg, 1998, Elmqvist et al., 1994) and that it exhibits an elevational range commensurate with *Merremia peltata* (up to 500 meters, Whistler, 2002), and given the vines long presence in the country, it may be likely that these two species are linked successional, and that *Merremia peltata* may select for the high frequency of *Pometia pinnata*. Also, quite often where a plot occurred upslope and appeared to be a fallowed taro plantation, with no standing trees and almost completely covered in *M. peltata*, there were frequently large remnant *P. pinnata* trees nearby; the greatest levels of vine infestation appeared to be occurring in areas of recently cleared *Pometia* forest. Figure 2 details the empirical data regarding *Pometia pinnata* from the study plots. This tree species appears to be extremely sensitive to groundcover, only becoming frequent under high percentages of canopy. It appears to need to have competing groundcover shaded out in order to become established. There is also a strong direct relationship between total *P. pinnata* coverage and occurrence of *Merremia peltata* in the canopy. Similar graphs for *Rhus taitensis* are provided for comparison. Although there is a similar response between the two tree species to canopy coverage and *Merremia peltata* groundcover, *Rhus taitensis* is not prominently featured under *M. peltata* dominated canopy. There thus appears to be a relationship between the *Merremia peltata* and *Pometia pinnata*, but this suggests that there is an intermediate successional step between this vine and tree; there has to be a canopy for the vine to be in before *P. pinnata* succession can begin.

Macaranga harveyana and *Cananga odorata* are two species frequently observed in and around plots dominated by *Merremia peltata* ground cover. Figure 3 depicts several scatter plots. *Macaranga harveyana* displays a greater correlation to high incidents of *Merremia peltata* groundcover than to the vine in the canopy. *Cananga odorata* shows a greater similarity to *Pometia pinnata* in response to *Merremia peltata*, with the notable exception of being less sensitive to the vine as groundcover. Figure 4 depicts stem diameter measurements for various plots. Plots 15 and 18 are both early successional plots, depicting close relationships between *Macaranga harveyana* and *Cananga odorata*. Plots 48 and 51 lie

in the peninsula forest, and show *Pometia pinnata* following *C. odorata* in succession, followed closely by other native forest species. Further evidence linking *Merremia peltata* to forest ecosystems is given by Figure 5, depicting the cluster dendrogram displaying grouped similarity of vegetation community. Figure 6 gives some typical examples of vegetation structure from the broad groupings. Group I from the dendrogram are plots that are dominated by *Merremia peltata*, with the plots in Group Ia having structures dominated by the vines *M. peltata* and *Mikania micrantha*. Group Ib have structures dominated by forest species, with canopy being the leading component. Group II are areas best described as being in the “coconut zone” with *Cocos nucifera* being the dominant on the landscape and weedy non-native groundcover being the dominant structural characteristic. Interestingly, the canopy-dominant plots of Group Ib represent an ecological community more similar to the vine dominated plots of Group Ia than to Group II. This suggests an ecological connection between the vine and canopy dominated structures. Some plots display characteristics of both Group I and Group II communities; frequency of human use appears to shift classification towards Group II, however. Table 1 also depicts how the cover of the dominant plant species disaggregates across Group I and Group II, and it reveals that most non-native weedy species are associated more with Group II plots, and suggests competitive exclusion of these species by *Merremia peltata*, and that this vine may be an important species in reclaiming native habitat from non-natives. Notable exceptions include *Mikania micrantha*, *Dioscorea bulbifera* and *Funtumia elastica* which show similar coverage across both Groups I and II.

Conclusions and recommendations

The cyclones of the early 1990s, the expansion of the taro zone for export and the taro blight of 1993 have combined to affect a large scale disturbance across the entire lowland area, opening large areas of habitat for *Merremia peltata* invasion. *Merremia peltata* appears to be part of the natural *Pometia pinnata* forest succession. Areas of recently export-expanded taro zone have occurred at a smaller time scale than ecological processes and are rapidly being reincorporated back into a forest ecosystem. As resource pressure on the coconut zone eases, and disturbance of some areas become less frequent, these areas of longer-duration disturbance are showing early signs of re-incorporation. In lowland rainforest, the vine is acting to close gaps in the canopy and alter successional pathways away from pioneer species and toward more shade-tolerant ones. One option for management is simply to do nothing, and allow nature to take its course.

The loss of ecological services associated with deforestation, for example the disruption of hydrological processes in vital catchment areas, necessitates an approach that may require more active control of the plant. One option is to exploit its shade intolerance and plant trees to shade it out. This technique is labor intensive, however, in that not only will trees need to be planted, but they must be tended to prevent the vines from getting into the canopy. There may be other problems associated with targeting the plant itself, in that other species such as *Mikania micrantha* are likely to become more dominant as the *Merremia peltata* recedes. This could be an option to pursue in conjunction with community forestry objectives, where individual households opting into the program could tend their trees or whereby simply performing other activities on the same land could provide sufficient disturbance to suppress the *Merremia peltata*.

A third option involves co-opting *Merremia peltata*. As ground cover, *Merremia peltata* suppresses the other non-native weeds that would likely be present as ground cover in its absence (*Mikania micrantha* excepted). In the canopy, it helps to hand succession over from

pioneer species to those more resembling climax species. An option may be to plant areas of *Merremia peltata* groundcover first with *Macaranga harveyana* and later with *Cananga odorata*, then following up with *Pometia pinnata* and other forest species. Scattering seeds, rather than establishing seedlings in nurseries, may be sufficient for this method. The low labor input and its self-maintaining strategy may make this a viable option.

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Species	Origin	Freq.	Cover (%)		
			Total	Group I	Group II
<i>Merremia peltata</i>	N/AI	22	52	45	7
<i>Mikania micrantha</i>	NWT	24	43	25	18
<i>Nephrolepis hirsutula</i>		16	22	6	16
<i>Cocos nucifera</i>	N	12	14	1	13
<i>Oplismenus compositus</i>	PT/AI	15	13	4	9
<i>Eriochloa procera</i>	OWT	8	11	1	10
<i>Blechnum pyramidatum</i>	NWT	13	9	1	8
<i>Hyptis rhomboidea</i>	NWT	9	9	2	7
<i>Cananga odorata</i>	AI	9	8	8	1
<i>Pometia pinnata</i>	N	7	8	7	1
<i>Ruellia prostrata</i>	OWT	12	8	0	8
<i>Dioscorea bulbifera</i>	OWT/AI	15	7	4	3
Fern 1		4	6	6	0
<i>Paspalum conjugatum</i>	NWT	13	6	2	4
<i>Funtumia elastica</i>	OWT	7	5	2	3
Fern 2		14	5	4	1

Table 1. Frequency and cover of all plant species encountered in the survey that account for at least 5% of cover. **Key:** Freq. = Frequency (total number of quads out of a total of 27); Cover = percentage cover across all quadrats in a group, where Total refers to all 27 quadrats and Group I and Group II refer to the groupings in Figure 5; N = Native, AI = Ancient Introduction, PT = Pantropical, OWT = Old World Tropics, NWT = New World Tropics. Source for origins: Whistler 1995a, 2002.

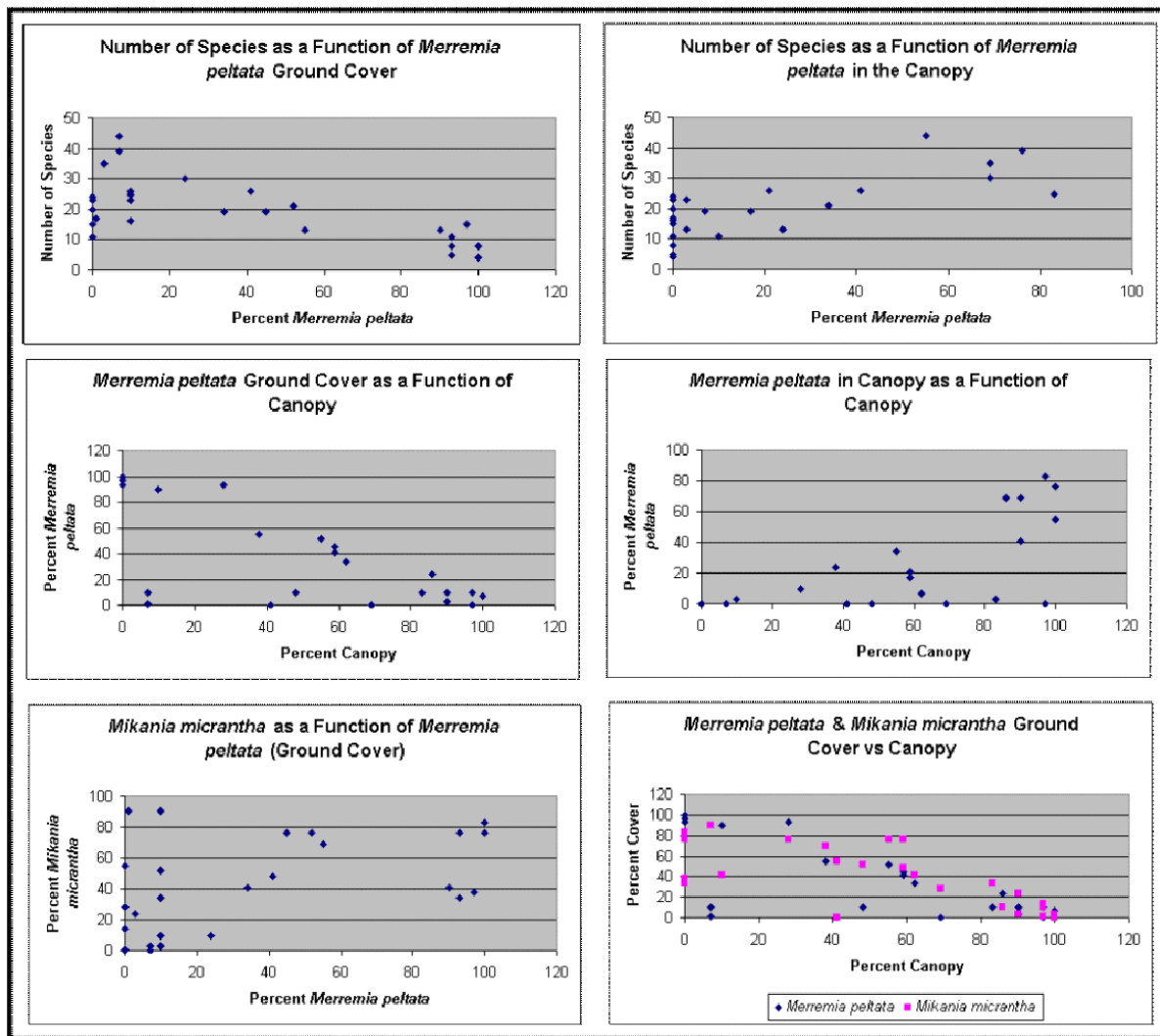


Figure 1. Relationship of *Merremia peltata* to species number, canopy, and *Mikania micrantha*.

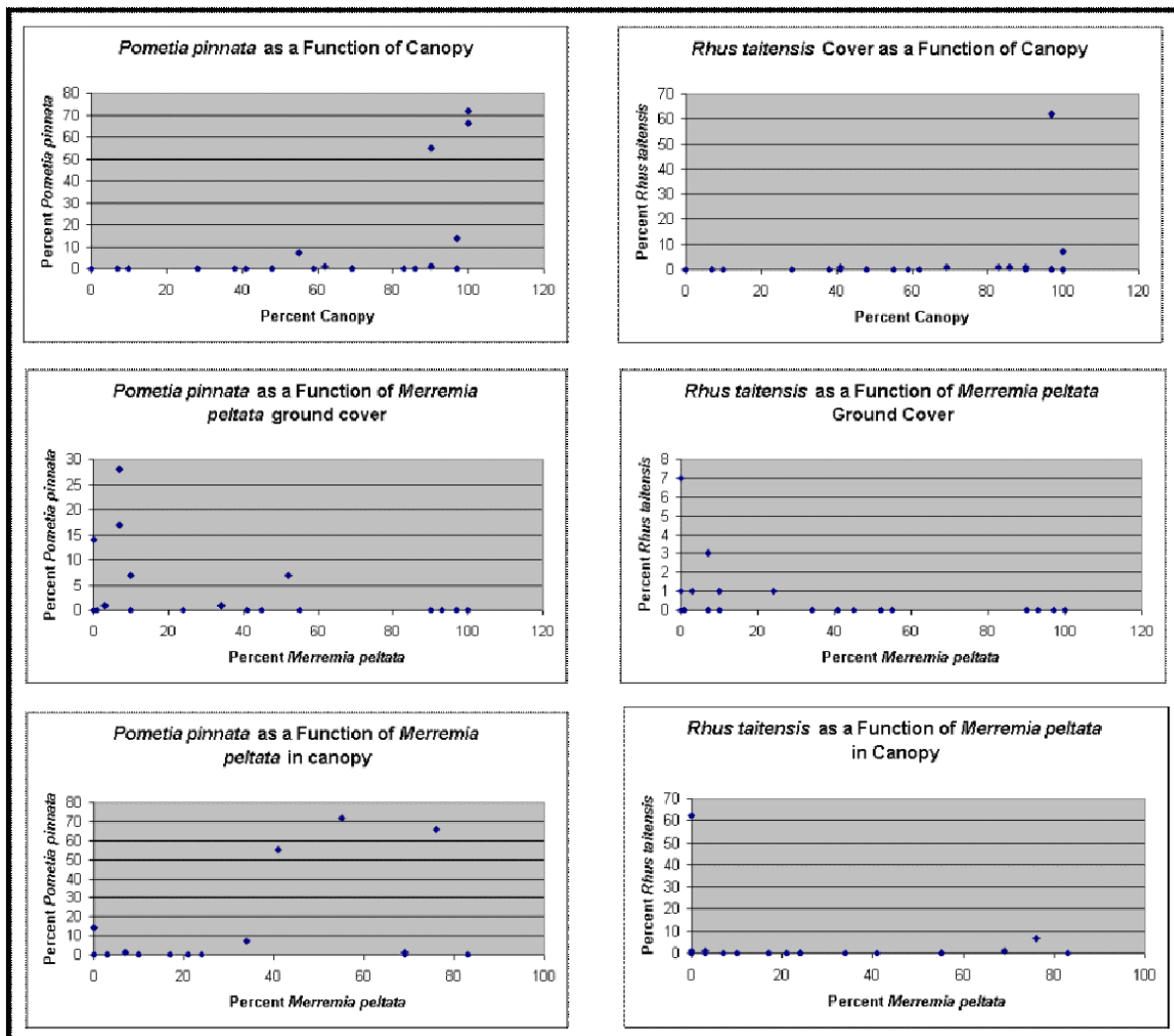


Figure 2. Relationship of *Pomotia pinnata* to canopy and *Merremia peltata*, with comparison to similar relationships for *Rhus taitensis*.

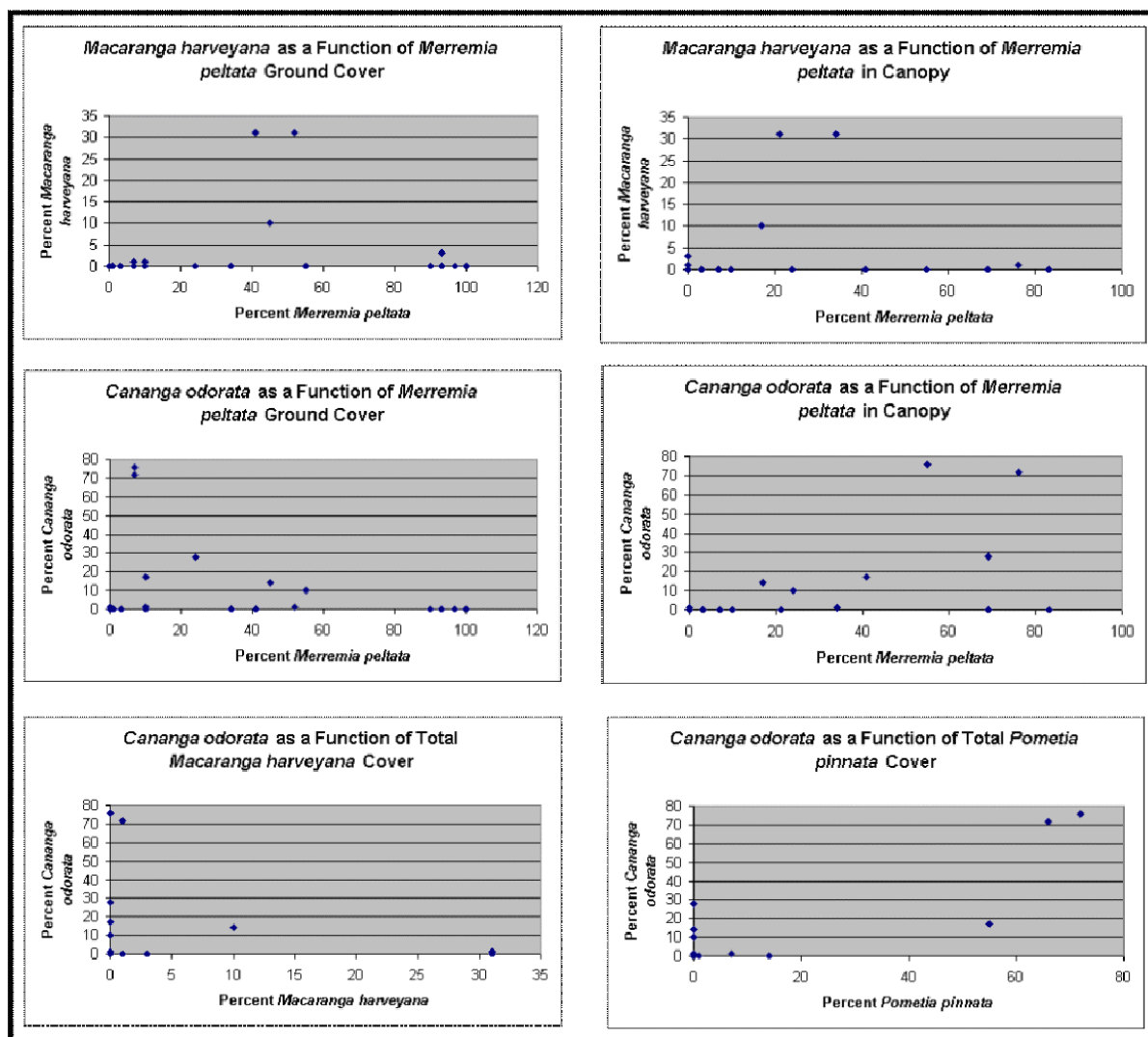


Figure 3. Relationships of *Macaranga harveyana*, *Cananga odorata*, *Pometia pinnata*, and *Merremia peltata*.

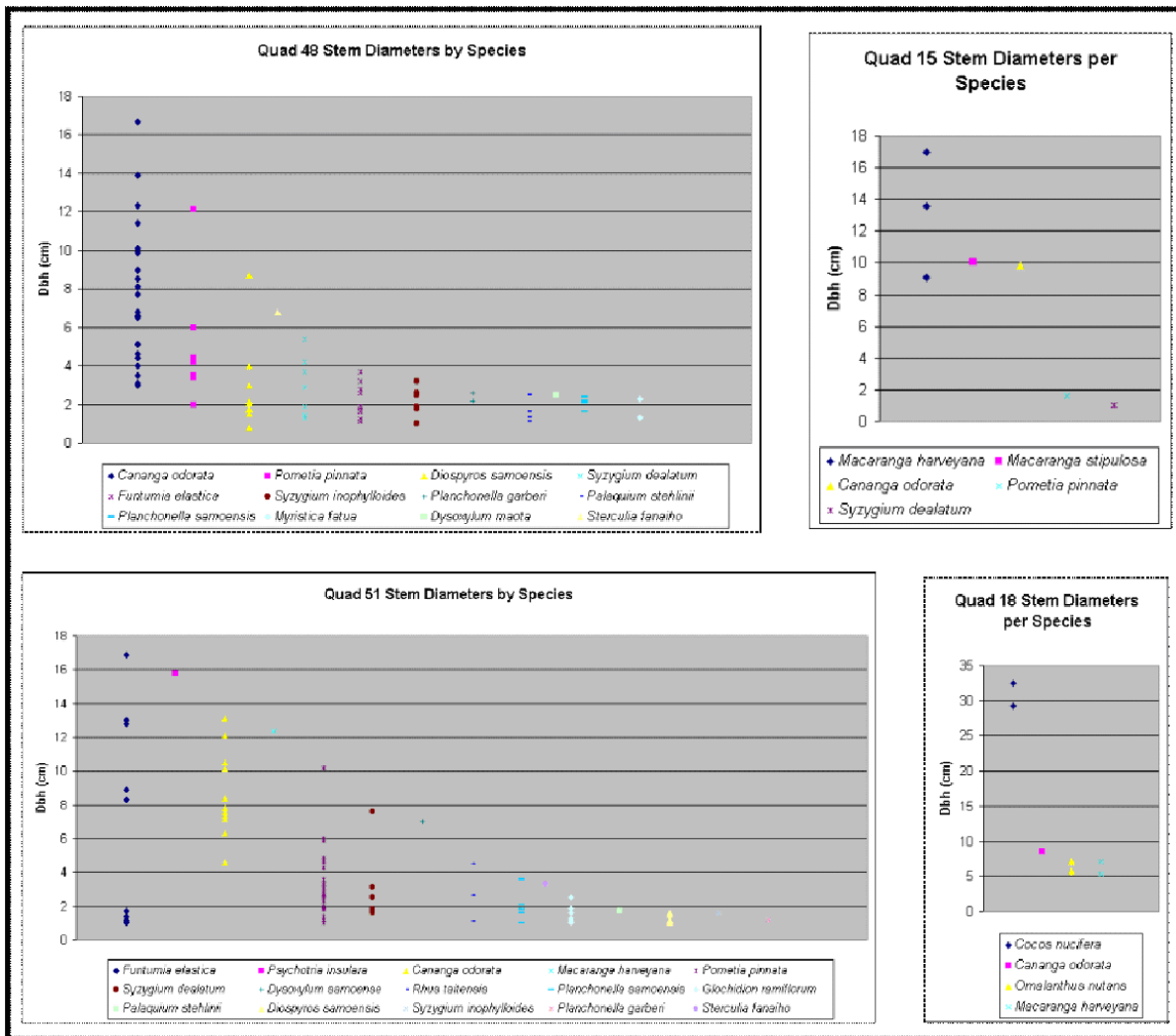


Figure 4. Stem diameters disaggregated by species.

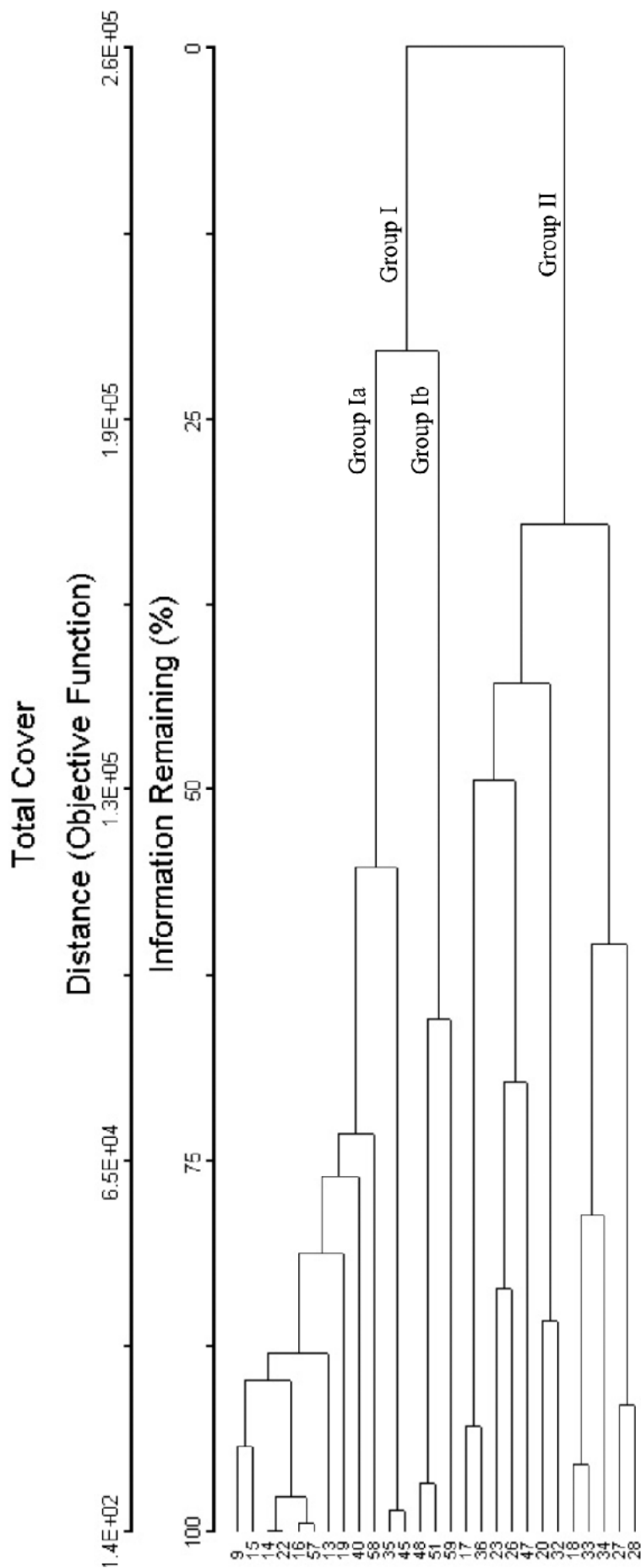


Figure 5. Cluster Dendrogram

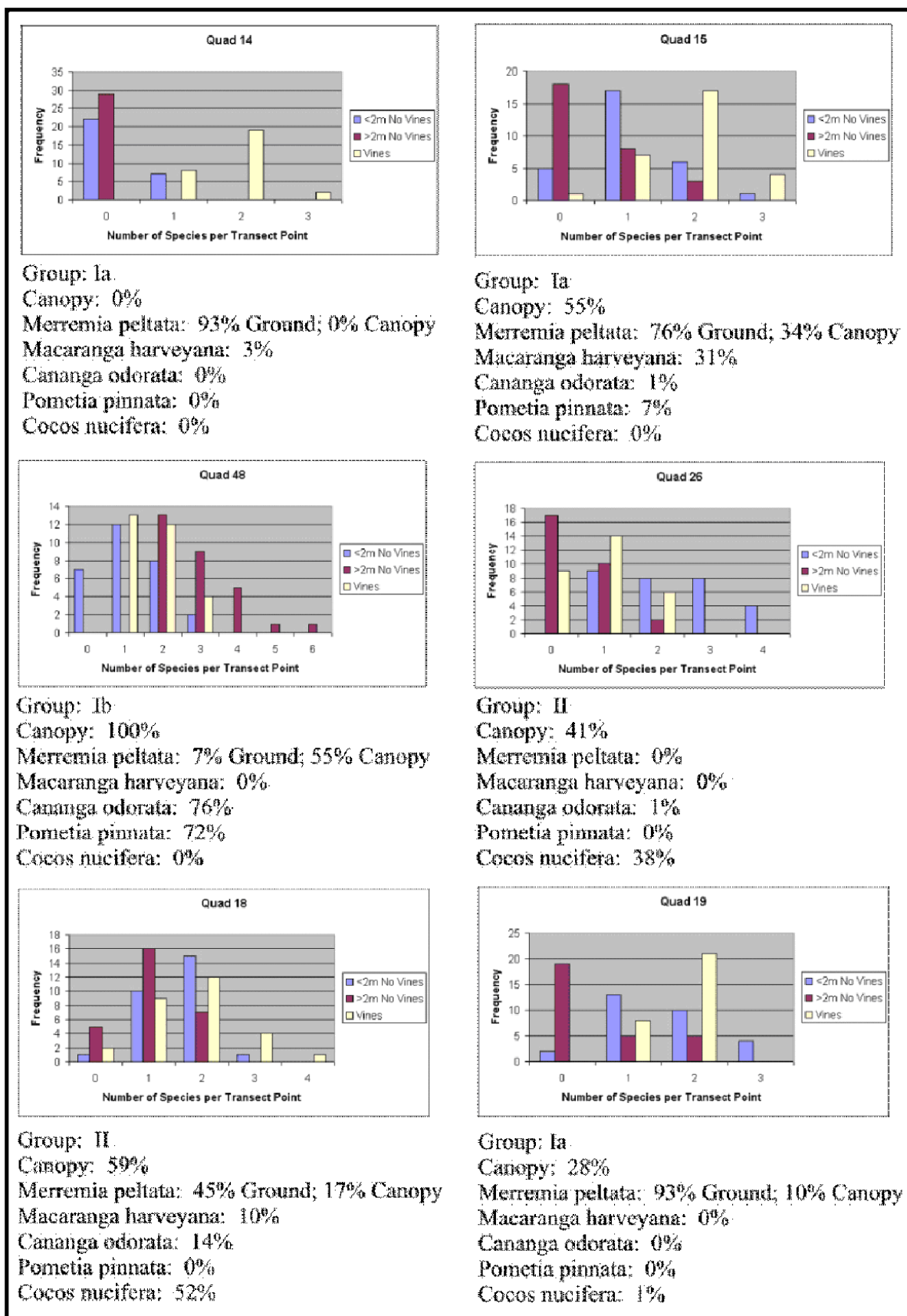


Figure 6. Structure of vegetation communities.

The Green Turtle Tour Project – a successful approach to aiding natural resource management in Samoa

*Funealii Lumaava Sooa'emalelagi & Steve Brown**

Summary

Not necessarily all members of the tourism and natural resource sectors will share all the sentiments presented here. Not all members of the tourism industry may realise just how serious the status of our tourism industry really is. What the authors wish for, however, is for you all to make the connection between our natural resources as tourism assets, loss of natural resources equating to loss of our culture, loss of our culture equating to loss of spirituality, loss of our natural resources equating to loss of our tourism sector as possibly our best income-generating option for future generations of Samoans. Samoa may now have one of the world's highest rates of deforestation and an environmental audit of Samoa's forest resources is now being requested. This paper highlights what action needs to be taken. The natural resource owners in Samoa are our Councils of Chief, and the fa'amatai is being questioned for its role in the demise of our natural resources. Laws are broken, sound environmental advice has been ignored, and above points can be seen as constraints to implementing effective natural resource conservation and sustainable tourism in Samoa.

The tourism industry could be justified in calling for a stop to non-sustainable tourism in Samoa until we have learnt to protect our natural resources, learnt to protect our culture and/or learnt how to use tourism as our best environmental management tool. This paper explains how this last statement may be seen as a catalyst provided we learn to do tourism better in Samoa – but this will require a lot of further tourism research in Samoa as well as more holistic planning at a national level with all stakeholders involved. The Government of Samoa, local academic institutions and our Councils of Chiefs need to embrace tourism research and tourism planning and natural resource management immediately, but without the understanding and prioritization needed comes little commitment and insufficient sustainable implementation.

This paper also highlights the important roles played by nature and cultural tourists in Samoa. A wider array of nature tourism products in Samoa (thanks to the Green Turtle Project) is attracting more visitors to Samoa and possibly hastening natural resource conservation efforts and hence assisting sustainable tourism initiatives. However, numerous constraints to sustainable tourism are highlighted in this paper, constraints that have existed for more than ten to twenty and are unlikely to improve unless we call for a Commission of Enquiry into the current demise of our natural resources and other tourism assets.

Introduction

In this presentation, we are here to discuss the relationship between tourism and natural resource management. Despite all the meetings, reports, global conventions, environmentally focused regional organisations (i.e. SPREP, FFA, FAO, SPC, SPTO, etc.) Samoa and the South Pacific continue to lose their natural resources. These are being depleted at alarming rates, possibly being depleted at increasing rates (e.g. with Samoa possibly having one of the world's highest rates of deforestation). The recent global environment and development

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meetings in Brazil (1992) and South Africa (2002) revealed that the world is moving away from sustainability, not closer towards attaining it.

Think about this for a moment

Some tourism industry stakeholders in Samoa are frustrated by the apparent national apathy to do tourism better. Like the newly graduated faifeau who complained to God that his first sermon was delivered in a village without a church, in the middle of a malae surrounded by cows, God's reply was "My son, you may find in future that it will be easier to move the cows than it may be to move the people". And this is how hard it has been for some of the presenters here today to move the natural resource management decision-makers in Samoa. With ten to twenty years of rhetoric, environmental advice given to governments being ignored, insufficient Environmental Impact Assessment (EIA) legislation in place and so forth, it is no wonder that our natural resources in Samoa continue to disappear and hence undermine our tourism industry. Government's recent call for a Forestry and Forest Products Management Advisory Committee may be too late to save our forests. We need an urgent moratorium on logging on Savaii to prevent further damage to such natural resources and our unique and vital biodiversity.

With global atmospheric oxygen levels expected to fall by the year 2012, human sperm counts declining rapidly over the past 50 years, newly identified toxic 'Persistent Hormonal Disruptors' being detected in plastics, human foetal development being altered, Samoa has reason to take action, environmentally speaking. Attaining sustainable livelihoods in Samoa is becoming more of a dream than a reality. We owe it to our children.

The signs are already here

While Western man has become so de-spiritualized, so has the Faa-Samoa. The Faamatai is breaking down. Our matais are the decision-makers and the law-makers. Do we care about the next generation of Samoans? If we do, we would all agree to do it differently. All we need is to make a connection here:

- i.) Between our natural resources as our tourism assets
- ii.) Between loss of natural resources and loss of our culture
- iii.) Between the loss of our culture and the loss of our spirituality and
- iv.) Between the loss of our natural resources equating to loss of our tourism sector as possibly our best income-generating option for future generations of Samoans.

Action needed

Today, Samoans have few options to their non-sustainable practices. Some novel tourism and environmental initiatives, therefore, need to be taken if we are to use tourism as our best environmental management tool in Samoa. Historically, Samoa's tourism development workers have had little positive influence over natural resource conservation in Samoa over the past ten to twenty years i.e. we have all witnessed this wholesale decline in our natural resources and even witnessed the current deliberate degradation of our unique wildlife conservation areas in Samoa, for example the Tafua Rainforest Preserve on Savaii Island. Concurrently, natural resource managers and biodiversity conservation projects in Samoa in the past ten to twenty years have had little influence over community tourism development in most Samoan villages i.e. had we known then what we know today about community tourism development, earlier natural resource management efforts in Samoa over the past ten to twenty years may have been a lot more effective, and nature tourism may have commenced much earlier in Samoa as a viable tourism product as well as acting as a valuable

environmental management tool (Sooaemalelagi et al., 1996). This paper is a call for more action to be taken.

Novel Tourism Initiatives

So, what urgent steps need to be taken to facilitate tourism protecting Samoa's natural resources? Basically, a high quality yet affordable ecotourism/community tourism product need to be designed in Samoa that:

- (i) Increased the number of ideal travellers to Samoa
- (ii) Developed innovative interpretive materials that would enrich tourist's environmental and cultural experiences (e.g. Green Turtle websites, Green Turtle travel guides, souvenir book
- (iii) Helped to raise environmental awareness nationally
- (iv) Vastly increased the number of bed-nights in rural Samoa and
- (v) Increased our visitors' satisfaction

The services offered by the Green Turtle Tours Project, including the Travellers' Lounge, have helped to offer travelers to Samoa the tourism infrastructure and travel information necessary in rural areas to help meet such visitor expectations. However, current inappropriate natural resource management practices in Samoa are undermining the future of one of Samoa's most profitable sectors: tourism. Surprisingly, our tourism industry (including the Samoan Tourism Authority) have stood on the sideline and watched the decline of Samoa's best tourism industry assets i.e. natural resources.

In addition, a wide range of novel holiday products (tours, activities, accommodations and services) needed to be designed for international travelers as well as Samoan (American included), and implemented and offered to our travelers at affordable prices (Sooaemalelagi et al., 2003). Holiday products such as a rainforest canopy walkway, mangrove walkways, mangrove canoe tours, bird watching tours, bird hides, beach fales, walking trails, trekking, surfing, sea kayaking, volunteerism, 'Woofers' , educational tours, etc. are now all included in many Samoan holiday itineraries. Simultaneously, an informal accreditation process was put in place by the Green Turtle Project for those 'beach fales' and tourist accommodations as well as 'rural tourism villages' which already met minimal environmental standards or had a wildlife conservation project in place or offered visitors a genuine and safe Samoan holiday experience. The end result of such initiatives was a high quality tourism product (the Green Turtle Tour and its associated Green Turtle Holiday Packages) that hopefully will continue to help protect the environment and, hopefully, the culture (see www.greenturtletours.com and www.greenturtleholidays.com).

The Green Turtle Tour Project has successfully demonstrated that effective web-marketing is an essential ingredient to increasing the number of visitors to Samoa who are seeking nature/cultural tourism experiences. Unfortunately, many such travelers have had to bypass their conventional travel agents who

- (i) Have been unfamiliar with such nature/cultural holiday products in Samoa
- (ii) Have only offered resort/hotel holidays in Samoa
- (iii) May be unfamiliar with the real benefits of nature tourism and cultural tourism products in Samoa
- (iv) Offer, either deliberately or accidentally, misinformation to travellers with respect to where they should stay in Samoa (and where they cannot stay) and what activities they can expect to participate in when they get to Samoa and

- (v) Polynesian Airlines underestimates the importance of rural economic stimulation through rural tourism (beach fale operators have been denied discount Beach Fale Holiday Packages for \$999 for 5 nights in Beach Fales inclusive of airfare). While there may be legitimate reasons in the past for this policy, these reasons no longer apply as the quality in selected accredited Beach Fales is now of a high international travel standard. In addition, community tourism is another tourism product in Samoa that does not compete with urban hotel or resort tourism packages.

Therefore, what Samoa now needs are more sophisticated novel nature and cultural tourism products that are attractive to our visitors and village stakeholders. To assist this goal, the Green Turtle Tour Project is working with aid donors, development agencies, tourism and environmental researchers/consultants, media, etc. to demonstrate what it takes to implement a sophisticated nature tourism and cultural tourism program that truly benefits natural resource conservation and sustainable development in Samoa, focusing on community tourism web-marketing, innovative nature tourism products, innovative cultural tourism products to name a few. Our five main websites: www.greenturtletours.com, www.greenturtleholidays.com, www.GoSamoa.com, www.ecotoursamoa.com and www.Samoa-Hotels.com are now selling these novel holiday products and activities to a targeted audience.

Novel environmental initiatives

To the credit of some of our key rural tourism stakeholders, they have adopted a much higher standard of environmental management which is now meeting and exceeding visitor expectations. Not only are the physical (waterfalls, caves, cliffs, mountains) and biological (rainforests, mangroves, and marine) environments being protected as wildlife conservation areas and tourist attractions, but numerous socio-economic and cultural aspects are also being addressed via rural-based community tourism. Green Turtle travellers are now being encouraged and invited to participate in sound tourism development.

Tourism development and environmental management are indeed complimentary. Therefore, some novel environmental initiatives needed to be taken (from a nature tourism marketing perspective) if we were to also use environmental management as our best tourism development tool in Samoa. Samoa needs a good model community tourism project that clearly demonstrates improved sustainable management of our natural resources at a local level. Community tourism in Samoa is now being recognized as a significant environmental management tool and Samoa should be given a chance to allow tourism to work more positively in rural villages where increasing social, economic, biological, cultural and physical hardships are being faced by these communities. While the recent 5 year Tourism Development Plan for Samoa addresses the need to attain sustainable tourism, the processes required to achieve this have been somewhat overlooked. Also, the relationship between the Samoan Tourism Authority and the Ministry of Natural Resources and Environment needs to be strengthened if we are to have an effective and holistic effort being made on-island.

Fortunately, Samoa boasts a long list of environmental projects and initiatives that, today are directly aiding tourism development. Conversely, many of the following environmental projects would not have been as successful (or as financially viable) had it not been for their initial tourism impact. For example, some argue that the establishment of conservation areas with cash handouts is counter-productive (for example, National Park of American Samoa and Falealupo Rainforest Conservation Area) but the Rainforest Canopy Walkway on Savaii is probably Samoa's most profitable existing wildlife conservation income-generating project

(not to mention the 'highlight' for some travellers to Savaii. Unfortunately, the financial return on investment for some environmental projects has been minimal where little to no tourism infrastructure and benefits were derived (for example, Saanapu, Sataoa, Aopo, Uafato Conservation Areas to name a few). More tourist amenities and activities still need to be included in these Conservation Areas if the best environmental benefits are to be derived from such projects. Once community tourism ventures are more profitable, then commitment from the villagers to protect their natural resources suddenly increases (mainly because our visitors tend to cancel village accommodations within such Conservation Areas if live conch shells and other marine-life are being sold, if trees are being felled, if rubbish is not being disposed of correctly, if spent shotgun cartridges litter the nature trails as in the Uafato Conservation Area, etc.). Nature tourism should be a learning experience for visitors, villagers and tour operators.

Samoa now has an exciting network of conservation areas, national parks and marine protected areas offering culturally-sensitive and environmentally-friendly affordable accommodation and holiday activities thus putting tourist dollars into rural economies to help eliminate rural poverty, assist with gender equity, and facilitate improvement of local environment and cultural practices. As a result, community tourism can be innovative way of selling environmental advice to local village stakeholders on their terms, thus maximising their financial and environmental returns with little extra risk provided we follow some Community Tourism Best Practices (See Appendix 1).

Constraints to natural resource conservation and sustainable tourism

Thaman (2002) redefined ecotourism (community tourism) as a multi-faceted discipline with numerous far-reaching positive impacts. Many tourism development workers in Samoa have a long history of working within the tourism industry using their political, academic, environmental, financial, marketing, publishing and conservation experience. Without such skills and resources today, our interpretation of our environment and culture to our visitors would not be of the high standard that it is today. Along with good interpretation comes good management. However, we still do not have all the information we need and further tourism research in Samoa is required.

The positive and negative impacts of tourism in Samoa now need to be further researched and monitored if Samoa is to strive for attaining sustainable tourism. Internationally, tourism has become recognized as a true science, and sustainable tourism indicators have already been identified for Samoa (Twining-Ward, 2003). As tourism is now one of our major sources of foreign income, organizations like the Cooperative Research Center for Sustainable Tourism in Australia are willing to stimulate a cooperative research effort within the South Pacific (and Samoa) to boost sound environmental tourism practices within the region. However, Samoa has been very slow on the uptake of collaborative tourism research, hence the justification for an 'Environmental Tourism Trust' being formed in Samoa that will help encourage such research.

The Samoan tourism industry's main foundation is its natural and cultural resources, currently are both over-exploited or eroded through poor governance and poor management. On some occasions, these tourism assets are better appreciated by our visitors than by our own villagers, environmental managers and government planners. Environmental Impact Assessment legislation needs to be introduced promptly to ameliorate the negative environmental impacts that are occurring in Samoa and that are directly undermining the future viability of our tourism industry and our ability to attain sustainable livelihoods within

the near future. At this rate, our children will inherit an impoverished island ecosystem that no amount of aid money can restore (e.g. ask why we are spending so much aid donor funds on water reticulation when we logged our forests for so little return in the past). Mind you, we are still logging our forests non-sustainably with apparently less than 18 months of millable accessible rainforest remaining, and we are still asking our aid donors to assist us despite our current non-sustainable practices. Our aid donors could do more than give further funding: they could assist on a certain level of commitment (by both the public and private sectors) to sustainability. This paper is a strong call to both the private sector and public sector to do more for tourism, more natural resource management.

We didn't inherit this nation from our ancestors, we borrowed it from our children promising to return it to them in better shape, But we have broken this promise.

Discussion

The government of the day must be held responsible for

- (i) Continued (past 20-30 years) non-sustainable and possibly illegal forest logging practices
- (ii) Cattle grazing within our water catchments
- (iii) Continued non-sustainable agricultural practices
- (iv) Dismissal of local landowners as key future tourism development stakeholders.

To help address these constraints to a more sound tourism development and natural resource conservation within Samoa, the Green Turtle Tour Project has initiated the establishment of a Green Turtle Resort Development Fund and an 'Environmental Tourism Trust' as a collaborative effort to highlight local tourism opportunities for local landowners. The Green Turtle Tour Project will soon help generate a further 10,000 additional bed-nights annually, providing direct benefits to local environmental, social, planning, economic and development projects in rural villages.

Further blame must be put directly on the local tourism industry for discounting our local environmental challenges as a direct threat to attaining a more sustainable tourism industry in Samoa. In addition, our own hotel industry, airlines, inbound tour operators, and cruise ship operators are today partially, but collectively, responsible for misinformation being offered to our visitors to Samoa in a direct marketing effort to boost conventional room occupancy rates and related travel commissions being paid to agents (at considerable expense to our rural economies). However, with a greater emphasis on affordable web-marketing, discerning travellers can get better access to more accurate travel information at more affordable prices on the Internet (and beach fale owners can reach potential travellers before they reach Samoa). This is equating to a more meaningful and more sustainable Samoan holiday experience with even more direct benefits to rural villagers and villages than ever before.

This deliberate misinformation being offered (both locally and internationally) to our travellers prompted the recent establishment of the Green Turtle Travellers' Lounge, the Green Turtle Resort Development Fund and the 'Environmental Tourism Trust'. Rural tourism stakeholders were being jeopardized even further by additional misinformation and/or oversights, namely:

- (i) That our key tourism assets do not include our natural resources (but protecting our natural resources will only strengthen our tourism industry);

- (ii) That local landowners cannot easily access credit (and yet greater access to credit is available today in Samoa than ever before: e.g. SBEC, WIB, SPTB Bank, Green Turtle RDF, etc.);
- (iii) That local landownership issues constrain tourism development (this is not true for community tourism resorts where the landowners operate their own tourism resorts on their own terms);
- (iv) That beach fale accommodation is a sub-standard for international travellers (this is no longer the case as beach fale standards continue to rise, sometimes exceeding conventional urban tourist accommodations and urban restaurants); and
- (v) That Samoa is an expensive South Pacific holiday destination (the Green Turtle Tour Project offers inexpensive holiday packages for less than USD\$30/day).

In addition, more access to credit from within Samoa is the key answer to sound (community) tourism development. This credit access needs to be simplified, and more accessible resort planning and development advice at a rural community level is needed. Samoa also needs to encourage tourism research via local and regional universities, with considerable focus on the design and construction of low cost, cyclone resistant, traditional fales that meet travellers' expectations. The Green Turtle Tour Project is building a unique design of traditional beach fales that meets visitors' expectations.

A conscientious web-marketing effort is now being made by the Green Turtle Project to offer affordable community tourism holidays in Samoa that

- (i) Meet minimal standards
- (ii) Involve travellers in local biodiversity conservation efforts
- (iii) Offer mutual travel learn experiences for visitors as well as villagers
- (iv) Boost rural employment
- (v) Encourage gender equity
- (vi) Encourage the introduction of alternate technologies that may be more environmentally-friendly than existing technologies and
- (vii) Helps address rural poverty.

Conclusion

Samoa's tourism industry stakeholders are the Government of Samoa, the Village Councils of Chiefs and the private sector. However, who lobbies who for the changes that are needed or the direction that should be taken is uncertain. No one on island is calling for a Commission of Enquiry into our failure to protect our own natural resources, our failure to protect our heritage, our failure to protect our culture or our failure to strengthen our tourism industry. No one is holding our politicians or Councils of Chiefs responsible for their poor management of our natural resources in the past. No one has successfully demanded Government to gazette the EIA legislation for Samoa (not even our Aid Donors). But may be Cabinet can assist with this process?

What Samoa's tourism industry needs is more involvement from key rural community tourism stakeholders in order to avoid the negative impacts of tourism already being recognised in Samoa and elsewhere (e.g. Lalomanu, Manase, Hawaii, Tahiti, Cook Islands and Fiji). This is warranted if our communities are to maximise their benefits from tourism in both the short term and long term.

- (i) More community consultation
- (ii) Less natural resource degradation
- (iii) Improved web-marketing of nature and cultural tourism products

- (iv) Better informative interpretive materials
- (v) More tourism research and
- (vi) Improved tourist information are all warranted

However, the apathy that exists within the tourism industry in Samoa is self-defeating. Improved public sector/private sector initiatives are urgently needed and a call has been put out to the Minister of Tourism to assist with this process.

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Persistent organic pollutants and persistent toxic substances in Samoa's environment

*Taule'ale'ausumai L. Malua, Bill Cable and Dr. Paul F. Heveldt**

Background

Persistent Organic Pollutants (POPs) have been referred to as the toxic or “dirty dozen” worst pesticides and chemicals known to man under the Stockholm Convention which Samoa ratified in February 2002 (Interim Secretariat for the Stockholm Convention on POPs 2002). They include nine (9) POPs pesticides, an industrial chemical, and two which are “unintentionally” produced by combustion:

Table 1. Current twelve POPs under the Stockholm Convention

Pesticides (largely Insecticides)	Pesticides (continued)	Industrial Chemical
Aldrin	Heptachlor (1)	Poly-Chlorinated-Biphenyls (PCBs)
Chlordane 1	Hexa-Chloro-Benzene (HCB)	
DDT 2	Mirex	“Unintentional” Combustion
Dieldrin 3	Toxaphene	Dioxins
Endrin		Furans

1. Termiticide (associated);
2. Former mosquito control (unlabeled “Double Rabbit” mosquito coil), and former banana scab moth control
3. Former soaking of banana bits for weevil borer and nematode control

Persistent Toxic Substances (PTS) have similar properties to those of POPs and have been reviewed for consideration as part of a regional study (United Nations Environment Program 2002) for possible addition as POPs (United Nations Environment Program Chemicals 2003).

What POPs are found in Samoa and where

This paper will provide insight into the extent of POPs and PTS in Samoa and the efforts that are being made to address them. How will this be done? Through answers to the questions of: What? How much is there?; Where are they?; What is the extent of the problem?; and What is being done about it?

POPs was talked about in 2000. However, not much was known about its existence and extent of its seriousness in Samoa. Earlier studies of Persistent Organic Pollutants (POPs) and Persistent Toxic Substances (PTS) were reviewed in the Samoa Environment Forum 2000 (Cable and Iakopo 2001). These studies were also referred to in a press release of the ongoing Samoa's Enabling Activity for POPs (GoS 2002). This was drafted also into Samoan and displayed and distributed during a 2002 Awareness Day of the Ministry of Natural Resources and Environment (MNRE). The press release was updated earlier in 2003 for presentations of the Assistant Director (now Chief Executive Officer) of Planning and Urban Management Agency (PUMA), in whose Sustainable Development section the Enabling Activity is sited, for the 2nd National Chemicals Awareness Day (Malua 2003).

The Samoa Environment Forum 2000 paper provided summary of analyses of POPs (and PTS; see section 4 for discussion) (Cable and Iakopo *ibid*) and is summarised here:

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The concentration of DDT in marine sediments at the main wharf was reported as “unacceptable”, although not that of the shellfish in that area (GWS and KfW 1993). The Western Samoa Water Authority (WSWA 1996) Master Plan Study included pesticides which were below levels of detection in 11 samples taken. The latter were largely from boreholes and included those from Savaii as well as Upolu.

Table 2. Summary of POPs and PTS Found in Earlier Studies in Samoa

POPs and PTS	Study: Fryauff (1982)	GWS and KfW (1993)
POPs: DDT	+	+
Aldrin	+	Na
Heptachlor	+	Na
Dieldrin	Na	+
Chlordane	Na	+(detected at wharf & Vaiusu mangrove of 4 sites)
PCBs	Na	+
PTS: endosulfan	+(only detected in fresh water)	Na
Lindane	+	+(only Mulinuu reef of 4)
Penta-Chloro-Phenol (PCP)	Na	+(only Mulinuu reef of 4)
Polynuclear Aromatic Hydrocarbons (PAH)	Na	+

+ Detected [Fryauff (ibid) studied 17 fresh water, 14 human fat, 8 egg, 7 taro, 5 marine fish, 2 Chinese cabbage and 1 soil samples among others with no indication of specific sites in the report; DDT in human fat samples was very high in this study];

GWS and KfW (ibid) studied 4 shellfish and 7 marine sediment samples from the wharf to Vaitele mangrove). Note that six (6) other POPs were not analysed in these studies, including Mirex, Toxaphene and Hexa-Chloro-Benzene (HCB) not known to have been previously analysed in Samoan samples. analysed

Preliminary inventory of POPs

The earlier analyses above were of concentrations in small samples and did not give quantitative estimates. The latter awaited the POPs in Pacific Island Countries (PICs) project of the South Pacific Regional Environment Programme (SPREP). The latter estimated 9,000 litre of old transformer oil potentially contaminated with PCBs and recommended for off island disposal (Graham 2000). In Phase 2 of that project, the transformer oil was actually routinely tested. Of 38 of 97 tested which gave a positive quick test using “Chlor-n-Oil 50”, only three (3) were confirmed by analysis at Hill Laboratories, Hamilton, New Zealand (NZ) as having more than 50 milligramme (mg) per litre (or parts per million, ppm) requiring disposal under the Stockholm Convention (Interim Secretariat for the Stockholm Convention on POPs 2002). The amount of oil in the three transformers was estimated as 465 kilogramme. No POPs pesticides were identified and, as a result of generally low amounts of POPs found in PICs, the Australian Assistance for International Development (AusAID) agreed to include non-POPs pesticides.

The MNRE’s Enabling Activity earlier in 2003 employed consultants of the Montgomery Watson Harza (MWH) NZ Ltd. (at that time represented at the Samoa Water Authority) to conduct an initial inventory of POPs. The inventory also included PTS as some are anticipated to be added as POPs and it is cost effective to analyse simultaneously. Surface soil from immediately around the transformers contaminated with PCB oil was found below international standards of concern. The two (2) contaminated transformers at Vaitele (Figure 1a) were later moved to separately enclose by 2 metre high chain link fence and labeled as hazardous chemicals to await disposal under the POPs in PICs project. A further contaminated transformer was identified at Asau (Figure 1b).

Other POPs pesticides contaminated sites were identified (Table 3). Extremely high contamination at the commercial pesticides warehouse at Vaitele (Figure 1c) was found of chlordane in 3 and heptachlor in 2 of 5 soil samples. Similarly, at the residential site of a pest control operator (Figure 1d) who formerly used chlordane termiticide, it and heptachlor were also found above and below overseas residential standards in one each of 5 soil samples. Chlordane was detected below standards at two other sites including Nuu Crop Development Centre which had been identified in earlier SPREP study and recommended for proper disposal of the buried pesticides.

Figure 1. POPs contaminated sites - Poly-Chlorinated Biphenyls (PCBs) contaminated transformers oil at Vaitele (1a-b) and Asau (1c-d)



In contrast to the earlier study finding unacceptable DDT concentration in sediments at the main wharf, DDT and its breakdown product DDE were below standards outside the main agriculture pesticides store as also DDE at the pest controller's residence. Dieldrin was also detected at the main agriculture pesticides store below standards.

In addition, eight (8) pig fat samples were also taken for analyses of POPs. The POP DDT was detected in seven (7) and its breakdown products DDE and DDD in five and one samples, respectively. The maximum concentration of 0.12 mg per kilogramme (kg) (ppm) was much below the NZ standard of 5 mg/ kg although it was recognised to be a small sample for which additional samples, if taken from contaminated sites (e.g. Vaitele warehouse and Vaivase pest control residence), could have higher concentration.

Table 3. Summary of POPs Contaminated Soils Exceeding Standards in Sub-samples Within Various Sites (GOS 2003)

POPs:	Site: ASCW*	VRB	FMS	ASC	N1	SC
Chlor-dane	3/ 5	1(+1)/ 5	1/ 5	-	(1/ 5)	(1/ 5)
Hepta-chlor	2/ 5	1(+1)/ 5	-	-	(1/ 5)	-
DDT + DDE	-	(1)/ 5	-	(1+2)/ 5	-	-
Dieldrin	-	-	-	(1)/ 5	-	-

* ASC = Agriculture Store Corp. main store, and ASCW = warehouse (Figure 1c);

VRB = Vaivase pest control operator (Figure 1d);

FMS = Fugalei marine sediment;

N1-3 = Nuu main buried pesticide site 1;

SC = Samoa College

() number of samples with detectable POPs but below standards

- below levels of detection

Persistent toxic substances

The PTS residues found in earlier studies are also indicated in Table 1 above. Lindane is still sold by pharmacies for treatment of scabies and pediculosis while three other competitively priced non-PTS alternatives are also available which could allow phase out by the Ministry of Health et al.

At a regional workshop, potential PTS were suggested (Cable 2002).

Endosulfan as Thiordan 35 was identified in the POPs in PICs project for disposal of only 0.8 litre of this obsolete pesticide from Vaitele warehouse. Disposal may be as early as December 2003.

Figure 2. Persistent Toxic Substances (PTS) contaminated marine sediments - (2a) Tri-Butyl Tin (TBT) contamination at main wharf and (2b) Poly-nuclear Aromatic Hydrocarbons (PAHs) contamination at Sogi



The first known analysis in the MNRE study of Tri-Butyl Tin (TBT) confirmed contamination above overseas standard at three (3) of five sites at the main wharf (Figure 2a). At Sogi, marine sediment on the margin of mangroves contamination above overseas standards was found from drainage from the adjacent oil tank farm of PAHs (dibenzo[a,h]anthracene, fluoranthene, fluorene, naphthalene/ phenanthrene) (Figure 2b; Table 4).

Because of the association of Penta-Chloro-Phenol (PCP) with Copper-Chrome-Arsenic (CCA) timber treatment, it was analysed at the badly CCA contaminated site at Asau. It was at the limit of detection in three (3) of six samples.

Table 4. Summary of PTS found in Soils Samples Within Various Sites (GOS 2003)

PTS:	Site: AHS*	SOGM	TVC
Tri-Butyl Tin (TBT)	3/ 5	na	Na
PAHs	Na	1(+2)/ 5	na
PCP	Na	na	(3)/ 6

* AHS = Apia harbour sediment;
 SOGM = Sogi marine sediment;
 TVC = Tui Vaai Corporation code used for old Samoa Forest Products site

Na not analysed

() number of samples with detectable POPs but below standards

Some suggestions for addressing the POPs/ PTS problem

a. POPs

As a Party to the Rotterdam Convention, Samoa has committed to obligations under it. The main one for which Samoa is receiving assistance under the Enabling Activity is to develop a National Implementation Plan (NIP) including Action Plans for elimination or reduction of the three (3) main classes of POPs, i.e.: 1 PCBs; 2 pesticides; and “unintentional” dioxins/furans. Pacific Environment Consultants Ltd. (2003) consultants are contracted to complete the NIP including other activities by 2004.

To facilitate elimination of PCBs, the Enabling Activity continues to test transformers manufactured before 1987. A representative of the Electric Power Corporation to the National Task Team for POPs in 2002 estimated that about 70 per cent of transformers were still on-line. Under the Convention, Parties have until 2028 to dispose of PCB contaminated transformers. Samoa should not require that long to identify and hopefully dispose of them and/ or the oil, but an Action Plan will be needed for continuing testing following the end of Enabling Activity now expected in 2004.

Likewise, the action plan for pesticides may consider a call-in by the Ministry of Agriculture, Forestry, Fisheries and Meteorology and/ or Agriculture Store Corp. to dispose of possible obsolete POPs pesticides. Most likely, the pesticides would be non-POPs and, if labels are intact, could be used by others or disposed by spraying at recommended rates.

Known pesticide contaminated sites were visited under Phases 1 and 2 of the POPs in PICs project. However, they were not agreed by AusAID for inclusion for disposal. The Action Plan will need to consider especially the badly contaminated Vaitele warehouse and residential pest control sites as also marine sediments off Fugalei stream.

b. PTS

Those that come under POPs will also have to be dealt with. As this may be with some delay, those which exceed standards should nonetheless be dealt with and may be included as

a part of Action Plans. The TBT and PCP are pesticides while PAHs are from “unintentional” burning. In developing a plan to reduce dioxins and furans, PAHs should also be reduced.

c. Standards for POPs and PTS

The Government of Samoa report provides international standards for shellfish and animals, soil and marine sediments (GoS 2003; Table 5a-c) which should be considered. It is noted that those for soil have considerable difference of US-EPA industrial and NEPM commercial samples which requires special consideration when analysis falls in the range.

Table 5. Standards for POPs and PTS in various circumstances

a. DDT (Organo-Chlorine) in shellfish and animal samples

Sample:	NZ-FSA (2002)
Shellfish	0.1 mg/ kg (also Organo-Chlorine)
animal (e.g. pig)	5.0 mg/ kg

b. POPs and PTS in soil

POPs or PTS:	US EPA(1993): residential	industrial	NEPM (1999): residential	commercial	MfE (1997): timber
POPs: chlordanes	1.6	8.1 (10 no dermal contact)	50	250	-
Heptachlor	0.1	0.48 (0.79)	10	50	-
“ epoxide	0.053		-	-	-
DDT or DDE	1.7	8.8	-	-	-
DDD	2.4	12	-	-	-
DDT + DDE + DDD	-	-	200	1,000	-
Dieldrin	-	0.13	-	50	-
PCBs	-	1.8	-	50	-
PTS: PCP	-	30	-	-	570 (agriculture 0.7)

- None given

c. Chlordane and TBT in Marine Sediments

POP or PTS:	ANZECC (2000): ISQC low	ISQC high	Canadian ESQ (1999)
Chlordane	0.0005	0.006	0.00226
TBT	0.05	0.07	-

- none given

d. Heavy metals

In developing the Regionally-Based Assessment for PTS, it was stressed that for heavy metals only organic forms have POPs properties. The find of concentrations of total lead above standards in water samples (Samoa Drinking-water Standards Working Group 1999) near the former Vaitoloa dump and Fugalei market could include some contamination from former use of organic tetra-ethyl and tetra-methyl lead additives now excluded from petrol import to Samoa but are most likely to be from lead-acid batteries. The UNDP’s Programme Specialist has provided information of Occupational Knowledge (OK) International (2003) assistance to NGOs, and a proposal drafted by O Le Si’osi’omaga Society Inc. (2003) if supported would provide needed awareness for affected communities.

Conclusion

This paper has provided a summary of the pre-2002 literature, and a preliminary inventory of POPs in Samoa. It stresses that work continues with dioxins and furans as well as PTS.

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Bridging the gap: building environment information linkages & network- a Pacific, Samoan Model.

*Satui Bentin & Leilani Duffy**

Introduction

On a regional level, SPREP assists the development of member countries' national assessment reports towards environmental management, encompassing all of the four major areas identified in its Action Plan. The development of national strategies is dogged by the lack of adequate information infrastructure and mechanisms. Constraints affecting the negotiation and implementation of Multilateral Environmental Agreements (i.e.: CBD, UNFCCC, Waigani etc) include inadequate access and analysis of environmental information.

Reviews of the Barbados Programme of Action (BPoA) and the World Summit on Sustainable Development show the need within the Pacific to create (where none exist), strengthen and enhance access to environmental information.

Experience has reaffirmed that sustainable development is best achieved through adoption of integrated and holistic approaches at all levels. The Pacific Environmental Information Network (PEIN) is a relatively small intervention but has already made an attempt at mainstreaming environmental issues through linkages to various sectors at beneficiary level. It comes at a time when there is greater expectation of regional organizations to assist members meet international and global obligations towards achievement of sustainable development goals and is contributing to better livelihood of the Pacific through the development of basic information infrastructures.

PEIN overview

As a people's information network, PEIN is designed to provide environmental information in appropriate forms and languages to all sectors of the community recognizing that women as well as men can play a significant role in promoting environmental awareness. It targets environment and related government departments (inclusive forestry, agriculture, land use units; meteorology; ports authorities; police; foreign affairs); schools (Universities and Colleges); Public, National and Special Libraries with final beneficiaries listed as Government personnel; Students (Tertiary, Colleges & Primary); Community at large (inclusive Non-State Actors); Regional and International organizations and bodies (inclusive Secretariats of various MEAs).

Objective of PEIN

The overall objective of the project is to build national capacity for environmental management and sustainable development of Pacific ACP States. In order to resolve the lack of environmental awareness, information accessibility, analysis and usage will be enhanced through the cross-sectoral services provided through the PEIN network. The PEIN services a network of targeted beneficiaries who directly interface with existing national systems (e.g.: NSAs, National Women's Groups, National Youth Groups, Church leaders and Congregations, Media etc.).

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The objectives and purpose of the intervention flow from the global level (i.e.: WSSD, WSIS, BPoA, Multilateral Environmental Agreements) to the regional level (SPREP Action Plan, Pacific Regional Strategy etc.) to the national level (National Assessment Reports; NBSAPs etc.).

This development objective contributes to the information infrastructure of SPREP member countries and Pacific ACP States and will assist efforts at sustainable and efficient use of natural resources, improved economic status and social capital development.

An initiative geared towards a regional approach is a necessity as it not only directly assists PACPs on the national level, it is also a conduit towards meeting obligations of countries and regions on the global and international level. Implemented within a framework of four technical phases (Phase I: Technical assessment of facilities, personnel & audience; Phase II: Purchase and installation of appropriate equipment and preliminary in-country training; Phase III: Environmental awareness activities and National workshops; Phase IV: Country attachment scheme), the PEIN relies heavily on its national counterparts identified in the early stages of the project. These national counterparts are normally Environmental Education Officers and/or Information Officers based within Departments of Environment or SPREP's operational in-country Focal Points. In very rare cases have the focal points been allocated not from environmental departments (e.g.: American Samoa's operational focal point is the Department of Marine, Wildlife & Resources (DMWR), not EPA).

Skills acquired through PEIN training in information management were to assist national personnel better service requirements of their own national needs. Its 'members' are by default SPREP's 25 member countries and territories; regional links/partners such as USP (PIMRIS & SOA), SOPAC, SPC, PIFS and FFA. International links/partners include UNEP-INFOTERRA, IUCN/WRI/IIED-INTERAISE, Global Information Network, various links through existing SPREP projects/programmes – e.g.: SIDSNet, PaciNet, POPs: UNEP Chemical, IMO, UNDP etc...Some links operate through formal organizational Memorandum Of Understanding (MOUs) whilst others work through 'project mandated' objectives. Figure 1 shows the Pacific model that won an international award at the 2004 Stockholm Challenge Environment Category, in its innovative use of IT tools for the sharing of information between scattered islands and peoples. For more information on the Stockholm Challenge, visit www.challenge.stockholm.se website.

Current members of the PEIN are the 14 Pacific ACP states and one non-ACP state (American Samoa) with the dissemination aspect operating in 10 of the 15 members mentioned above. Of the 10, Samoa is currently the top country in terms of national membership (13 network members: 5 sites – 4 providers and 1 user). The system can operate as a stand-alone database or can be accessed via internet through the SPREP website (www.sprep.org.ws). The PEIN system relies heavily on the "people-aspect" of networking hence its heavy concentration on capacity building in the form of national in-country trainings, country attachments and national workshops. It also works closely in collaboration with the environmental education and training section of SPREP.

Looking ahead

The PEIN Project will address capacity building through country attachments, workshops and seminars and other complementary programmes implemented by SPREP and its sister regional organizations. Linking activities with similar interventions envisaged through the

Convention on Biological Diversity, and UNFCCC's clearinghouse will also ensure sustainability of PEIN's cross-sectoral service.

The major problem undermining attempts to redress environmental problems is poor quality access to and analysis of appropriate information. The SPREP Action Plan reflects what each country perceives as its main environmental issues for the given timeframe (i.e.: 2001-2004, 2005-2009). Information accessibility, analysis and dissemination are identified as a major stumbling block in the implementation of almost all environment-related initiatives. Community knowledge and awareness of appropriate environmental management is crucial for the success of national policies for sustainable development. PEIN addresses information infrastructure required for the collection, documentation and dissemination of available and appropriate information to all sectors of the community and as well, assists in the quest for knowledge management. It will strengthen support to all Pacific ACP States through capacity building activities. Training will encompass all three components of capacity building (i.e. institutional, human and systemic).

Information dissemination, analysis and management cannot be tackled solely through the infrastructure (i.e.: systemic), it must also look at providing support in the creation of national information policies and strategies (institutional) and provide training for environmental personnel to better analyze and repackage information into appropriate formats. By incorporating PEIN into the national level and through the creation of national networks, there is assurance of a wide spread reach of information and a wider concentration of efforts to link the various partners that are already networked or linked to various sectors of the community, on the national level.

Case study Samoa: Samoa Environment Information (SEI) network

Overview

Samoa's participation to the United Nations Conference on the Environment and Development (UNCED) in 1992 was the first stepping stone for the country to pledge its commitment and support to the international community to work towards addressing key issues related to environmental conservation and sustainable development. The development of the National Environment Sustainable Management Strategy for Samoa (NEMS) 1993, is one positive outcome of UNCED, because this strategy specifically outlined twelve target environment components for Samoa to directly respond to local and regional emerging environmental problems. The government's political support for the sustainable management and use of natural resources through establishing conservation areas, national parks and the development of national legislations, policies strategies, and national environment public awareness events saw the growth of environmental interest from the public.

The gradual awareness about local, regional and environmental problems started to find its niche within the formal education system through environment education and the existing subjects taught in science and social science. Similarly, local environmental concerns were the highlights of every community workshops or road shows conducted by different government ministries or NGOs promoting development sectors with a strong emphasis on sustainable development. For instance, the Samoa Tourism Authority road show to promote tourism in communities, strongly advocated for the importance of Samoa's natural environment as a reflection of our culture, identity and how Samoan people live in harmony with nature. This informal education approach is an indication of driving environmental awareness to the community or village level. In this context, a new culture of "environmental consciousness" has emerged and along with it comes the craving for environment related

information dealing with various issues such as; climate change, biodiversity, pollution in both terrestrial and marine, sustainable development and the list is endless.

Division of Environment & Conservation (DEC) Information Resource Center

The DEC was established in 1989 under the Ministry of Natural Resources and Environment[†] and was solely responsible for addressing means for sustainable development that would accentuate the value of natural resource management for Samoa's national planning. As workload for the division grew, so did the need to set-up an information center for employees of DEC to do research work and house all reference materials received from regional and international environment organizations, as well as local research study, field work, and reports. In 1998 the DEC through NZODA conducted a study to assess the need for environmental information. The outcome of the study in which Ms. Satui Bentin of SPREP conducted, distinctively identified that the DEC Staff Information Resource Center has expanded its services to provide information for the growing number of local researchers on environmental issues.

The NZODA funded project produced this report emphasizing the need to formally set-up an environment information center to accommodate the demand from schools (students doing research), academic researchers from Tertiary Institutions, international and local consultants, other government ministries and the general public. The outcome of the NZODA report for Samoa came at the right time when SPREP had just started the Pacific Environment Information Network project (PEIN). Unlike other Pacific Island Countries who were members of PEIN, Samoa through its own initiative had already completed its first phase of technical assessment and now is sure of what approach they need to undertake for the establishment of the Resource Center and at the same time set-up a network of information providers and users. This report became the guideline for Samoa's implementation of PEIN.

Establishment of the SEI-network

Like all new projects, information networking is no different. A period of trial and error can go on for a while, before the responsible agency can come up with deliverable output for potential stakeholders to see and gauge their interest. The development of the Samoa Environment Information Network database (SEI-network database[‡]) is no easy task given the limited number of staff available and the hours spent on entering data. SPREP through the EU-PEIN project provided technical support in developing the environment information database with the use of the DB/Text Software program. The continued support from NZODA for capacity building in environment information compilation and dissemination prompted the approval of funds for the first national environment information networking workshop in February 1999. This workshop launched the national database of environment information that DEC has put together with the technical support from SPREP. The outcome of the workshop consolidated the members for the first SEI-network and this included; two tertiary institutions, four government ministries, 2 environment NGOs and two colleges.

The members of the SEI-network identified the need to access information and promote sharing of this information to students, teachers and learners who are the main users of environment information. In order to make the information available from each institution

[†] Ministry of Natural Resources & Environment was formerly the Department of Lands Surveys and Environment. The name change is a result of government reform in 2002

[‡] SEI-network was formerly the National Environment Resource Database for Samoa (NERDS), the name was changed due to request from members to come up with a name that is more marketable and catchy for people's interest.

through the use of the SEI-database, members feed in the relevant information to DEC for updating the national database. It was also the responsibility of DEC being the national coordinator to install the search version of the national database with all its members. The information in the database is basically a catalogue or listing of reference materials from international, regional and national level, which include the location of where a user can borrow the actual report or reference material. It was this common understanding that guided the SEI-members access and sharing of information. In addition, institutional policies of each member's apply when a user borrows the information from their library or resource center.

The DEC being the driver of this project was able to mobilize its resources from other existing environment programmes, such as the GEF-Operational fund to continue the capacity building training for the SEI-network members and its new members on how to use the program. In 2001 funds were received from the UNDP-GEF Operational programme funded a national workshop for the SEI-network and also demonstrated to participants the GEF website and how they would be able to access environment information from the global network. This workshop identified the need to purchase PC's for member institutions with already established resource centers, but have problems in accessing the SEI-database because there is no computer to host the database. The leading role DEC plays at the national level in pushing forward capacity building trainings for the SEI-network and acquiring PC's for pilot institutions reflected the commitment from both members of SEI-network, the national coordinating agency MNRE and support from donor organizations. In addition capacity building trainings for the SEI-network would not have been possible had it not been for SPREP's continued technical support as well as the purchasing of PCs for some members of SEI-network under PEIN project.

The SEI-network expanded its recognition to Samoa's sister island American Samoa who had expressed interest to participate in the SEI-network trainings. The interest from American Samoa colleagues was to find a better means of improving their information dissemination to the public. As well, American Samoa is a member of the PEIN project and they have also been very active participants. Apart from its country-country ad hoc partnership between the SEI-network and environment institutions in American Samoa, the MNRE is the national focal point to the UNEP-INFOTERRA global environment information network.

Lessions learned

The SEI-network is one particular project of MNRE that has continuously evolved with the growing need for environment information. It started off as a reference information center for the staff of the Division of Environment and Conservation, and now it has expanded to be the Resource Information Center for the Ministry of Natural Resources and Environment, being the depository and clearing house for all information that comes into the four main divisions of MNRE (Technical, Land Management, PUMA and DEC). The Information Resource Center is the main place for researchers, students and academia's to use when they come in to look for information and do studies. Although, progress is witnessed in the evolving changes of the SEI-network as a result of the commitment by the Division of Environment and Conservation of MNRE, it has also at the same time experienced a number of pitfalls such as;

- The current institutional arrangement as a result of the government reforms structure 2003 which has moved the Capacity Building Section (CBS) from the DEC to the Corporate Service Division of MNRE. Although the intention has some potential in terms of being the central section to provide backstopping support to all other divisions, with regards to public education and awareness, trainings and information dissemination, there are major drawbacks to the type of leadership capacity and priority focus of the current division to

promote and emphasize the valuable contribution that the Information Resource Center provides to Samoa, and the work of the SEI-network. The constraint emerges from the misconception that Corporate Services Division being the central division providing all administrative support to the ministry should at the same time absorb other sections providing a similar service. However, what has been overlooked is that the functions of CBS runs parallel to that of the Corporate Service Division, therefore they can not integrated. For instance, CBS fitted in well with DEC because it was developed under the functions of DEC. Similarly it can merge into PUMA (Planning and Urban Management Services) and Land Management Division because they provide technical service to external stakeholders unlike Corporate Service, which focuses internally on MNRE. Thus, projects, like the SEI-network is directly for external stakeholders of MNRE whereby the CBS is the leading national coordinator for the project. However its static status is a result of the lack of support from the divisional head because of the limited knowledge into the work and functions of CBS, which provides a valuable service to the ministry externally.

- The high number of staff turnover has been a problem, especially with member focal points in each institution under the SEI-network. Henceforth, the SEI-network coordinator in collaboration with members encouraged partner trainings on the use of the SEI-network database program in the event that one person leaves for greener pasture, another person can take-it up.
- The lack of high level support for information access, sharing and dissemination is a long- standing issue raised by all members of the SEI-network. It seems that the inputting or cataloguing of existing information into the SEI-network database has faced a brick wall a number of times due to the lack of support from divisional heads of many government ministries within the SEI-network to provide equipments (PCs) to enable the cataloguing and storing of information. This issue is attributed to the traditional reference being made to any Information Resource Center as a library, when it is not. And it seems that the library being stigmatized, as not being a priority of many government ministries is very disappointing because it holds back the progress of people that have been trained in the use of the SEI-network database. The MNRE has moved away from this trend but the current place at which the PEIN project and SEI-network is being hosted may face similar dilemma like its members, and thus defeat the whole purpose for which the SEI-network coordinator under the DEC had pushed for an information resource center because it provides more services to the public.

Way forward

The SEI-network is a good example of information access, sharing and dissemination at the national level. In fact the PEIN project has Samoa as the leading country in this Project, which is now at its last phase of implementation. The valuable potential of information as we all know is the key that open up doors of opportunities to people to build knowledge and improve accuracy in the collection and dissemination of information. The initiative taken by MNRE is a step forward to what each Pacific Island Country should regard as one priority area of national planning. The SEI-database is a tool that enables the network and linkages between members of SEI and users. The Environment Information Resource Center within the MNRE provides the central place for dissemination of information to all relevant stakeholders (users) and the recording and collection of environment information for storage and use.

The SEI-network through the use of its information database can ensure access and sharing of environmental information or resources by users. The dissemination of information can

empower communities, students, or anyone to support Samoa's sustainable management of its natural resources. The network also provides an alternative solution to the issue of access to information stated in Agenda 21;

There is already a wealth of information that could be used for the management of sustainable development, but many people have trouble finding the information they need, when they need it" (Agenda 21, 1993:61)

The MNRE SEI-network although well established now with members and they have some on-going programmes, more consolidated work is yet to unfold, but the current placing of the SEI-network and PEIN Project with Corporate Service may lose sight of what information networking and linkages is all about. Generally, if there is a choice for a suitable section or division, for the PEIN project and SEI-network to be managed due to its information technicality in management, it would be with the IT Section of MNRE and PUMA, as they have people with the capacity and knowledge to manage. The Capacity Section can still manage the daily operational activities of inputting data or cataloguing in the MNRE database and the IT Section to update the SEI-network database.

Conclusion

The PEIN and the various national networks established in its member countries is working to redress the information gap by utilizing and linking other national, regional and international networks that are not already linked or working in partnership with and through PEIN. It is envisaged that PEIN will eventually evolve into a partnership network where each partner will have equal responsibility in the documentation and dissemination of information and as well, in the maintenance, monitoring and analysis of information dissemination resulting in a much higher percentage of public awareness and understanding of environmental issues.

By the next five to ten years, every member would have agreed to an exchange policy or would have written a national information policy that encompasses information dissemination, analysis and exchange between all partners. It also presumes that within the same timeframe, every partner and/or existing network irrespective of 'subject' area would be connected or linked in one way or other.

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The MNRE model for institutional strengthening in the public sector

*Tu'u'u Ieti Taule'alo & Moilovao Elisaia Talouli**

Introduction

The Department of Lands and Survey was traditionally responsible for surveying and land services until 1989 when environment was introduced and it became the Department of Lands, Survey and Environment. Since mid-1999 the department had undergone a number of significant institutional changes including the approval of a new organisational structure, establishment of a new institutional policy, formulation of a new corporate plan and the development of a new service charter. During the later part of 2000, a review of the department's reforms was conducted. The findings of that study (Yeoman Ward International, 2000) as well as the recommendations of the Public Service Commission Institutional Strengthening Project formed the basis for institutional strengthening discussed below. In July 2003 the Department of Lands, Survey and Environment became the Ministry of Natural Resources an Environment (MNRE).

This paper explores a model for institutional strengthening as developed during the continuation of MNRE's public sector reforms during 2003. It describes the logic of the approach taken and the processes that were followed; and highlights some strengths and weaknesses encountered during implementation.

Background

The Minister was the overall head of MNRE with the Chief Executive Officer charged with its day-to-day administration and management. At the start of 2003, it comprised of six divisions – Land Management, Environment and Conservation, Technical Services, Planning and Urban Management, Corporate Services and Legal Services – each controlled by an Assistant Chief Executive Officer except for Legal Services. As shown in Figure 1 the divisions are structured into sections, each supervised by a Principal Officer and staffed with Senior Officers, Officers, Assistants and casual workers. The Public Service Commission is responsible for all matters related to public service employees.

Figure 1: MNRE Structure, 2003

Divisions	Sections
Land Management	(1) Land Registration, (2) Land Administration, (3) Land Development
Environment and Conservation	(1) Terrestrial Resources Conservation, (2) Marine Resources Conservation, (3) National Parks & Reserves, (4) Water Resources
Technical Services	(1) Surveying, (2) Draughting & Plan Examination, (3) Land Valuation, (4) National Maps
Planning & Urban Management	(1) Strategic Planning, (2) Sustainable Development, (3) Urban Management, (4) Disaster Management
Corporate Services	(1) Administration, (2) Finance, (3) Capacity Building & Human Resources Development
Legal Services	(1) Legal Services

By early 2000 it became abundantly clear that MNRE had a much wider role dealing with natural resources generally. It was already responsible for lands, biodiversity, parks and

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reserves, and water and worked closely with others agencies on the management of other resources such as forestry and fisheries. It was also evident that there were a range of services to support resource management, some of these - surveying, valuation, mapping, plan examination, planning, urban management and legal - were also already delivered by MNRE. Figure 2 shows the MNRE functions and responsibilities, all of which were support by relevant legislation. By the end of 2003, Samoa had ratified seventeen international environmental Conventions and Protocols.

Figure 2: MNRE Functions and Responsibilities

Functions	Responsibilities
Land Management	•Administration of government lands under the Land Board, •Land registration. •Management of land-based natural resources, •Alienation of lands, •Taking of lands for public purposes, •Secretariat for the Land Commission, •Secretariat for Land Board
Environment and Conservation	•Conservation of terrestrial biological diversity, •Conservation of marine biological diversity, •Management of national parks & reserves, •Management of water resources
Technical Services	•Surveying, •Draughting & plan examination, •Land valuation, •National maps
Planning Services	•Urban and rural planning, •Development approval, •Management of waste, •Pollution control, •Management of chemicals, Disaster management, •Secretariat for the Planning Board
Urban Management Services	•Operation of public markets, •Landfill operation, •Solid waste collection, •Septic tank sludge disposal, •Urban ground maintenance, •Public toilets operation, •Public cemeteries maintenance
Environmental Conventions	•Implementation of international convention

Logic of the model

The MNRE model provides an integrated approach for institutional strengthening, taking into account all the relevant institutional components. For this exercise, the focus was the achievement of the goal – sustainable development of Samoa's natural and environmental resources. As an environmental agency MNRE promotes a balance in resources conservation and development through the efficient provision of its services.

Seven components were identified – core functions, staffing, programmes, funding, capabilities, services and legislation – which were considered to strongly influence the achievement of the above goal, represented as operational objectives and leading to functional outcomes as shown in Figure 3. While each outcome addressed the respective objective, it was the interlinking of all that defined the model logic.

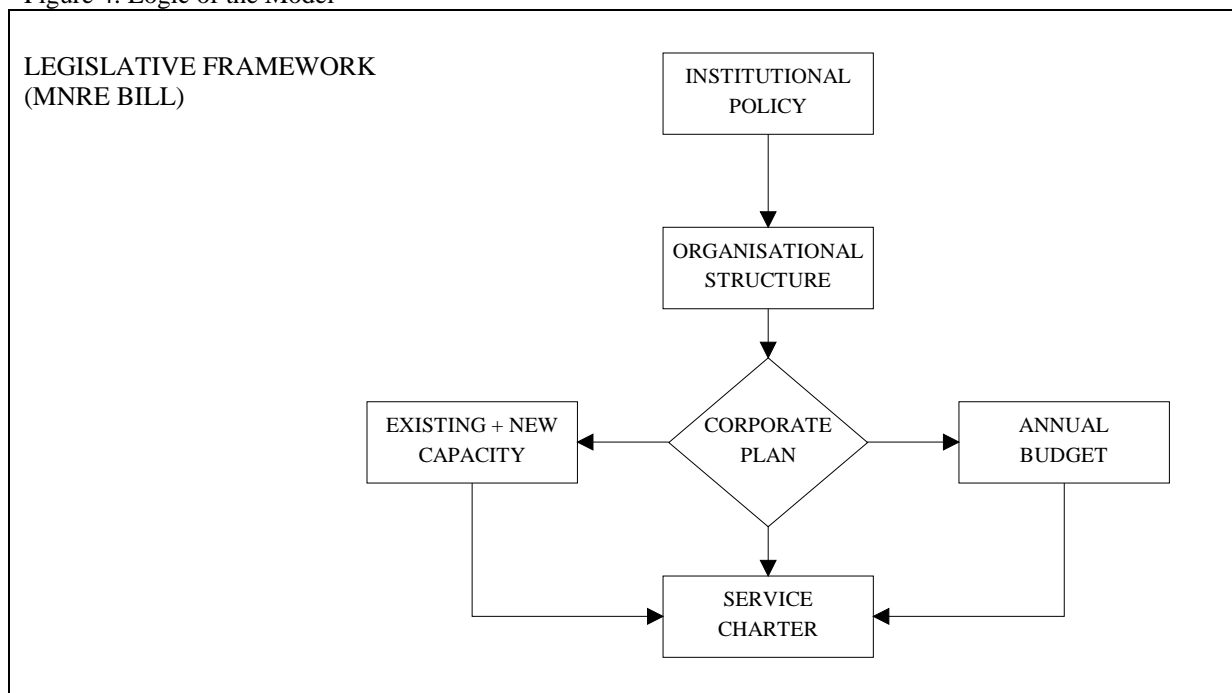
Figure 3: Model Objectives and Outcomes

Institutional Components	Objectives	Outcomes
Core functions	Relevant functions and responsibilities	Institutional Policy
Staffing	Suitable levels of human resources	Organisational Structure
Programmes	Relevant programme of action	2003-2005 Corporate Plan
Funding	Sufficient financial resources	2003/2004 Budget
Capabilities	Adequate staff capacity	Capacity Building Plan
Services	Appropriate level of service delivery	Service Charter
Legislation	Enabling legislative framework	MNRE Bill 2003

It was considered that the interaction of outcomes facilitated the strengthening of MNRE's institutional capabilities to fulfill its mandate. As shown in Figure 4 the Institutional Policy which set out MNRE's core functions and responsibilities determined the Organisational Structure establishing the minimum staffing levels for effective implementation. Both the

policy and structure defined the Corporate Plan providing the Programme of Actions to effect MNRE's agreed responsibilities. The Corporate Plan was the centre of management tasks leading to the Annual Budget to fund activities, Capacity Building to improve staff skills and the Service Charter to control service delivery to the public. All these outcomes operated within the context of the MNRE Bill providing the enabling environment for MNRE operations.

Figure 4: Logic of the Model



Methodology

The process for institutional strengthening was driven by MNRE staff through a participatory approach that involved all stakeholders with work plans designed, organised, implemented and the final outputs decided by MNRE staff themselves. This was considered to be only way to ensure maximum staff participation and claim ownership of the final outputs. This as well as the involvement of external stakeholders was also considered to promote transparency and accountability.

Overseeing this process was the MNRE management of the Chief Executive Officer and the Assistant Chief Executive Officers, it defined scope, set targets, issued directives and reviewed progress to adjust action strategies. These were reviewed by divisions and debated among staff. Staff in a series of workshops developed details and determine priorities for the various outcomes. Inputs from each division were presented at a series of staff workshops and the results compiled into the draft reports. An external consultant was engaged to draft the MNRE Bill while a staff drafting committee compiled the other reports which were circulated to stakeholders for comments and final approval decided by MNRE staff.

It was decided from the outset to adopt a staff-driven approach designed to ensure both a top-down and bottom-up setting to achieve the required outcomes. The process involved wide consultations within MNRE from the officer level and up. These consultations were very important - they provided opportunities for staff to participate directly in the development of ideas as well served educational activities. They also helped to expand the learning experience of staff beyond routine knowledge and increased the levels of awareness and

understanding of the key institutional factors affecting their jobs and the work of MNRE. Four of the six outcomes - Institutional Policy, Corporate Plan, Service Charter and MNRE Bill - also involved consultations with key external stakeholders because of public interest in these areas.

Institutional Policy

The new institutional policy (MNRE, 2003a) set out the MNRE functions and responsibilities based on a review of the existing policy. Some existing responsibilities for Land Valuation, National Maps, and other Land-based Resources were formalised while new responsibilities for Urban and Rural Planning, Water Resources and Disaster Management were introduced. For efficiency, the aim was to bring together natural resources and environment functions under the new MNRE. A framework for partnership with the private sector was also highlighted, with a schedule for the transfer of some responsibilities from MNRE to the private sector. It was considered that private firms could provide more cost-effective implementation of these services. This was promoted strongly in the Strategies for the Development of Samoa with the private sector to undertake operational activities and MNRE to deal with regulatory and mandatory functions.

Already many of the urban services had been contracted-out including urban maintenance, Solid waste collection, Public toilet operations, Cemetery upkeep and Landfill earthworks while the Public market management were yet to be privatised. In land surveying and valuation MNRE only dealt with its own needs while private firms were to meet all other demands. But with limited capacity in the private sector it would be some time before many of the MNRE's technical operational activities could be fully undertaken by the private sector. The long-term aim was for the MNRE to become a regulatory authority within the natural resources and the environment sectors. This included responsibility for the increased number of environmental conventions that Samoa was party to.

Organisational Structure

The new organisational structure (MNRE, 2003b) showed a significant growth in the level of recommended staff – from 114 in 199 to 200 positions. This reflects the staff level required by MNRE to execute its functions and responsibilities. The increase was due mainly to the expansion of existing activities within MNRE, transfer of functions from other ministries, and the formalisation of existing responsibilities. But with the limited funds available in the budget to finance new positions it was expected that the implementation of the new structure would be restricted to the filling of selected priority positions.

To facilitate the development of the new structure a set of guidelines was identified, taking into account the budgetary constraints. These were: (i) Total of six divisions being Land Management, Environment and Conservation, Technical Services, Planning and Urban Management, Corporate Services and Legal Services; (ii) Sections to highlight the specific functions of each division and their names to reflect their respective responsibilities; (iii) Structures to follow the Public Service Commission policies; and (iv) Clear career paths provided within divisions. The last item promoted the establishment of small sections with specific responsibilities allowing for accelerated advancement within or across sections.

Corporate Plan 2003-2005

The new corporate plan (MNRE, 2003c) outlined MNRE's work programme for the period 2003-2005. It was built on experience learned from the implementation of the first plan and reflected both the MNRE and national goals for development. A Vision statement set out the

overarching and long-term direction of the MNRE; Mission statement identified the key components for the achievement of the Vision; Goals represented the cross-cutting themes that linked all functions and responsibilities; Objectives were aligned with divisional functions; Outcomes based on the responsibilities of divisional sections; and Outputs being the target section activities to achieve success. Other features of the corporate plan included the MNRE Mandate, Values and Operating Environment.

For consistency and to avoid confusion the corporate plan and the annual budget were closely aligned to ensure that funds allocated in the budget correlated directly with plan targets. The main feature of the corporate plan which reflected the requirements of both the institutional policy and organisational structure. However there was some confusion with in the use of terms between the corporate plan and budget with plan objectives representing divisional functions matched against the outputs of the budget, plan outcomes dealing with sectional responsibilities corresponded to budget sub-outputs; and plan outputs translated to budget activities.

2003/2004 Budget

Annual budget preparation, largely carried out by senior MNRE and Ministry of Finance staff, was made one of the institutional outcomes because it was a key component of institutional development and implementation. It was also done in order to mainstream the budget process among MNRE staff and demonstrate the principles of performance budgeting. It was considered that improved financial management by staff was strongly dependent on better appreciation of the budget rationale particularly its underlying constraints. It was also important for staff to understand the connections between the budget and other institutional components. The aim therefore was to familiarise staff with budget planning, execution and monitoring so they could better appreciate the budgetary implications on the other institutional outcomes generally and the divisional activities in particular.

The main budget strategy was to maintain a surplus between current revenue and expenditure based on a more stringent approach to reduce expenditure and control spending while improving revenue collection. All ministries were asked to prioritise activities, demonstrate clear linkage between outputs and strategic outcomes of government, allocate resources to priority outputs, provide cost effective service delivery. Budget proposals were also to be supported by current corporate plans. The MNRE annual budget (MNRE, 2003d) was therefore largely dependent on the above conditions and not necessarily reflective of the scope of its work or level of responsibilities. It was \$6,008,418 in 2001/2002, \$6,684,132 in 2002/2003 and \$6,029,769 in 2003/2004. In spite of MNRE's expanded role with new functions and responsibilities, its current budget had hardly changed in three years. A successful final budget was therefore not in the total amount but in the details of the individual items.

Capacity Building

It was considered that capacity building was the most critical success factor in achieving institutional success. With the contracting-out of MNRE's operational responsibilities already in place future capacity needs would be focused more on management and less on implementation skills. The assessment of capacity building needs was strongly influenced by the other institutional outcomes. As discussed above MNRE functions and responsibilities were set out in the institutional policy. To undertake its functions and responsibilities it required the level of human resources as proposed in the new organisational structure and based on the work programme as outlined in the corporate plan. This required sufficient

funding from the budget and adequate staff capacity, all leading to effective service provision as set out in the service charter.

The MNRE capacity building priorities (MNRE, 2003e) were derived from the particular needs of each division. They were generally gaps in current capacity that would apply to the majority of staff and mainly involved the strengthening and/or upgrading of existing skills. Priority was placed on developing basic skills and providing benefits to the maximum number of staff. No specialised skills were included as those were covered under the government-sponsored long-term training programme.

Service Charter

The provisions of the new charter (MNRE, 2003g) were directly related to the MNRE services derived from its functions and responsibilities. The process involved first, the MNRE management reviewed the old charter and established the changes due to internal realignment and the incorporation of new functions. Second each division reassessed their particular requirements and procedures for services as well as set delivery standards. Third the draft details were worked and compiled by the drafting committee. Fourth the draft details were presented at a stakeholder workshop after which a final draft was prepared. And fifth at a second workshop of MNRE management and staff the details of the final report were adopted.

Generally a service charter provided a framework for setting out the service delivery targets. It established the standards of service that customers would expect and allowed the public to judge the performance of the particular agency. A successful service charter was therefore strongly dependent on customers having the confidence that their complaints would be followed through and resolved. Procedures for complaint resolution were developed setting out the mechanisms to follow if a customer was unsatisfied with any MNRE service or response. Starting with the officer involved, then the supervisor, Chief Executive Officer and finally the complaints committee. The aim was to tackle customer concerns by identifying weaknesses in the system and ensuring that weaknesses were addressed to avoid future repetition.

MNRE Bill 2003

The proposed legislation provides the enabling environment for MNRE to implement its functions and responsibilities. Compared to its existing Lands, Survey and Environment Act which combined both enabling provisions and details for lands and environment management, the new MNRE Bill (MNRE, 2003f) focuses only on the overall MNRE mandate. The intention was to create a hierarchy of legislation with the principal act at the top followed by specific legislation for different subject matters and Regulations and Orders at the bottom. Where divisional responsibilities overlapped with those of other agencies the concept of 'combined responsibility' was introduced with each agency following its own legislation but in partnership with others.

Programme Evaluation

An integral part of the model was the evaluation (Solofa, 2003) of the achievement in the short-term of the institutional objectives, largely supported by the consultant's. This was an independent task with the consultant proposing own methodology, to ensure on-going self-assessment and application of the lessons learned from institutional change. Many of the consultant's comments, however, would apply to a long-term evaluation of the MNRE goal, to be conducted at the next institutional review in five years time.

Conclusion

Driven by the MNRE staff, all aspects of the institutional strengthening were planned, agreed upon and implemented internally. This was the first strength of the model where all concepts, ideas and details were developed by management and staff in a participatory approach. While this was at times quite difficult to coordinate due to normal work commitment and limited project time it was still an extremely worthwhile exercise with staff being directly involved in the planning of tasks and the development of details leading to the final reports. As suggested in the evaluation report, designating a focal point could ease the coordination of activities.

There was a real sense of ownership among MNRE staff who were closely engaged in consultations, presentations and reporting. Interactions at all levels promoted skills transfer with senior members sharing their experience with others. The involvement of external stakeholders also highlighted the importance of customer services particularly the partnership between the public and private sectors.

A second strength was the integrated consideration of the main institutional components at the same time which allowed staff to understand how they interlinked. MNRE functions and responsibilities were set out in the institutional policy while the required human resources for implementation were identified in the organisational structure based on the work programme in the corporate plan. But any implementation would depend of financial resources in the budget and the capacity within the MNRE to undertake the required tasks. These were all linked to the delivery of services in the service charter.

Finally while the model was developed specifically for MNRE institutional strengthening, it would equally apply to other public sector ministries or state-owned corporations with mandates for public or customer services. Institutional components are similar with the enabling legislative environment largely driven by government policies. An apparent model weakness, however, relates to the adequacy or otherwise of financial resources to support institutional change. With government budgetary allocation based on funding availability, budget priority is therefore on effective utilisation rather than the financial adequacy.

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SPREP in Samoa

*F. Vitolio Lui**

Background to SPREP

SPREP's origin goes back to a workshop on conservation held in 1969 in Noumea, New Caledonia, where strong support was voiced for a regional environment conservation organization. Subsequently, a small one man conservation based program, was established in 1973 at the South Pacific Commission (now the Pacific Community). As regional awareness grew, the volume and gravity of environmental problems in the islands that needed urgent attention all increased. Hence, a regional Ministerial Conference on the Human Environment in the South Pacific was held in Cook Islands in 1982 to develop an Action Plan for Managing the Natural resources and Environment of the Region. The Meeting not only adopted an Action Plan but it also established a South Pacific Regional Environment Programme to operate as an autonomous unit in the SPC. In 1992, at the invitation of the Government of Samoa, SPREP relocated to temporary headquarters at Vaitele to operate and complete its evolution to an independent inter-governmental organization. This was concluded in June 1993 with the signature of the SPREP Agreement here in Apia. SPREP has 25 members, 21 Pacific island countries and territories (PICTs) and 4 developed countries. Its work programme however is targeted solely for the benefit of PICTs.

In 1996, the Government of Samoa leased to SPREP, at peppercorn rent, a prime site of 10 acres at Vailima for its Headquarters. In the same year the Government of Samoa also executed a Headquarters Agreement conferring formally, conventional diplomatic privileges and immunities befitting an intergovernmental organization and its operations. And in 2000, with donations from some of its members and other donors a modern headquarters was constructed and completed at its premises at Vailima.



SPREP New Headquarters at Vailima

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SPREP purpose

As can be gauged from the above historical background, SPREP is an environmental conservation/protection organization. In its founding Agreement (1993), its members declared that the Purposes of SPREP “**are to promote cooperation in the South Pacific region and to provide assistance in order to protect and improve its environment and to ensure sustainable development for present and future generations**”. How does the Secretariat conduct this work? SPREP carries out this mandate largely through coordinating regional actions, promoting conservation and best practices, facilitating regional and national actions and the provision of advisory and technical assistance to PICTs to help them address environmental problems and concerns. The major focus of SPREP in delivering its programmes to PICTs is to build capacity in the islands and to improve the lot of Pacific islanders at the basic level.

The Environment and the Region

While it is generally held, that our Pacific ancestors, in pre-modern times existed in harmony with their environment and surroundings, this of course, is no longer the case anywhere in the Pacific islands. There are now a lot more Pacific islanders. Their needs and aspirations can no longer be satisfied with what their natural environment provides. To satisfy our modern needs and tastes we create or import a lot of materials that not only benefit us but also harm our environment and surroundings and destroy the natural environmental resources we depend on and which future generations will need for a good and meaningful existence.

Because of the smallness, isolation and general lack of capacity of our islands, it is not easy or even feasible for us individually to address or remedy the problems we have created or imposed on us by need or circumstance. But together as a region we can do this and learn from each other. That was what led to the creation of SPREP.

SPREP and Samoa

Consistent with it being an intergovernmental organization, SPREP’s links to and interactions with its Pacific island members is through Government designated official focal points. This is not to say that SPREP does not deal or work with NGOs or other international agencies which form one of SPREP’s important network of partners and collaborating institutions.

For Samoa, SPREP’s official relations are conducted mainly through the Ministry of Foreign Affairs and Trade and the Ministry of Natural Resources and Environment. On more technical matters SPREP is more directly accessible to other government organs, the private sector, NGOs and civil society.

The nature of SPREP’s assistance to Samoa, in particular the environment area, has evolved over the last 10 years that it has been in Samoa. In the earlier years, SPREP has been much more involved in what might be called implementation activities – helping local staff with project implementation. Since then, Samoa has become one of the most fortunate and developed island members in terms of environmental awareness. Trained and skilled local people with more environment dedicated resources from the government have been able to carry out direct implementation work with external assistance from organizations such as SPREP being confined more to the areas of resourcing, advisory and technical backstopping support than direct implementation.

SPREP assists Samoa in a variety of areas through different organs (governmental and non-governmental) and through different modes. But naturally most of this collaboration and assistance is through the MNRE. While, most of SPREP's work programmes are regional in nature it is also national and expected that through sheer proximity and hence accessibility, the host country would stand to benefit more than the others – and Samoa does.

SPREP also assists Samoa through a wide spectrum of projects – for example, assistance with solid waste disposal system (landfill), water catchment protection, ozone depleting substances removal, conservation area support, invasive species control and eradication, environmental planning, marine protected areas, marine pollution, emergency planning and control, meteorological assistance, environment and educational assistance, and environmental information collection and dissemination to name a few.

Having said that, the more easily quantifiable and greatest although less visible effect of SPREP's presence in Samoa, is economic and financial. This results from the simple fact that SPREP is based and operated in Samoa. In recent years, SPREP spent USD\$9million or SAT\$29million annually on its operations. Most of that money is spent or invested in Samoa. This significant financial injection into the Samoan economy comes via employment (about 60% of SPREP's 67 staff are Samoans), spending and investment by employees, services and supplies to the organization, travel and transport spending, tax, pension and residential rental and the likes.

The above is not to suggest that SPREP does not benefit from its location in Samoa. As indicated earlier, when SPREP's expansion could no longer be housed by the SPC in Noumea, Samoa was canvassed for interest and it responded with an offer. It provided temporary facilities to house SPREP, donated land and entered into an agreement to assure the independence of SPREP and all necessary facilities and services to ensure an effective operation in Samoa. Samoa is a secure and safe location, central and easily accessible to the region and the wide world with the necessary support and service facilities and infrastructure to enable the organisation to serve its regional mandate in a cost effective and efficient manner. SPREP looks forward to continuing this partnership with Samoa so that it can better serve the Pacific islands region and at the same time be a good corporate and civil member of the Apia community.

Samoa: A paradise lost?

*Le Mamea Sefulu Ioane**

When John Milton wrote his soul-searching verses under the title-'Paradise Lost', he was more concerned with Man's spiritual fall from the Grace of God than their environmental impact on the Garden of Eden. The book of Genesis, chapter 1, verse 28, notes the following:

'And God blessed them, and God said unto them, be fruitful and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moved upon the earth.'

The operative clause this discussion is – 'Be fruitful and multiply, and replenish the earth, and subdue it.' A glance at Samoa's population statistics for the 1991 census showed a total of 161,298; and the estimated total for the year 2000 was 170, 727 - a definite increase in numbers, thus fulfilling the first part of God's command - 'be fruitful and multiply.' But, unfortunately, during the process of living and maintaining our lifestyle and culture on these islands, the Samoans have unthinkingly failed to 'replenish the earth'; and instead of 'subduing it' cause part of it to be destroyed

The aim of this paper, however, is to draw attention to the intimate and inextricable relationship between Man and his environment here in Samoa, bearing in mind the allegorical implications of the poet's figurative imaginings.

Moreover, the concepts outlined herein, though deeply rooted in modern science and socio-educational practice, are nevertheless fashioned in such a way, so as to provide a useful local platform for the launching of sustainable environmental programmes in the villages throughout our country, where ordinary folk would be able to espouse them without much difficulty and; and in the context of their culture (which is to a large extent oral in origin), they would not find them intrusive or inappropriate to their daily lives.

As a young boy over sixty-odd years ago, my mother always insisted that I should spend as much time as possible with our family at the village of Pu'apu'a, Faasaleleaga, Savaii; the place where my ancestors, on her side lived for many generations in accordance with our oral history. For me, it was my Paradise.

It was there, at Pu'apu'a, where I fell in love with Nature - the different species of plants in the bush, the wild life including pigs, fowls and snakes as well as the birds in the wood.

At my favourite spot - Le Solo Cove, one could hear all day long the singing of the manutagi on the mosooi or the cooing of wild pigeons on a mamalava tree. On an average day, depending on the tide, sand crabs of all colours scurry along the beach looking for food, while mud-flappers such as the manoo seem to enjoy darting in and out of small holes in the soft mud amongst the aerial roots of mangrove trees in the foreshore, which was an important part of the natural habitat for the ecosystem in that part of the northern coast of Savaii.

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Le Solo Cove, to the west of Pu'apu'a is the natural home of the I'aeva - the wandering ocean-going mullet with a distinctive red ring around its nose-mouth region. Throughout the history of our people, ever since our fore-bearers settled on the Pu'apu'a coast of Savaii island as referred to in the oral history and legends passed down from one generation to another, the I'aeva, as a source of food, was not only regarded as a gift from God, but also a powerful icon to the village culture.

Over the centuries, the arrival of the I'aeva to spawn at Le Solo Cove, in the month of September (or about that time of the year, depending on climatic conditions, was always a special occasion in the lives of everyone in the village of Pu'apu'a - men, women and even children accompanying the arrival of the I'aeva from its travels within thousands of miles of the Pacific Ocean where it had been feeding around the Fijian Islands.

I remembered with nostalgia as a young man having participated in the festivities and 'po ula' during the evenings of the 'taliga o le I'aeva' - it was a time of revelry when relatives from other parts of Savaii and Upolu would arrive in considerable numbers; there were also visits by members of other villages through a so'o with Pu'apu'a.

The occasion of the arrival of the I'aeva was not only a time for catching large quantities of fish, but it was also a cultural festival of a unique kind - where the activities of human beings coming together at Pu'apu'a village, mirrored the designs of Nature taking place out in the lagoon by Le Solo Cove.

Through their legends, songs and dances, the village people maintained a proud tradition over the years through the uniqueness of their relationship with the I'aeva.

But alas! The catches of the celebrated I'aeva, have disappointingly been declining over the past 40-odd years. Recent attempts at setting nets to catch the fish met with failure. Only 200 fish were caught in the 2002 season - a miserable number compared with thousands in the Forties and early Fifties.

It appears that Nature has turned its back on the people of Pu'apu'a, and sadly, the story of the I'aeva and all the cultural celebrations surrounding it might have already passed into the realm of legends of the past.

I am also aware of similar problems in the relationship between man and Nature as described by Tu'u'u Ieti Taule'alo in a paper entitled 'Unsustainable Village Development; Reflections on the Changes at Lepa' (2000)

'The sea used to be a natural source of food. I remember when the tide was really low at night people were out on the reef with lights and just literally filled their sacks with green snails and stranded fishes. However, the effects of coastal degradation and years of over-exploitation and destructive practices have virtually destroyed the lagoon and reef environment that was once the village's main source of protein...'

Having acquired cognizance of the environmental and ecological problems faced by many villages throughout Samoa today, resulting from years of exploitation and destructive practices similar to the cases referred to above, I have decided to focus attention on EDUCATIONAL INNOVATIONS as part of the most crucial components of Resource Management for future environmental programmes in the villages throughout Samoa.

It is envisaged that Man and Nature in a holistic approach are perceived as important components of the living environment around the villages. These are outlined in the following concepts:

A. Man/Woman Including His/Her Culture Is A Product Of His/Her Environment

When our fore bearers arrived on these islands many hundreds of years ago in their fleets of alia, after traversing the Pacific ocean during migration from South east Asia , they found a pristine environment rich in native trees, shrubs animal life. The sea was blessed with an abundance of fish, and the reefs and rivers were teeming with creatures which provided people with food. As the settlers established homes and villages in their newly-acquired islands, their daily activities (involving fishing, hunting or the gathering of food from the forest as well as the chores associated with life on dry land) became the foundation of their new culture.

Culture, is defined as the way of life of a group or a community of people living in a particular place: it includes everything pertaining to Man's survival in his surrounding environment as well as his beliefs, behaviour and artistic attitude. To a large extent, we are what we are because of our culture - which is intimately linked to the environment in which we live.

Taking a closer view of the intimate relationship between the Samoans and their natural environment, let us sample a random selection of some of the well-known songs, sayings and legends:

- (i) *Malie e,
Tanifa e,
Malie, tanifa e,....etc
A i ai se tautai
Ua na iloa
Se mea feai
Mua oetc*

This chant is often referred to as a laulusiva - an introductory part of a major song or dance performed by a group of people. It conjures up visions of brave warriors and sea-captains on a fleet of fishing boats out in the open sea - the abode of large man-eating sharks and formidable tanifas. The chant is also a constant reminder to the people of the maritime nature of their culture - that which was also noticed by the Dutch explorer Jacob Roggeveen in 1722, when, seeing Samoan fishermen in their canoes far out at sea referred to them as Navigators; hence the origin of another name for Samoa-the 'Navigator islands.'

- (ii) *Le ele'ele ua le malie i vai etc*

The song refers to dry soil unquenched by insufficient water. It symbolizes a person's yearning for his or her lover, and the wish for more favourable treatment.

- (iii) *Ua ta'ape le fua manusina
O si manu ma si ana I'a ...etc*

The saying is based on human observation of the natural behaviour of white terns (tava'e sina) or other sea birds on their way home from the sea. The birds were often seen carrying fish to their nests high up on the trees in the bush.

In terms of oratorical usage, the expression depicts the happy dispersal of people from a gathering, meeting or a social function where each of the participants takes a gift, food or

something of benefit to his or her home. It could also apply to intellectual or spiritual matters where those taking part at a gathering have reached a satisfactory consensus of opinion.

(iv) *Mata o le alelo.....*

This is, socially, a form of retort referring to the beastly swimming pool by the sea side - the site of the famous story of **Sina** - a very beautiful young woman and **Tuna**, the ever-present eel which became madly in-love with her.

The 'Mata o le alelo,' remark, according to the legend, was Sina's angry utterance conveying her disgust and horror at being stalked daily by and ugly creature in the form of an eel which became infatuated with her beauty, after seeing the super-sensuous naked body of the former, during one of her ablutions in the village pool.

Throughout the Pacific Ocean for many years, the story of Sina and Tuna was a popular source of cultural entertainment, folklore and justification for human behaviour.

The following are examples of the societal implications of the above legend:

- (I) The legend of Sina and Tuna (Polynesian - Samoan) bears a very close thematic parallel with the story of Eve and the Serpent (Jewish - Yahweh tradition)
- (II) The first coconut - arising out of the spot where Tuna's severed head had been buried bore nuts whose shells carried a close replica of its face.
- (III) The justification of the domestic role of Samoan women was linked to Sina's remorse when Tuna was killed by her people. Women 'loved' working daily with parts of Tuna's body in carrying out their domestic chores:
 - e.g. (i) Making baskets using tuaniu, and weaving pola, ato and other artifacts.
 - (ii) Sweeping the rubbish using the salu
 - (iii) Cooking using pe'epe'e etc

In all these domestic activities using parts of the coconut tree, the Samoan women were not expected to complain because of their 'love' for poor Tuna.

Similar beliefs and Nature-related stories also abound among other Polynesian cultures including the Maoris of New Zealand. In the case of the latter group, for instance, as represented in this case by the 'tangata whenua' or people of the land in the Waikato area, the folk concerned are very proud of their close relationship with the river of the same name. Like the Samoans, the Maori tribes of the area enjoy having a unique fa'alupega which no other tribe in New Zealand could claim:

He Waikato Taniwha rau

He piko he taniwha!

He piko he taniwha!

The Waikato of many tanifas

At each bend (of the river) there is a

Tanifa!

At each bend (of the river) there is a tanifa!

Their belief in having giant tanifas in each bends of the mighty Waikato River to protect them from their foes, is as firm today, as ever before the arrival of the white man in New Zealand.

Just before I left for Samoa last December, news broke out on TV New Zealand, featuring a group of Waikato Maoris, blocking the construction of a major extension to the Southern motorway, protesting against the intrusion of a new road on what they regard as sacred land presided over by local taniwha.

They maintained that the taniwha would be very upset if the road crossed the land in question. Accordingly, the protesters erected tents and held up placards on the site, preventing access to the area for construction workers and their machinery.

Aside from the political and financial implications of the protest by the Maori group concerned, a number of important corollaries could be deduced from this example for our own information:

- (i) That prior to taking action on land belonging to tribal (village) communities, state agencies must obtain the united consent and co-operation of the local people.
- (ii) That state agency e.g. Ministry for the Environment, Agriculture, Public Works etc ought to respect the culture and the specific needs of the local people whose lands, foreshore or resources are being utilized in implementing government projects.
- (iii) That notwithstanding the need to preserve the integrity of a proposed community project, a Public Relations Programme incorporating cross-cultural and educational inputs may be used in villages where environmental work is planned for the future.
- (iv) That state agencies involved in community projects should be on the lookout for groups or individuals from the local area, whose political or private agendas are disguised under the cover of culture (faa-Samoa).

B. The Pathways Of Knowledge For All People Are Through The Educative Process – Either Through Traditional Cultural Practices Or Modern Interventions Involving Institutions (for example) Schools, colleges, universities, the mass-media, churches and businesses.

The main problem which is often encountered by bureaucrats and field workers alike in implementing projects in the community is making people understand and appreciate the rationale behind such official ventures.

In other words, there is often

- (i) a failure by the well-meaning officers concerned to fully enlighten the local recipients on:
 - a) the merits of the programme
 - b) the benefits to the people both short-term and long-term
 - c) the likely problems to be encountered etc
- (ii) a large knowledge gap between the well-educated officials and the beneficiaries of the programme.

The foregoing discussion highlights the need for passing on appropriate knowledge to the local recipients of community projects – in this instance, scientific or environmental information. But, the question which immediately crops up is –

How?

The most appropriate response is through the employment of educative processes involving learning. Learning takes place when the learner has achieved a behavioral change. In other words, the learner, who is, in this context – the villager, in recognizing what is placed before him/her, behaves differently afterward, and that this new behavior becomes part of his / her repertoire of responses to future experiences.

e.g. A child quickly learns not to touch hot objects after burning himself/herself as a consequence of coming into contact with the same.

The oral culture of Samoa employs a system of rewards and punishments for its learners. This is the most popular practice in our homes and villages.

e.g. In teaching children the concept of obedience to parents and older people, the learner who displays it quickly is often rewarded with positive statements such as

- (i) Talofa e, i si a'u tama, lelei tele 'oe
- (ii) O le tama/teine usita'I e fiafia tele I ai ona matua.

On the other hand, a stubborn child who displays indifference or is somewhat slow in showing respect for his elders, may receive negative treatment in the form of a reproof or worst still, physical punishment: e.g.

- i) Tama/teine leaga tele oe
- ii) A leaga umi oe, o le a sasa loa etc

From this simple example, we can see that the learning process involving village practice, has been an integral part of our enculturative growth since our fore-bearers arrived on these islands.

Adult behavior displays similar learning characteristics, and a proper professional handling of this knowledge could be of benefit to environmental field-workers whose target is to enhance the quality and outcome of projects in the village.

e.g. A couple of months ago, the writer was engaged in an environmental discussion with the CEO of a certain organization (name withheld) in Apia.

Our meeting had to be temporarily stopped in order to allow a deputation of ali'i ma faipule from (out of respect for the village concerned, the name of shall remain anonymous) to state their mission. Their spokesperson, introduced the reason for their mission by referring to the intrusion and destruction of trees in their bush land by alleged encroachers from an adjoining village during the latter's involvement with a joint project once sponsored by the CEO's organization.

But, as the orator continued, their visit, in addition to informing the host of the damage done by the neighboring village, they were wondering if a similar community project (like that involving their neighbor whose members were already gaining financial rewards for their labour) could be started in their area.

The above example showed the following village learning processes in motion:

- (a) the complaining village learned a lesson for their indifference to starting a similar programme of their own when first approached by environmental officials

Most likely, the villagers concerned were inwardly tormented by the knowledge of their neighbors' financial success. In other words, they regarded it as a 'punishment' for their vacillatory behavior.

- (b) Shame in losing face is a common feature of the Samoan persona grata.

Thus when the spokes-person for the visitors introduced their mission, he immediately blamed the folk from the neighboring village for the unauthorized destruction of their trees.

His reference to the real reason for their visit was almost an afterthought, though it was sufficiently couched in expressive oratorical terms in order to drive the point home.

Our culture has helped us over hundreds of years to cope with our environment. But, the pressure of population growth, changing life-styles and modern-day economic developments, all combine to create environmental problems for our future as a nation, and as a people in a group of small islands in the middle of a vast ocean.

It is now time for the following institutions to play an active role in promoting environmental knowledge, and a real love for Nature in the community at large.

Pre-School Education

- Stories featuring animals and plants etc
- Songs featuring animals and plants and Nature
- Visits to selected areas e.g. beaches, lakes, streams
- Flower gardens

Schools/Colleges

- Gardens
- Environmental studies / Field trips / Camps
- Special Projects e.g. scholarships

Universities

- Environmental Studies
- Special Projects / Research etc
- International Exchange Programmes
- Organizing Public Seminars on Environmental issues

Churches

- Inclusion of Environmental themes in the preaching by pastors, ministers and priests
- Special Projects e.g. by Autalavou, Tina, Aoga Aso Sa, etc
- Inclusion of Environmental studies in the courses for theological students
- Initiate a Natural Replenishment Day (1 Genesis: 28) “.....and replenish the earth...)

Mass Media

- Regular broadcasts of environmental information
- Sponsorship of special projects in the community
- Initiate Song Competitions about the preservation of the environment

Businesses

- Sponsorship of environmental projects
- Scholarships
- Take positive roles in the removal and proper disposal of commercial and industrial wastes.

C. Samoan Society Is Currently Undergoing A Process Of Accelerated Cultural Change As A Result Of Increased Pressure From International Developments In Technology Economic Participation And Communication

The Samoan culture of today is no longer the same that we used to practice some fifty years ago. This is because it has undergone a process of change – just like the people who are practicing it.

Culture-change is a normal process in an advanced society. Cultures which fail to change in a changing society simply die a natural death.

Fortunately for us in Samoa, our culture is still intact despite the fast rate of change we are now experiencing as a result of inroads from overseas technological societies like those in European countries, America, New Zealand, Australia and other parts of the world.

Listed below are some of the agents of culture change and their effects:

1. The Church

The close relationship now existing between the Samoan Culture (Faa-Samoa) and the Church is by far the most significant change in our lives today.

In each of the villages throughout our country, the most prominent institution one would find there today is the church. It is also the seat of 'power' and influence in the village, beside that of the Council of Chiefs.

The village pastors now have their own fa'alupega:

- Ao o fa'alupega
- Faifeau Malolo Manumalo
- Toeaina etc

From the environmental stand point, the church is one of the most influential institutions in each of the villages with a potential for enhancing the development of community projects.

2. Education & Educational Institutions

Education, in its wider application to this country is, by far the most effective agent for culture change. Educated people have a wide range of opportunities and choices from which they could select the kind of life they wish to live. They are also the people who have had the most recent exposure to the world outside Samoa.

The educated Samoan publics are the people who form the main group behind the growing use and importation of western-type goods and technology to the country.

3. Technology & Modern Communication

From the day the Samoans used spoons, forks, knives and other western tools, their culture and language changed forever. Instead of using terms such as o'e they preferred naifi; asu became sipuni etc. Their food took on westernized names such as – sapasui, povi-masima, siaumeni, etc.

People's behavior also changed when they used modern machines, tools and imported raw-materials.

e.g. Almost every bus/taxi now subjects (entertains) its passengers to the constant Boom ! Boom! sound from its radio or built-in CD player.

From the environmental standpoint, the main problem associated with culture change as a result of our increasing use of overseas products and technology (which is unavoidable in the modern age) is what to do with waste-products such as plastics, old cars, toxic materials e.g. paints (lead), waste oil and other hazardous materials.

D. Environmental And Bio-Spherical Awareness Must Be Part Of The Cultural Environment For All Samoans – Men, Women And Children

It is of vital importance that programmes aimed at the preservation of Nature around us become part and parcel of our daily lives.

Samoa's culture, as aforementioned, was the direct result of man's inter-action with his environment over the hundreds of years of his occupation of these beautiful islands.

There are now enough community groups in our society which can play an active role, in promoting environmental and bio-spherical awareness in our homes and villages:

- Council of chiefs – Ali'i and Faipule
- The Samoan National Council of Women
- O le Siosiomaga Society
- The Women's Committees
- OTHER Environmental Groups and many other groups which are already providing useful services to our community.

Conclusion

In this paper, the emphasis has been placed on the damage already suffered by the environment as a result of man's activities. The potential contribution by certain institutions and groups for positive action has also been highlighted.

It is sincerely hoped that the matters raised in this paper, will serve as a positive stimulus for those involved with projects which aim at (as far as the environment is concerned) making our country a PARADISE REGAINED

Taking of customary land for the new Salelologa township

*Patea M Setefano, Vaitogi I Vaitogi, Faanimo Warren & Fiona Sapatū**

Introduction

The valuation of the land taken for Salelologa Township is a lesson not only to the government but also to the landowners of Salelologa village. The process and valuation of this land paves the way to reconsider the land valuation procedures and land policy under the Ministry of Natural Resources and Environment (MNRE). The valuation of 2,872 acres of land in the village of Salelologa produced challenges and experiences to the people involved, especially the government valuers and Salelologa village. One learning experience that emerged from this land valuation case is to identify a gap between valuation principles and practices. That gap needs to close by way of controlling and monitoring the valuation practices in one way or the other.

The critical issue of liability for negligence is one core principle examined under the Salelologa case. The causes of negligence are clearly identified under international land valuation standards (Hayward and Rees 2000). Land valuers cautiously performed the duties according to the required standards. *Gesta Romanorum* laid the greatest peril of negligence as *Whatever you do, do cautiously, and look to the end* (ibid) In comparison to the Samoan context, land valuers adhere to the land valuation policy. This policy set the requirements and conditions that all valuers need to have a license in order to practice land valuation in the country. This policy satisfies one required standard of the international valuation standard (IVSC 2003).

This paper begins with discussing the valuation of 2,872 acres of customary land. The discussion is then directed to the negotiations between Salelologa village and Government where the issue of land value conflicts is identified. We conclude with a discussion of lessons learned and the implications to the Salelologa village and Government.

Land valuation of 2,872 acres

The valuation of 2,872 acres of land was valued similarly to other large areas of land. Land valuation procedures and processes were implemented. The valuers acted under instructions from the Land Board, to perform the valuation of the Salelologa Township. The valuation began by studying the 2,872 acres following approval of survey by the Chief Executive Officer and Minister of Natural Resources and Environment. The government and Salelologa village made negotiations before the land survey in 2000. These negotiations concentrated on surveying the land and money was involved between the two parties.

In valuing the 2,872 acres of land, the government valuers identified the land boundaries, took soil samples, identified potential features, recorded landuse and elevations, as well as inspecting physical characteristics of land. The fieldwork including inspection of the land was critical in the land valuation process. Some of the works involved in the process were inspections, taking critical notes and collecting data from comparable land sale transactions.

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Major comparable sales were located along the coastal area of Faasaleleaga district and the inland Vaiaata area. Few land sales were located in the Palauli district.

The basis of valuation is very essential in any valuation work. The international valuation standards have specific standards in forming up a valuation basis. Every practising valuer shall follow the international standards no matter which country they reside and practice. Valuation basis is where the valuer has formed up an opinion based on evidence and accurate information from fieldwork of the land being valued. The adoption of valuation methods rationalise and underpin the opinion and create a strong valuation of the land. In comparison with 2,872 acres, the accurate data gained from fieldwork, and land sales available in Palauli, Faasaleleaga and Vaiaata districts form up the basis of valuation. In addition, previous land compensation payments and appropriate adjustments of land sales were included in the valuation basis.

The valuation method secures the land value of the land. The most recognised method adopted in Samoa is the direct comparison method. This method was adopted to value 2,872 acres of Salelologa land. The reliability, accuracy and availability of information pertaining to the method will enlighten the justification of using it to value 2,872 acres. The confidence of the government valuer in using the method is paramount. There is no limitation to using valuation methods in Samoa. However the selection of an appropriate and suitable method depends upon the valuer's decision. Salelologa land is a customary land. Under the law there is no land value for customary land. An adjustment is made at 10 percent depreciation from the market rate due to the fact that land is under customary ownership, rocky, volcanic, and undeveloped. The government valuer not only uses the direct comparison method as a primary approach but also adopted the unit metre method as a check approach to value 2872 acres. The final land value of 2872 acres is \$3.2 million that is \$1,114 per acre basis.

The impact of statutory provisions to the market value of the land is imperative. The court cannot take into account any special allowance for customary land in terms of compensation. In valuing the 2,872 acres, the government valuer has to consider the provisions of land valuation under the *Taking of Lands Act 1964*. The calculation of this land value has made reference to the provisions of the Act. The land value of \$3.2 million tala was a true value without any special allowance. On the other hand, there is a special value to the owner concerning the compulsory taking of the land for public purpose. The international valuation standards underpin the valuers' judgement to include an appreciation allowance on top of the market value in consideration of the special value. However, this required standard cannot consider statutory laws in Samoa. There is a gap existing between international standards and statutory laws exercised in the country itself.

Negotiations between Salelologa and Government

Negotiations began on 2 February 2001 between the Government and Salelologa village at the Ministry of Transport headquarters. The Government representatives included the Minister, CEO and senior officers of MNRE. The Minister offered \$3.2 million for 2,872 acres based on government valuations prepared by the government valuer. The government valuer elaborated on the valuation implementation and valuation basis to the village representatives. The representatives from the village did not agree to the \$3.2 million offered by the government. In response, the village proposed for \$300 million for 2,872 acres plus free accessibility to electricity and water supply. In conclusion, no amicable agreement was reached by both parties. The government advised the village to set up a sub-committee to

provide a valuation to support the basis of their offer and liaise closely with government officials.

A second negotiation took place in the village of Salelologa on the 11 May 2004. The village again offered \$300 million for 2,872 acres, equivalent to \$104,500 per acre. However, government kept its offer of \$3.2 million. Again no agreement was reached and still no valuation provided by the village to support their price. A third negotiation on the 19 October 2001 in which Salelologa village sought out an amount of \$50 million, that is \$17,410 per acre. Government still remained at \$3.2 million and still no agreement was made between parties. A fourth negotiation between Salelologa and Government was made on the 11 December 2001. The government still offered the same amount for compensation whilst the high chief of the village advised the government to leave the matter with the village. There was no mention of any alternative compensation amount sought by Salelologa village.

The fifth negotiation was held at Salelologa village on 1 February 2002. The honourable Prime Minister, Tuilaepa Sailele Malielegaoi was involved in the negotiation process as a representative for the government. The government offered \$4 million for 2,872 acres to the village as compensation. This amount includes \$3.2 million based on government valuations and \$800,000 as *matupalapala* (gift under Samoan custom and usage) to recognise the importance of the relationship between the government and Salelologa village. The high chief of the village accepted the offer at \$4 million for 2872 acres. There was no mention by the high chief or any other matai (holders of chiefly titles) present as to any other amount sought by Salelologa as compensation. The written agreement between the village and government was held on 25 March 2002. The Minister of MNRE explained the legal agreement document as the high chief of the village and other matais of Salelologa village were signing the agreement.

The land value conflicts

The government started to implement some work at the Salelologa township after an amicable agreement was made. Roads were constructed inside the 2872 acres. Some portions of the area were subdivided for commercial, industrial, and other public amenities. The government's intention was leasing out the land plots to all people for business development. The priority to lease these land plots were given to the people living in Savaii Island. After several months the Salelologa village took the government to Court claiming \$40 million as compensation based on their valuation at \$45 million tala. A private valuer made the valuation. The difference between the government valuation and the private valuation is \$41.8 million tala. It appears that people were confused especially the Salelologa village. This case raises other land issues that were not handled by the government in the past. The issue of land valuation practice and true value of land appears to be controversial. People will question the reliability of the land valuation practice, which needs solutions from government. The piece de resistance that emerged from the Salelologa case is to bring out land valuation issues requiring further investigations.

Lesson learned

The writer admits that gaining work experience from the Salelologa case was challenging. Land compensation and land exchanges were key lessons learned by the government not only from the Salelologa case but from other land issues in the past. The most important thing is to maintain the *faasamoa* (Samoan way of life) between the government and villages. The *va tapuia* amongst the matais is still paramount and that is one essence of the Samoan way of life. Although political movement is hiding somewhere, that is real life and the same situation happens to other Pacific countries (Van Trease 1987).

The lessons learned by the Government included:

- a) review protocols and procedures in taking customary land under *The Taking of Lands Act 1964*,
- b) control and monitor the land valuation practice and system through land valuation legislation,
- c) more resources to investigate ways to register and use customary land as collateral, and
- d) recognise the importance of consultation with villages in dealing with land issues.

Lessons learned by Salelologa village (applicable also to other land owners) were:

- a) people of the village understand that their rights are exercised under the law,
- b) people of the village and other villages in Savaii island benefit by the development of the new township,
- c) people understand that land valuation is part of their preparation for negotiation process, and
- d) that government has no intention to treat the villages unfairly in regards to land compensation.

Conclusion

This paper provided an insight to the issues of land valuation practices and land negotiation processes. The protocol of the law still remains. However, government uses the principle of *faasamoa* in negotiations with the village in order to achieve the development of new township for Savaii Island. The land valuation practice required legislation to control and monitor since it is an important element to fulfil sustainable development. This legislation requires consultation and should be carefully crafted at precursory level. There is a need in reviewing the procedures and protocols for the taking of customary lands for public purposes. Government should carefully make decisions according to the law of compulsory acquisition of lands. Finally the case describes a 'win-win' situation for both parties involved – Salelologa is enjoying the benefits from their lands but in the long run they will enjoy more from the benefits of a new township whilst the government successfully achieves major development objectives.

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A study of indigenous knowledge and its role to sustainable agriculture in Samoa

*Pitakia Tikai & Aaron Kama**

Abstract

The primary objective of this paper is to identify the Indigenous Knowledge used in sustainable agriculture in Samoa. Indigenous Knowledge (IK) is the knowledge that has been developed over time in a community mainly through accumulation of experiences and intimate understanding of the environment in a given culture. This research covers indigenous knowledge on farming tasks such as managing soil fertility, controlling pests and diseases, controlling weeds, soil preparation, planting materials, harvesting and storage of indigenous root crops and animals here in Samoa. From the results, we can conclude that indigenous knowledge should be recorded and used to devise innovative research for agricultural researchers, extension workers, development practitioners, and environmentalists for sustainable agriculture development and management of Samoa's natural resources. Understanding and conserving Indigenous Knowledge will help to sustain farming practices which will not cause so much plant genetic erosion and environmental deterioration. Indigenous knowledge should cater for sustainable food security and conservation of the variety and variability of animals, plants and very vital soil properties such as physical, biological and chemical properties. Conservation of Samoa's natural resources depends on human beings and their interaction with the environment which is very much related to the Indigenous knowledge that has been communicated and passed down from generation to generation through family members and communities.

Introduction

Samoa comprises of eight islands, the two main islands are Upolu and Savaii. A country of natural beauty and some species of wild life. This beauty will soon be vanished due to population pressure and industrial development such as farming. Agriculture development has evolved in Samoa as it is the main stay in domestic food supply, employment, cash income, foreign exchange, raw material for processing and handicraft for Samoans. Wild species and traditional crops are becoming extinct and environmental deterioration of which modern farming system practices is a major contributor. Agriculture and Forestry are the largest sector in Samoa's economy (Suavi 1998). As such traditional cropping practices such as multistory is disappearing due to increased use in external inputs such as inorganic fertilizer, pesticides and mechanization that diminishes the role/significance of nature. Introduced agricultural crop diversification like wise contribute to the loss of agro biodiversity and causes other environmental problems.

This paper therefore examines Indigenous Knowledge and its roles to sustain agriculture in Samoa. Indigenous Knowledge (IK) is the knowledge that has been developed over time in a community mainly through accumulation of experiences and intimate understanding of the environment in a given culture. As Samoan farmers are semi-subsistence and smallholder oriented, Indigenous Knowledge therefore plays a very vital role in sustainable agriculture

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because farmers are familiar with practices and technologies. Indigenous knowledge need to be recorded and can be of good use to devise innovative research for agricultural researchers, extension workers, development practioners, and environmentalists for sustainable agriculture development and management of Samoa's natural resources. Understanding Indigenous Knowledge in agriculture helps to ensure that farming practices will not cause so much plant genetic erosion and environmental erosion. In fact it should cater for sustainable food security and conservation of the variety and variability of animals, plants and very vital soil properties such as physical, biological and chemical properties. Conservation of Samoa's natural resources depends on human beings and their interaction with the environment which is very much related to the Indigenous knowledge that has been communicated and passed down from generation to generation through family members and communities.

Objectives

The objectives of this study are;

- i) To identify the Indigenous Knowledge that are used in agriculture.
- ii) To identify the role of Indigenous Knowledge to sustainable agriculture in Samoa.

Literature review

Samoa like any other small island nations provides challenges for economic development and environmental management. Farming for all Samoans is mainly subsistence with small scale plots which are usually village based. Out of the total Samoan Agriculture, only 7% is classified as whole commercial (WSG, 1989). The need for sustainable agriculture development focuses on improving and sustaining food security and improving the quality of life for the people of Samoa and its future generations greater than ever before. Traditionally, all household requirements from agriculture were provided by very complex, robust and traditional farming system. These were multistoried rational fallow systems utilizing bush or grass fallowed for several by series of root crop intercropped with coconut and other tree species (census of agriculture report in Western Samoa, 1999).

Only 7% of the farm were classified as whole commercial (WSG, 1989). Traditional farming system was proved sustainable in the past but highly affected due to population pressure and urban development which shortened fallow periods and declined fertility. Samoans had been using their indigenous knowledge to select disease resistant varieties and use natural solutions to reduce pest invention such as the Tarophagus proserpine by collection of dried coconut fronds and setting alight among taro plants (Tolova'a, 1982).

This same method has also been reported in else where in the Pacific (Anon, 1982). According to Weightman 1989, In Vanuatu, yam gardens are raked clean and the have logs placed on the which are set alight using coconut fronds. These burning logs are dragged over the entire garden for several days. This practice is very common in Santo, Malekula, Maewo, West Ambae, North Pentecost, Paama, Erromango and Tanna (Weightman, B, 1989).

In Tonga, shifting cultivation is the oldest method of cultivation and is still practiced today, specifically on the island of Niuafu'ou, Niuatopatupu and some of the volcaniv islands such as Tofua, Kao and tafahi. Crops are usually sequentially cropped for several years before the land is abandoned to fallow (*Traditional Farming and their contributions to the economy and sustainability of production-IRETA workshop*).

In Fiji, a traditional system of raised bed has been described for shifting cultivation of taro (Parry, 1994). According to Parry, 1994, these are created by ditches which allows drainage.

In Fiji, it is known as *vuci, solove or vuevue* and are found on small scales in many local areas (Kulhken, 19994). The high organic contents and activities of these soils are said to have reduced the nematode population by producing toxic substances to the nematodes. In Papua New Guinea, good storable aroid products are obtained by sun drying, foe example, colocasia suckers and headsets (Ochse, 1931). In Kiribati, *Cytosperma* corms are scalded, chopped and sundried and are stored for several months (Massal and Barrau 1955b).

Research and materials and methodology

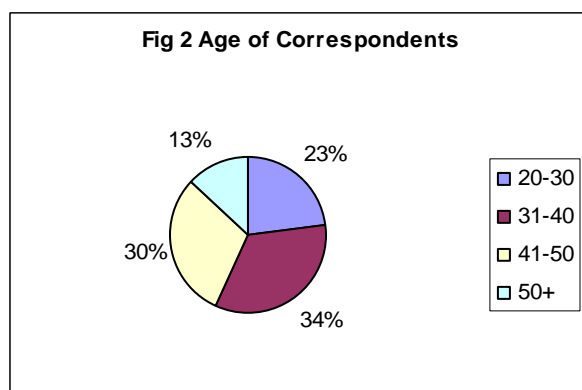
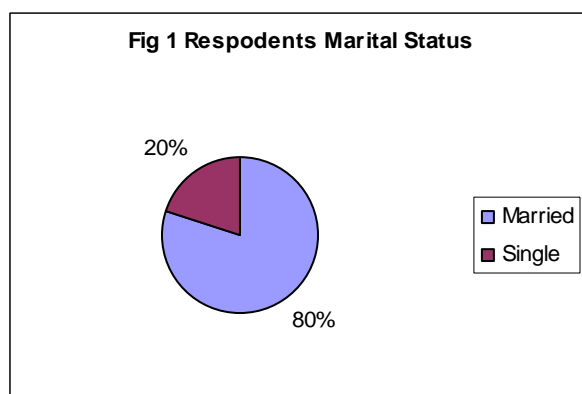
This study was carried out on the islands of Savaii and Upolu (Samoa). Interview Schedule of earlier field-test questionnaire was used to collect information from farmers through the use of Samoan Language. The questionnaires was divided into six sections. Sections A deals with the type of Indigenous Knowledge in the rural Samoan Community while section B solicited for information on the Indigenous Knowledge (IK) used in Agriculture development in Samoa, Section C is the impact of indigenous knowledge on sustainable agriculture and section D is the Demographic variables. This questionnaire was translated into Samoan Language and fifty copies were made. Twenty copies were randomly distributed to farmers in Savaii while thirty were randomly distributed to farmers in Upolu by the help of the extension division of MAFFM, Samoa.

In all out of fifty questionnaires distributed only 30 (65%) questionnaires were returned. Subject pertaining to the topic was researched at the library of the School of Agriculture, Alafua campus and some information were obtained from the internet using “Google search”.

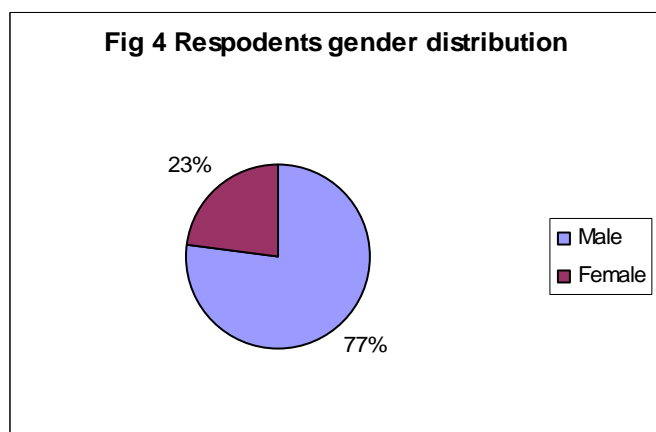
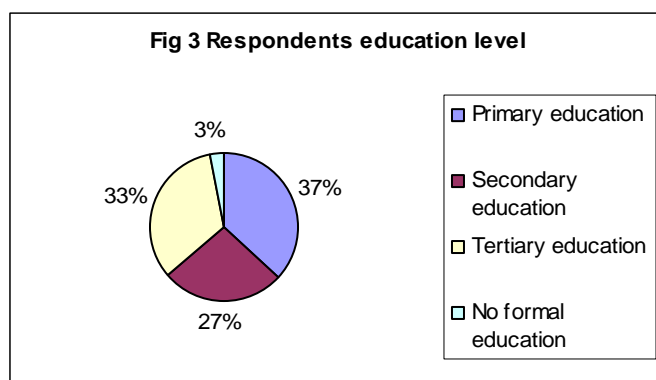
Results and discussions

Respondents personal characteristics

Fig 1 shows that majority (80%) were married and only 20% were unmarried. This is expected as all respondents were adults when viewed against the age distribution in Fig 2. That is because majority were around the age of 30-50 years old (63), thus are well experienced and knowledgeable in the local Samoan method of farming.



The distribution of respondents according to educational level (Fig 3) shows that there is a high level of farmers in Samoa who have gone through formal education (only 1% no formal education). This indicated that farmers in Samoa have recognized the benefits and values of indigenous knowledge and its impacts of environment of Samoa.



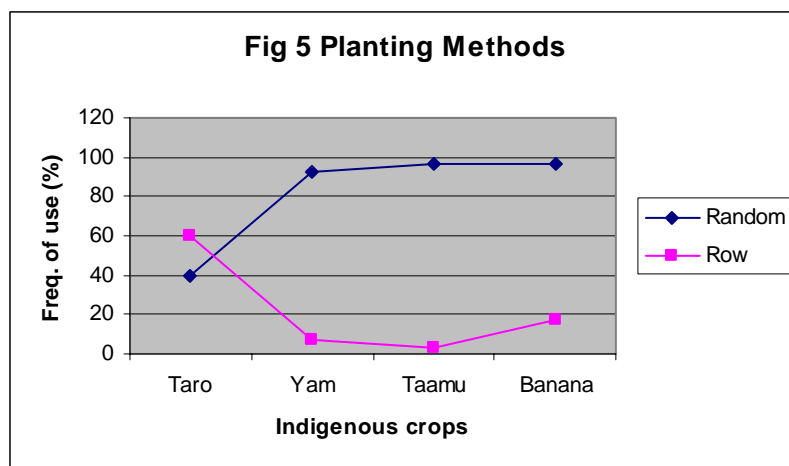
Furthermore, the study indicated that 77% of the respondents were male (Fig 4). It indicated that male are responsible for the greater part of food production in Samoa. However, there is an increase of 23% (Fig 4) of female involving in farming. This is a remarkable figure, as traditionally females do not farm. However, this result has indicated the changing role of women.

Farming task variables: Indigenous soil preparation and planting materials

Traditionally farmers in the Pacific Islands countries practice non-tillage farming techniques. This means that farmers normally clear the land which is either done by hand or burning and raise crops with minimum disturbance to the soil (soil is not tilled). Holes for planting are made with a stick (oso) that is large enough for the planting material. In the case of taro (esculenta) the apex of the shoot (tiapula) is placed in the hole and base is covered with soil. With taro, there are no significant differences on yield between tillage and non-tillage treatments. However, weed infestation is greater with tillage with other benefits such as soil conservation and lower labour inputs.

67% of farmers in Samoa plant taro, yams and taamu with the use of planting stick (oso). Normally they work the digging stick to the soil and lever in three or four directions to make a hole of accepted size. The tiapula is then placed into the hole and oso is used to press the soil against the shoot.

3% of farmers indicated that taro should be planted with the arrival of rainy season. They explain that planting in the dry season might affect taro from suffering from lack of moisture. Results also indicated that 93% of the respondents plant yam randomly and only 7% plant yams in rows.

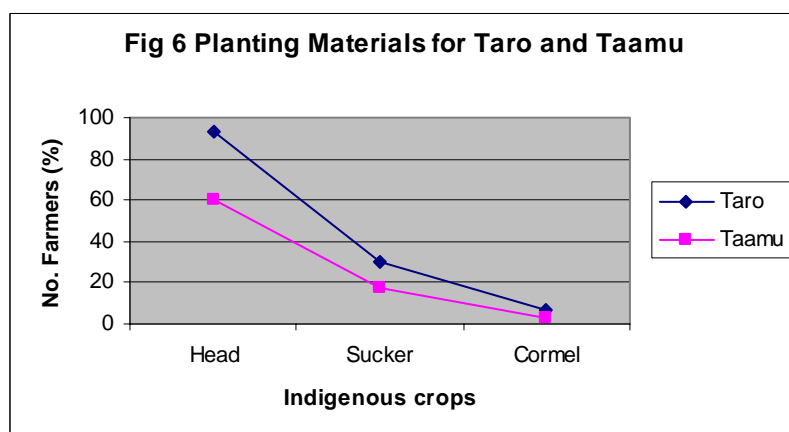


Indigenous Preparation of planting materials and parts used for taro and taamu.

According to Table 1, it is evident that majority of farmers agreed that the bigger the stipule, the bigger the yield. Some farmers indicated that the tiapula and lauvai or piles of taro tops and suckers (ofaga) are covered with banana leaves and left under shade for 1-2 weeks before planting. Fig 6 indicates that majority of farmers used tiapula as the best planting materials for taro and taamu.

Table 1 Preparation of planting materials and parts used for taro and taamu (n=30)

Activity	Frequency of use			
	Taro	%	Taamu	%
Leave headsets 1-2 weeks before planting	15	50	15	50
Select large Suckers only	5	17	5	17
Planting at the start of rainy season	20	67	5	17
Parts used for planting				
Plant head sets (tiapula)	28	93	18	60
Plant suckers (Lauvai)	15	30	5	17
Plant control	2	7	1	3



Preparation for planting materials and parts used for planting yams

In Table 3 a majority (80%) of farmers plant yams on mounds and 70% use headpiece as planting materials. Headpieces are normally treated with ashes to prevent diseases infestation before planting. While 50% of the respondents allow the headpiece to sprout before planting.

Table 3 Preparation of planting materials and parts for – yam (n=30)

Activity	Freq. of use	Percent
Preparation		
Planting on flats and dug holes	23	
Planting on mounds	24	
Sprouting before planting	15	
Parts used for planting		
Headpieces	21	70
Middle	2	7
Tails	1	3
Milk Yam	4	14
Small whole yams	5	17

Preparation of planting materials and parts used for planting banana

In Table 4, it shows that 67% of farmers prefer to trim shoots from the suckers' corms before planting and 83% used sword sucker as best planting materials for banana.

Table 4 Preparation of planting materials and parts used for – banana (n=30).

Activity	Freq. of use	%
Preparation		
Plant broad leaf suckers with leaves removed	16	
Plant suckers with roots removed (Trimmed)	20	
Remove roots and leave suckers under shade for 1 week before planting	4	
Parts for planting		
Sword suckers	25	83
Broad leaf Suckers	2	7
Stumps	1	3

Indigenous methods of controlling pests and diseases

In Table 5, it indicated that farmers in Samoa have practiced various indigenous knowledge to control pests and disease even before the advent of modern synthetic insecticides. Most of the indigenous insect pest control methods were to disrupt pests' life cycle by periodically denying their food and to achieve the maximum control the manipulation of ordinary agricultural practices would follow.

McKenzie (1990) stated that pacific island countries have a broad range of plant diseases of concern (e.g. taro leaf blight, Mitimiti disease of taro, Alomae and Bobone disease of taro, bacterial blight of cassava, papaya ring spot, coconut tinangaja, Panama disease of banana, Vascular streak of cocoa). There is continual worry over spread of diseases and their control. The late includes diseases with the potential to spread over the Pacific – those currently of restricted distribution within the Pacific and those which are present outside the Pacific region. Besides these diseases of restriction, distribution, there are many serious and widespread diseases which limit crop production and hence the potential to export (e.g. Kava

dieback, taro corm rots, ginger rhizomes rots, banana leaf steak, cucurbit viruses). Fruit flies and taro beetles deserve a mention because of the resources allocated to reducing their spread and developing control methods. Here in Samoa, (see Fig 7) farmers use rouging as a method of controlling pests and diseases taro, yam, taamu and banana. From this result, I believe that farmers also use rouging to control the other diseases that were already mentioned.

There are concerns over the control of diseases already present in the country such as taro leaf blight (*Phytophthora colocasiae*), and concerns of diseases of quarantine risks. However from Table 5, we see that 33% of farmers used smoke to the field. Unfortunately, according to Tolivaa (1994), there is no record to support the effectiveness of this method.

Table 5 Indigenous methods of control of pests and diseases of taro, taamu and banana. (n=30)

Indigenous control methods	Frequency of use							
	Taro	%	Yam	%	Taamu	%	Banana	%
Sanitation (hygiene)	10	33	23	77	15	50	17	57
Burning & smoking	5	16	6	20	1	3	10	33
Use of resistant variety	24	80	15	50	1	3	3	10
Variatal Mixtr/intercropping	20	67	24	70	14	47	5	17
Rouging of diseased plants and leaves	25	83	21	70	3	10	16	53
Use parts as repellent/or attractant	24	80	3	10	1	3	-	-
Dusted planting materials (Ashes)	10	33	26	87	2	7	-	-
Dusted planting materials (sand)			5	17	-	-	-	-
Hand picking and squashing of beetles	15	50	15	50	5	10	1	3
Fallowing and Shifting cultivation	23	77	17	57	6	20	1	3
Using physical barriers	5	17	6	20	1	3	7	23
Selection of planting materials	25	83	20	67	2	7	20	67
Drying of setts prior to planting	-	-	12	40	-	-	-	-
Manipulation of planting season	22	73	9	30	1	3	-	-
Scaring devices for vertebrate pests	1	3	1	3	1	3	5	17
Slash and burn	11	37	1	3	3	10	14	47

Table 5, shows that fire ashes (lefulefu) are commonly used to treat yam cuttings or setts to prevent further infestation of pests and diseases. Hygiene (Table 4.2) often has a pest control purpose. The destruction of crop residues removes residual pest population and eliminates plant debris on the soil surface in which many pests find shelter for hibernation.

In Table 5, its shows that burning is not a common practices for controlling pests and diseases here in Samoa. Most farmers stated that burning could lead to soil erosion and other fertility problems. However, there are some cases that are applies to control pests and diseases. Soil scientists at the International Institute of for Tropical Agriculture, Nigeria have

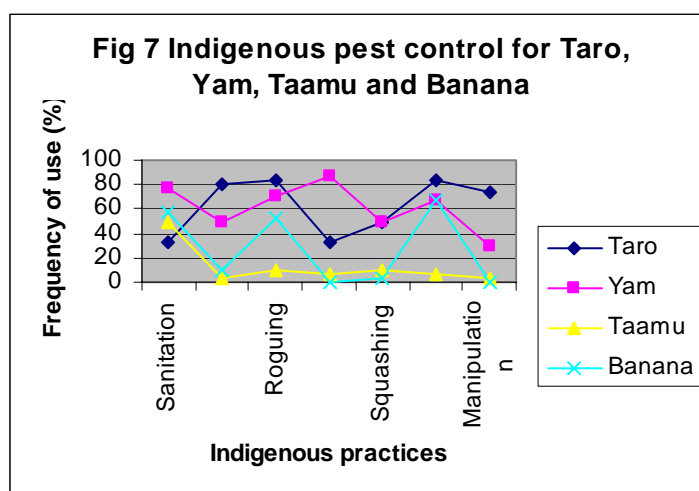
stated that burning a 10cm layer of plant litter can destroy nematodes to a depth of 9cm (AG 112 course book, pg).

Effectiveness of indigenous control methods

The respondent rating of the effectiveness of various indigenous control methods of pests and diseases is presented in Table 6, According to the result, the effectiveness of these control methods of pests and diseases depends on the type of pests and diseases concerned and the complexity of the attack.

Table 6 Frequency distribution according to the respondents ranking of the effectiveness of indigenous control methods for taro, yam, taamu and banana (n=30).

Control methods	Not effective	%	Effective	%	Very Effective	%
Sanitation	7	23	17	57	7	23
Bush burning & smoking	16	53	8	27	4	13
Use of Resistant Variety	15	50	16	53	-	-
Variatal mixture/ or intercropping	4	13	24	80	2	7
Rouging of diseased plants & leaves			27	90	5	17
Shifting cultivation fallow	11	37	19	63	5	17
Use of plants as repellants	6	20	4	13	-	-
Treated materials (ashes)	12	40	17	57	1	3
Treated materials (sand)	19	63	3	10	1	3
Scaring devices for vertebrates	20	67	1	3	-	-



According to Fig 7, indigenous control methods using hygiene, intercropping, fallowing and rouging of diseased plants and leaves are effective in controlling pests and diseases of taro, yam, taamu and banana.

Indigenous methods of maintaining soil fertility

In Table 7, it can be seen that mixed cropping is one of the frequently used indigenous methods of maintaining soil fertility for the four crops surveyed. According to Tofiga (2003), he described mixed cropping as the growing two or more crops simultaneously on the same piece of land with or without distinct row management. Mixed cropping systems create favourable condition for the soil, water, nutrients and provide excellent environmental conservation and sustainability. Eighty three (83%) of the respondents have practiced fallowing to maintain soil fertility on taro production. For many years, farmers in Samoa have

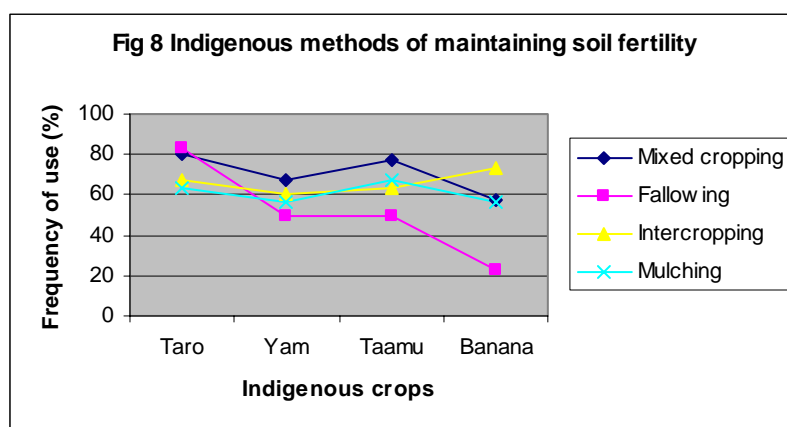
successfully practiced cultivation of taro (*esculenta*), farmers traditionally plant taro on newly cleared lands for 2-3 years and then must fallow 8-20 years, depending on the inherent soil fertility and land pressure (Wils, 1989). Recently increasing population has driven farmers to shorten the fallow periods resulting in the loss of soil fertility (Wright, 1963; Vergara, 1987a; Nile, 1988).

According to Paulson (1992), the parentage of cleared land in fallow varies considerably between villages. For instance, he stated that the percentage of land fallow in Taga and Saanapu in 1988 was 16% and 17% respectively. Intercropping is also common practice use to maintain soil fertility (Table 4.5) and controlling of pests and diseases (Table 7). In his research, Paulson also indicated that in Saanapu, about 50% of coconut land was both intercropped in both 1954 and 1988. the percentage of coconut land intercropped increased from 33% to 58% in Uafato and from 25% to 45% in Taga between 1954 and 1988. This he said was not an indication of intensification. However, young coconuts are also intercropped with taro (Paulson D 1992).

Table 7 Frequency distribution according to indigenous methods of maintaining soil fertility of taro, yam, taamu and banana (n=30)

Indigenous method of maintaining soil fertility	Frequency of use							
	Taro	%	Yam	%	Taamu	%	Banana	%
Fallow	19	83	25	50	15	50	7	23
Planting local legumes	10	33	6	20	2	7	2	7
Mulching	1	3	18	60	16	53	-	-
Adding compost (dead leaves)	1	3	12	40	1	3	1	3
Mixed cropping	24	80	20	67	23	77	17	57
Mulching (coconut husk)	19	63	17	56	20	67	17	56
Shifting cultivation	20	67	14	47	15	50	1	3
Charcoal and ashes	15	50	1	3	1	3	-	-
Intercropping	20	67	18	60	19	63	23	73
Sea weeds			1	3	1	3	1	3
Animal manure	5	17	8	27	1	3	1	3

In Fig 8, shows that there are majority of farmers who use mixed cropping, fallowing, intercropping, and mulching to maintain soil fertility.



Indigenous methods for controlling weeds

Majority of small holder farms in Samoa (Table 8) still practice cultural methods such as pull and burn, mulching, shifting cultivation, fallowing, slash and burn, intercropping, cover cropping and shallow cultivation to control weeds in the garden. It is clear from the result (Table 8) that 60%-70% of farmers in Samoa are practicing the indigenous method of “pull and burn” and “fallowing” to control weeds of taro, yam and taamu.

Table 8 Frequency distribution according to indigenous methods of weed control in taro, yam, taamu and banana. (n=30).

Indigenous weed control method	Frequency of use							
	Taro	%	Yam	%	Taamu	%	Banana	%
Pull & burn	20	67	18	60	20	67	10	33
Mulching	14	47	23	77	1	3	1	3
Shifting cultivation and fallowing	22	73	22	73	18	60	5	17
Hand weeding	21	70	18	60	16	53	14	47
Slash and burn	5	17	12	40	5	17	14	47
Intercropping	21	70	20	67	5	17	26	87
Shallow cultivation	5	17	8	27	5	17	1	3
Plant cover crop	2	7	5	17	1	3	8	27

Effectiveness of indigenous method of controlling weeds for Taro, yam, taamu and banana. The respondents rating of the effectiveness of the various indigenous control methods of weeds is presented in Table 9, indigenous control methods using mulching, fallowing, intercropping and planting cover drop are effective in controlling weeds here in Samoa.

Table 9 Frequency distribution according to the respondents ranking of the effectiveness of indigenous control methods (=30)

Control methods	Not effective		Effective		Very effective	
		%		%		%
Bush burning (slash & burn)	15	47	10	33	3	10
Mulching	6	20	18	60	8	27
Shifting cultivation fallow	11	37	19	63	10	33
Intercropping	12	40	17	57	5	17
Plant cover-cropping	5	17	19	63	9	30

Indigenous methods of harvesting and storage of the four root crops surveyed

Table 10 shows some traditional storage systems that are used to store roots crops. Taro, yam, taamu, together with cooking bananas (plantains) are perishable staple food crops. Many communities in Samoa traditionally practice a greater or lesser degree of “storage avoidance”, i.e. harvesting only for immediate or short term requirements throughout much of. Or even the whole year. Thus, storage systems are usually relatively short term (the yams, the most highly seasonal of the perishable crops, provide a marked exception). Nevertheless, many traditional communities in Samoa have been primarily dependent on the perishable staples for centuries or often millennia, have devised many highly ingenious storage and processing techniques for these staples. The culture-historical evolution of these societies in relationship to their food plants has, in general, made them strongly eccentric in their thinking, in contrast to the technocentric philosophies prevailing in the developed world, while further their material resource bases are strictly limited. Their storage (see table 4.7) and processing systems are generally, therefore, extremely simple and have only minimal impact on the total environment. Owing to their simplicity and the fact that they are usually individually small-scale, they have often been disregarded or even despised as “primitive” by

qualified agricultural scientists; this attitude has been reinforced by the fact that the vegetative-propagated crops from which these staples are derived are poorly understood within and alien to the “Western” cultures within which scientific thinking developed.

Table 10 Indigenous methods of harvesting & storage – taro (n=30)

Activity	Frequency	Percent
<u>Harvest</u>		
After 6 months	4	13
After 6-8 months	6	20
After 7-9 months	1	3
After 10-12 months	1	3
<u>Storage</u>		
Pit storage	8	26
Store in cool place (shade)	23	77

Table 11 shows that 90% of the respondents harvest yams when the plant dies and 67% harvested yams twice. The first harvest is when the tubers are large and the second is when the tubers die. The storage life of yams is finally terminated by breaking of dormancy and subsequent sprouting but storage of tubers for food use can be extended by as much as a month by breaking off emergent sprouts when they are 20-30 mm long (Coursey, 1981). Most farmers in traditional yam growing societies are well aware that only sound healthy tubers are suitable for storage and others are set aside for consumption and processing.

Figure 9 shows respondents indicating that the simplest storage technique for yam is leaving the tubers on the ground until they are needed during the planting time.

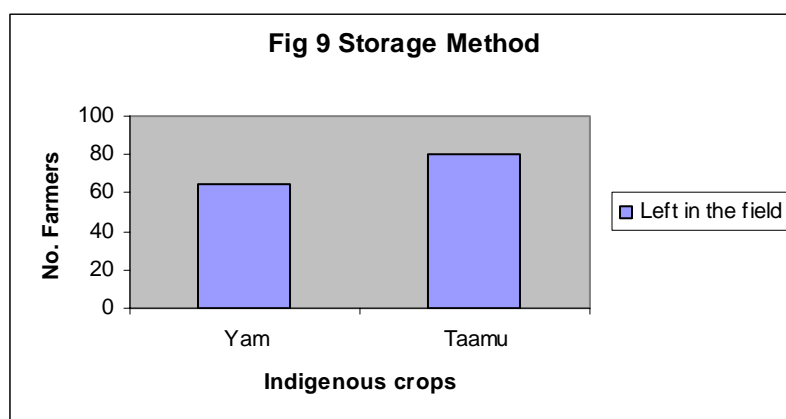


Table 11 Indigenous methods of harvesting and storage – yam (n=30)

Activity	Frequency of use	Percent
<u>Harvest</u>		
6-12 months	2	7
Yam plants die	27	90
First harvest & second Yam harvest	20	67
Harvest done by hand	30	100
<u>Storage</u>		
Avoid breaking & scratching	18	60
Store in hatch house	6	20
Left in ground	12	40
Store in dry shade	3	10

In Table 12 shows that majority (73%) of respondents agreed that taamu must be stored under well ventilated shade and must be harvested when corm are fully dormant.

Table 12 Indigenous method of harvesting & storage – taamu (n=30)

Activity	Frequency	Percent
<u>Harvest</u>		
7-9 months	1	3
12-18 months	15	50
Leaf decrease in size and corm fully Dormant	23	73
<u>Storage</u>		
Left in the field (ground)	25	83
Store under shade (coconut leaves)	10	33
Proper ventilated area	5	17

In Table 13, it was found that none of the respondents has indicated the storage method for banana. However majority (53%) harvested their banana when the finger is plump but still green.

Table 13 Indigenous methods of harvesting & storage of banana (n=30)

Activity	Frequency	Percent
<u>Harvest</u>		
Harvest when finger turn yellow	2	7
Finger are plump but still green	16	53
Fully mature	2	7
Some fruits are ripe	2	7
<u>Storage</u>		
(There is no record)		

Importance of IK to sustainable agriculture in crop and animal production

Tables 14 and 15 have indicated the importance of indigenous knowledge in crop and animal production here in Samoa. For instance, 97% (table 4: 8.1) of respondents indicated that indigenous method for controlling pests and diseases in crop production are effective and cost effective. This will be true because from table 4.2 are the lists of indigenous control methods that are appropriate for farmers to use in terms of their small scale production.

Table 14: Importance of IK to sustainable agriculture – crop production (n=30)

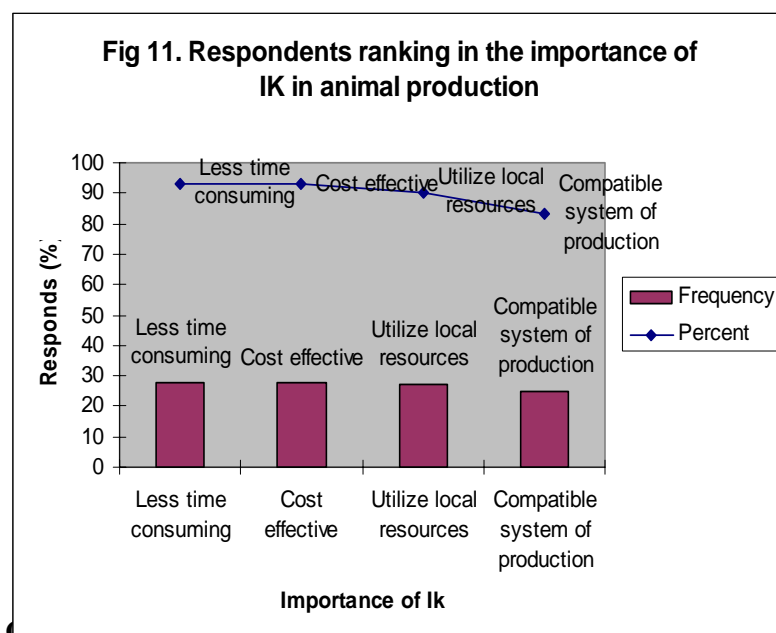
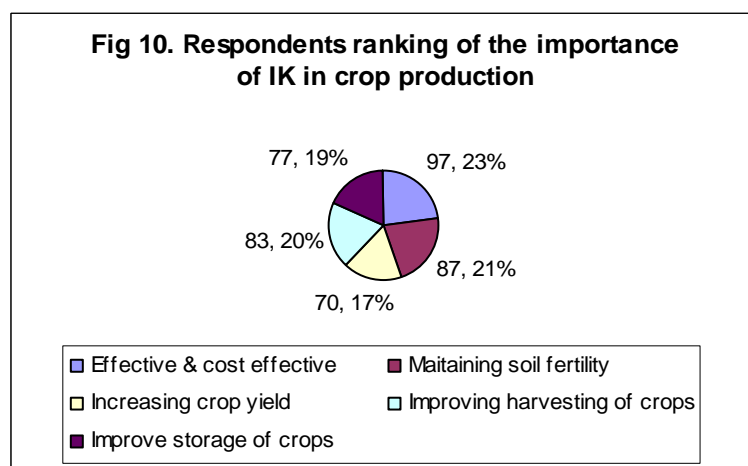
Practices	Frequency	Percent
Seed preparation promotes early germination & health		
Seedlings	20	67
Preparing planting materials produce healthy crops	25	83
Spacing produce high yield	13	43
Weed control reduces pests & diseases	17	56
Pest control are effective & cost effective	29	97
Maintaining soil fertility	26	87
Increasing crop yield	21	70
Improving harvesting of crops	25	83
Improves storage	23	77

In Fig 10, shows that majority of small scale farmers use IK in crop production because it is;

- Effective and cost effective
- Sustainable way of maintaining soil fertility
- Improves and increases crop production
- Improves storage

Table 15 Importance of IK to sustainable agriculture – animal production (n=30)

Practices	Frequency	Percent
Improves animal behavior	15	50
Improves labor intensity	14	47
Improves animal management	19	63
Sustain feed availability to animals	21	70
Less time consuming	28	93
Cost effective	28	93
Utilize local resources	27	90
Compatible system of production	25	83
Use of appropriate facility	14	47



The 80-90% (see Fig 11 and Table 15), of farmers indicated that IK in animal, production.

- Less time consuming and cost effective. This may be true because chemicals and feed are expensive, its require ongoing cash and majority of farmers here in Samoa are small holders and cannot afford to rely on it because it might be five time their average household income.

- Sustainable feed availability to animals. Indigenous knowledge draws on local resources. People are less dependant of outside supplies which can be cost scarce and available only irregularly.
- Less time consuming. This is because of smallness of the farms and the system of production compatible.
- Compatible system of production. Farmers are familiar with indigenous practices and technologies. They can understand, handle and maintain them better than introduced western practices and technologies.

Conclusion and recommendation

Conclusion

- There is much to be learnt from the IK system if we are to move toward interactive technology development from the conventional transfer of technology approach, it is feasible, efficient and cost effective to learn from the village – level experts (IAD vol.,13).
- Traditional knowledge is vital to sustainable development of Samoa's natural resources. Sustainable Agriculture development and conservation of Samoa's resources could be significantly advanced if modern scientific knowledge could be incorporated with the traditional knowledge system.
- Much of the IK has been lost since early European colonial and more recent internally eco-colonialism. Whether traditional knowledge used in Agricultural production will survive the millennium remains the question of time. There should be an awareness programme about the value of IK for development in order for the communities to conserve their indigenous knowledge.
- Small scale farmers in Samoa rely on IK for agriculture production because it is efficient and cost effective.
- Sustainability of Samoa's natural resources and Agriculture production depends on indigenous knowledge and traditional farming.
- Central and local Governments, environmental community and universities could become components of valuing, preserving and protecting Samoa's invaluable traditional knowledge before it disappears forever.
- IK should provide effective alternatives to western know-how. It should provide local Samoan, development workers or extension workers extra opinions when designing projects instead of searching only western technologies for feasible solutions. They can either choose from IK or combine indigenous and western technology in the development program.

Recommendation

The following recommendations have been derived from the conclusions of this research study. Since IK is important to sustainable agriculture:

- Recommended to do proper recording and documentation of IK used for agriculture. However, when recording, it is important to find who knows what in order to tap the right source. Otherwise data will not truly reflect IK in the community.
- Recommended to do research in improving IK used for agriculture by integrating with western technology.
- Recommended to preserve, protect and use IK to promote sustainable (ecological, socially and economically) agriculture development.

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PABITRA (Samoa): Promoting capacity building via biodiversity studies by young Samoans

*Nat Tuivavalagi**

Introduction

PABITRA (Samoa) refers to the Samoa component of the *Pacific-Asia Biodiversity Transect* Network. PABITRA is considered as a most appropriate network for Samoa and other Pacific islands. It promotes biodiversity studies while achieving capacity building for young locals. It brings in foreign experts while considering and respecting the local way of life. This article explains various aspects of PABITRA including its background, objectives, activities, funding, concerns and future outlook. The main purpose of the article is to describe this network, particularly its Samoan component, in the hope of providing basic information to potential collaborators potential members, other stakeholders and the general public. More details regarding PABITRA are available at the PABITRA website (see section 6 below) and in various published materials e.g., “The Pacific-Asia Biodiversity Transect (PABITRA): A new Conservation Biology Initiative” (Mueller-Dombois, et al., 1999).

This article is based on the author’s presentation at the 2003 Samoa National Environment Forum; however, the original material has been updated to include activities carried out by PABITRA (Samoa) during 2004. Those wanting additional information or would like to join the network are encouraged to email Dr. Tuivavalagi.

Background

PABITRA grew out of DIWPA (DIVERSITAS in Western Pacific and Asia) which, in turn, grew out of DIVERSITAS which is an international global environmental change research programme sponsored by ICSU (the International Council for Science), SCOPE (Scientific Committee on Problems of the Environment), IUBS (International Union of Biological Sciences), IUMS (International Union of Microbiological Societies) and UNESCO-MAB (Man and the Biosphere). DIVERSITAS was launched in 1991 and is considered to be the direct successor to the International Biological Program (IBP) which was active from the mid-1960s to the early 1980s.

DIVERSITAS's missions are :

- to promote integrative biodiversity science, linking biological, ecological and social disciplines in an effort to produce socially relevant new knowledge ;
- to provide the scientific basis for an understanding of biodiversity loss, and to draw out the implications for the policies for conservation and sustainable use of biodiversity.

During an international forum on DIVERSITAS held in Paris in 1994, the DIWPA Network (DIVERSITAS in Western Pacific and Asia) was officially initiated by members of the Ecological Research Center at Kyoto University, Japan and Prof. Dieter Mueller-Dombois, a

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professor at the University of Hawaii Botany Department and a very active member of the Pacific Science Association, was invited to be a member of the DIWPA Steering Committee.

The island biogeography theory of MacArthur and Wilson (1963, 1967) provides an underlying scientific inspiration for PABITRA. However, the PABITRA concept evolved in part from “The Future of Island Vegetation”, the last chapter of the book “Vegetation of the Tropical Pacific Islands” by Mueller-Dombois and Fosberg (1998). In the conclusions to the book’s final chapter, reference is made to DIWPA as a new research initiative. DIWPA has been described by others including Inoue (1996). PABITRA was later established as the tropical island branch of DIWPA (Yumoto 1999).

In 1996, the 8th Pacific Science Inter-Congress of the Pacific Science Association was held at the University of the South Pacific, Fiji, and during this inter-congress, a special workshop (the first PABITRA workshop, reported by Kitayama and Mueller-Dombois, 1997) was held to establish a Biodiversity Transect across the Pacific high-island archipelagoes for a comparative study of their indigenous watershed forests.

PABITRA became a project of the Ecosystem Division of the Pacific Science Association – which meets every two years coinciding with the Pacific Science Congress and Inter-Congress meetings. As the new project of the PSA Ecosystem Division, PABITRA received setup funding from the MacArthur Foundation in 1998. Later, PABITRA received funding from APN (the Asia Pacific Network for Global Change Research), Kobe, Japan. This funding is restricted to run meetings and workshops for initiating collaborative research but does not pay for research, equipment, or salaries.

In July 1999, the 19th Pacific Science Congress was held in Sydney, Australia and in this conference, the third PABITRA workshop (following the 2nd one held in Taipei, Taiwan in 1998) was held on “Preliminary site descriptions and projects for PABITRA”. At this workshop Dr. Art Whistler and Mr. James Atherton presented a paper on “Savaii, Western Samoa, as a Pacific-Asia Biodiversity Transect (PABITRA) Site”.

During this workshop, other speakers presented a paper on other potential PABITRA sites in the Pacific Asia region apart from Savaii, Western Samoa. These alternative sites included Papua New Guinea (described by Roger Kitching; and Wayne Takeuchi with K. Kisosau R. Kiapranis), Taiwan (Chang-Hung Chou), Lauru of Western Solomon Islands (Will McClatchey with M.Q. Sirikolo), Kolombangara, Solomon Islands (David Burslem), Fiji (Randy Thaman with M.Tuiwawa; Peter Newell), American Samoa (Art Whistler), Cook Islands (Mark Merlin), Tahiti and Marquesas Islands (Jean-Yves Meyer with Jacques Florence), Palau (Harley Manner with Olivia Idechiil), Pohnpei, Federated States of Micronesia (Bill Raynor), Hawaiian Islands (Sam Gon III with Jim Juvik; Lloyd Loope with Stephen Anderson, Robert Hobdy, Mark White, and Randy Bartlett; and Jim Juvik), Bonin Islands (Yoshikazu Shimizu), Yap Island (Margie Falanruw), Irian Jaya, Indonesia (Matheus Kilmaskossu); Juan Fernandez Islands (Tod F. Stuessy, with Michael Kiehn and Josef Greimler), and the Galapagos Islands (Syuzo Itow).

The next (i.e., 20th) Pacific Science Congress was held in Bangkok, Thailand during 17-21 March 2003 and, during this congress, PABITRA held a special meeting to decide on its next site – after successful establishment in Hawaii, based at the University of Hawaii and Fiji, based at the University of the South Pacific. Dr. Nat Tuivavalagi who attended the congress,

strongly promoted Samoa as the most logical next-site for PABITRA, and the majority of those attending the special PABITRA meeting agreed.

Objectives

The PABITRA Network hopes to empower Pacific islanders to have a better understanding of their natural resources, including land, soil, climate, plants, animals, terrestrial environment, freshwater environment, marine environment, coral reefs, watersheds, etc. The depth and scope of focus would of course be limited by availability of expertise, personnel, funding, local interest, and other factors.

The main objectives of PABITRA in the Pacific islands are:

- To establish mountain-to-coast landscape transects in a number of Pacific islands and to use these for the study of biodiversity and ecosystem functioning;
- To involve resident Pacific islanders in all aspects of the work to develop a deeper interest in the protection and wise use of their own resources; and
- To do cooperative and comparative biodiversity research for mutual capacity building with other scientists linked to the PABITRA network

PABITRA activities in Samoa have two main objectives:

- To contribute towards meeting PABITRA objectives (as stipulated above); and
- To contribute towards local capacity building.

Management of PABITRA (Samoa)

As mentioned above, it was agreed by PABITRA members at the 2003 Pacific Science Congress to have Samoa as the next PABITRA site. After discussions with senior, international PABITRA collaborators at the Congress and a review of the local situation in Samoa, Dr. Tuivavalagi proposed that PABITRA be based at NUS and that it be run by a Steering Committee to be chaired by the Dean of the NUS Science Faculty, where the Steering Committee would call on others for advice or assistance when needed – including personnel from Natural Resources and Environment, Forestry Department, NGOs, USP and others. This proposal was discussed with stakeholders from NUS and other groups, and even though there were a few concerns, all seem to agree that at least this would be a good starting setup which could be reviewed later.

For a variety of reasons, the management setup did not function and Dr. Tuivavalagi who was by this time working with Phoenix Research in Auckland had to return to Samoa to coordinate an international workshop during 10-13 June 2003 at the National University of Samoa – to provide a forum where local stakeholders could meet and exchange information and discuss issues of mutual concern, and also to establish PABITRA in Samoa at an official level. Dr. Tuivavalagi continued as Coordinator – and coordinated a training workshop that was held in Samoa from 24 November to 5 December, 2003. Dr. Tuivavalagi has continued as Coordinator with the assistance of others – particularly Mr. Siliko and Mr. Foliga, the two Deputy Coordinators.

Alternative management structures are being explored while PABITRA management is also allowed to go through a “natural” evolutionary process. Through this process, NUS has placed PABITRA under its Institute of Samoan Studies but there is still close affiliation with the Faculty of Science – particularly through Mr. Siliko who is a staff member of the NUS Faculty of Science and also involved in PABITRA management. Also Dr. Tuivavalagi has been accepted by the Director of the Institute of Samoan Studies as a Research Fellow.

At present, there are three levels of management of PABITRA (Samoa). At the highest level, the head is the NUS Vice Chancellor and he is the one who signs invitation for workshops, signs certificates of achievements for participants of PABITRA Trainings and is expected to sign exchange schemes negotiated with other universities through PABITRA. At the next level, the head is the Director of the Institute of Samoan Studies. PABITRA is linked to NUS through his office and his office is expected to oversee PABITRA's account which has been opened under the NUS Bursary Office. Lastly, at the field and technical level, PABITRA has the Coordinator and his two deputies as mentioned above.

PABITRA is not a donor agency and members of the network have to ask for funds from various donor agencies to enable them to carry out their various activities. For example, section 6 of this paper describes some of the main activities carried out and their sources of funding.

Membership in PABITRA (Samoa) is open to all interested Samoans and there is no membership fee. There is no register of members – all who have been involved in any way in any of the PABITRA activities are considered as members. However, at the field or technical level, there is a clear distinction between “active” members and other members – where “active” members are those that are currently engaged in research or any other activity associated with the activities of PABITRA (Samoa).

Needless to say, PABITRA management could evolve further; in fact alternative systems of management are being considered and changes could be deliberately introduced by current members. However, it should be realized that PABITRA (Samoa) is part of an international network and any change considered should be within the core objectives and strategies of the network as a whole.

Benefits and costs of joining PABITRA (Samoa)

Benefits

The main benefit that first made Dr. Tuivavalagi want to introduce PABITRA to Samoa is its capacity to empower young Pacific islanders – as witnessed by the presentations by the PABITRA Team from Fiji during the recent Pacific Science Congress held in 2003 in Bangkok (Pacific Science, Volume 59, no. 2. In press). For long, the Pacific Science Congress has been typically a meeting where Caucasians talk about their studies and thoughts on the Pacific. While the Asian presence in these meetings has greatly increased in recent years, it seems that there is still a need to improve participation by Pacific islanders themselves. PABITRA has made a significant impact in this regard and PABITRA (Samoa) is particularly interested in ensuring that its activities contribute directly to capacity building whereby young locals increase their knowledge of their own local resources, climate, and biodiversity – and increase their knowledge of how to conduct research in these areas.

PABITRA also provides an opportunity for networking and sharing of ideas, knowledge, and skills. This enables collaborators to expand their areas of expertise and skills. PABITRA also provides a solid base or foundation for requesting funds from local, national, regional and international sources. This enables anyone to join PABITRA (Samoa) and, right away, write a strong proposal requesting funds for research and relying on PABITRA's experience and expertise to assist in the success of the proposal.

Costs

The main cost for collaborators would be in terms of time required for their participation in PABITRA activities which include proposal writing, field studies, report writing, financial management, etc. It was previously thought that collaborators have to contribute in terms of provision of resources required for the PABITRA activities, however, it is now obvious that this should not be so as a well written proposal should include costs of all required resources – apart from the time required.

The PABITRA website

The internet address for the PABITRA website is <http://www.botany.hawaii.edu/pabitra/> and information included under this site are as follows:

- General Information
- Highlights
 - Organization of PABITRA
 - PABITRA Sites
 - PABITRA Methods Book
- Upcoming Events
- Past Events
- Background Papers and Information
- Projects and Presentations
- Links to Organizations associated with PABITRA's Missions.

Activities of PABITRA (Samoa) and funding

There are two approaches to obtaining funds for PABITRA activities. Firstly, PABITRA Management could ask donors for money to fund their activities and those of their members. Secondly, members themselves could approach donors for funding. PABITRA (Samoa) uses both approaches; however, it must be pointed out that an important goal of PABITRA is to empower islanders to write their own research proposals for team-work as members of the PABITRA Network.

Previous activities

Before PABITRA was brought “officially” to Samoa in June 2003 (see section 7.4 below), a number of Samoans have been involved with PABITRA activities. These included Mr. James Atherton who attended the Pacific Science Congress in Sydney in 1999 (as previously described above) and Mr. Tony Tipamaa who attended a PABITRA Workshop in Fiji in 2000. Mr. Joe Reti and Mr. Sam Sesega were also involved with PABITRA activities while they were with SPREP (the then South Pacific Regional Environment Programme), as well as Mr. Cedric Schuster who used to work for WWF (Worldwide Fund for Nature). These activities were funded from various sources.

Pacific science congress (March 2003)

Dr. Tuivavalagi attended the 20th Pacific Science Congress that was held in Bangkok, Thailand during 17-21 March 2003. Dr. Tuivavalagi's expenses were paid by Professor Mueller-Dombois from funds he obtained from donors to help him run the PABITRA session of the Congress, which is now being published and will come out in the next issue of the Pacific Science journal.

Consultation with Samoan stakeholders (March/ April, 2003)

After the Pacific Science Congress, Dr. Tuivavalagi “unofficially” brought PABITRA to Samoa and spent the following six weeks talking with individual stakeholders regarding the

PABITRA concept and the proposed establishment of PABITRA (Samoa) via a base at the National University of Samoa. The management and staff at NUS were first consulted then, a great number of other people were also consulted including government officials from various departments including Agriculture, Forestry, Fisheries, Meteorology, and Natural Resources and Environment; management and staff of the University of the South Pacific Alafua; NGO staff members including those from Siosiomaga, METI (Matualeo'o Environmental Trust Inc.) and Faasao Savaii; staff of environment-related bodies including Conservation International and SPREP, private consultants, and private individuals. Most of the meetings were on a one-to-one basis, however, there were also some meetings with small groups and Dr. Tuivavalagi also conducted a seminar at USP Alafua where USP management, staff, students and members of the public were invited. The main concerns raised in these meetings are discussed in section 8 of this paper. This activity was not funded and Dr. Tuivavalagi carried this out with his own resources. However, to compensate him for some of his contributions, Prof. Mueller-Dombois gave him a laptop computer and printer acquired from his own private funds.

Initial Workshop, Samoa (June 2003)

This is the meeting that “officially” introduced PABITRA to Samoa – with the presence of Prof. Dieter Mueller-Dombois, the International Director of PABITRA. Local stakeholders were invited to the meeting and a number of them gave a formal presentation including representatives of Forestry, METI, Siosiomaga, USP Alafua, NUS, and Natural Resources and Environment. Prof. Mueller-Dombois paid for the expenses of this meeting using funds he applied for from APN (the Asia Pacific Network for Global Change Research).

Reconnaissance surveys (June & October, 2003)

While in Samoa for the above June meeting, Prof. Mueller-Dombois and Dr. Art Whistler and Mr. Siliko Siliko of NUS took a tour of Savaii to consider possible sites for the training workshop to be held later in the year, i.e., in November/December. Various sites were considered and Dr. Tuivavalagi, Mr. Siliko and Mr. Talie Foliga of the Ministry of Natural Resources and Environment had to take another trip to Savaii to select the actual sites and draw up a programme for the training workshop. Again, Professor Mueller-Dombois provided funds for both trips with funds he applied for from APN.

Training workshop, Samoa (November/December 2003)

A 2-week training workshop was held in Samoa from 24 November to 5 December, 2003. The training started with sessions open to the public which was held at NUS before selected participants were taken to Savaii for intensive training in the field. Resource people from overseas included 7 from the University of Hawaii, 2 from USP Fiji, and one each from the University of Guam, Kyoto University and the Secretariat for the Pacific Commission.

Professor Mueller-Dombois provided funds for this workshop using funds he applied for from APN. Dr. Tuivavalagi was also able to secure some funding from the New Zealand High Commission in Apia; and Prof. Mueller-Dombois and Dr. Keith Morrison of Lincoln University, New Zealand, made cash donation from their personal funds to assist with the workshop.

Aopo expedition, Savaii (June 2004)

During 31 May – 2 June, 2004, Dr. Tuivavalagi, Mr. Siliko and Mr. Foliga made an expedition to the Aopo Transect in Savaii. During the trip, a weather station was installed and other studies were also carried out with regard to the soils, flora, fauna, land use and

socioeconomic situation in the transect area. This trip was funded by the NUS University Research Committee and the NUS Science Faculty. Funds approved by the NUS University Research Committee should be adequate for two additional trips to the Aopo transect.

International Association of Vegetation Science symposium, Hawaii (July 2004)

Mr. Siliko and Mr. Foliga (and Ms. Mila Misa from American Samoa) made a presentation at the PABITRA session of the International Association of Vegetation Science (IAVS) Symposium that was held in Kailua-Kona, Hawaii during 18-23 July, 2004. After the symposium, Mr. Siliko also attended a PABITRA-related climatology workshop in Hawaii but was not able to stay for the whole duration of the workshop due to personal circumstances back in Samoa. Mr. Siliko and Mr. Foliga (as well as Ms. Mila Misa) were able to attend these professional gatherings with financial assistance from the organizers.

University of Hawaii/ East West Center attachment (October – December 2004)

START offered fellowships for scientists from developing countries to visit laboratories in developed countries. Dr. Tuivavalagi successfully applied for this funding which enabled him to spend two months (11 October – 15 December, 2004) at the University of Hawaii and East West Center in Honolulu, Hawaii. His activities in Honolulu were coordinated by Prof. Mueller-Dombois. Under this fellowship, and with the assistance of Prof. Mueller-Dombois, Dr. Tuivavalagi gave two seminars in Hawaii and will give at least two more in Samoa. Dr. Tuivavalagi, with Prof. Mueller-Dombois's assistance is also writing up academic papers and proposals for funding. These activities are expected to be concluded by the end of February, 2005.

Concerns

Discussions by Dr. Tuivavalagi with local stakeholders revealed some concerns which are discussed below. As PABITRA (Samoa) continue to evolve and as members consider alternative styles or structures of management, it might be worthwhile to consider these concerns.

Academic interest versus practical usefulness

Stakeholders are concerned that PABITRA might be just pursuing activities out of academic interest – but with little practical value. The scholarly nature of PABITRA cannot be denied. Academics make up the bulk of the voluntary staff behind PABITRA which has its first base at the University of Hawaii, then the second base at the University of the South Pacific in Suva, Fiji, then the third base at the National University of Samoa.

However, just because academics are heavily involved, it should not be assumed that the activities undertaken would be of little practical, direct use. Secondly, members of PABITRA (Samoa) have to ensure that their activities satisfy both academic curiosity and practical usefulness.

Data ownership

Stakeholders are concerned that PABITRA might be used by foreigners as a tool to extract local information. Because of this concern, it was agreed that all data resulting from PABITRA studies in Samoa be considered as locally owned and use of data outside Samoa should be cleared through the National University of Samoa's Institute of Samoan Studies. However, this arrangement may have to be reviewed so that it does not end up as being counter-productive.

Overloading of local capacity

Nobody is paid to work for PABITRA (Samoa), hence all members have their own jobs and some stakeholders are concerned that PABITRA can contribute negatively to the overloading of local capacity. This seems to be a valid concern and measures should be considered to address it. Two strategies are suggested, firstly to devise ways of increasing the effectiveness of limited inputs, and secondly to devise ways of encouraging increased inputs by local collaborators.

Input by local collaborators can be made more effective by twinning with local and overseas experts, provision of training, and provision of required equipment and tools via preparation of project proposals for funding. On the other hand, inputs by local collaborators could be increased by membership drives, and via the provision of incentives. Research activities could be encouraged by promoting the fun-side of it and also by arranging academic credit or certificates for research and corresponding write ups in relation to studies carried out at the PABITRA sites.

Overloading of local resources

Stakeholders were also concerned that PABITRA can lead to the overloading of local resources. For example, there was concern that government vehicles will now have to be shared with staff traveling to Savaii for PABITRA activities – on top of their usual activities. So far it is obvious that this concern is not valid. Firstly, it has become obvious that funds have to be first sought and be available before any PABITRA field activity is started. As such money should be available for hire of tools and equipment including hire of vehicles. (I must point out here that PABITRA personnel in Fiji have even hired planes for some of their activities.) In some cases, PABITRA collaborators use their own resources (e.g., camera, etc.) wherever applicable, however, they do this out of their own free will, and they do this only when the resources concerned are not needed elsewhere. Even at this early stage, PABITRA (Samoa) has a few equipment and tools (GPS and other equipment and tools donated by overseas PABITRA personnel) and these are being continually loaned out to local participants. As such, instead of leading to an overload of local resources, PABITRA is expected to contribute more, and in a positive way, to the pool of resources available for biodiversity studies in Samoa. These equipment and tools are being kept at NUS under the responsibility of Mr. Siliko Siliko. (It must be also pointed out that PABITRA collaborators in Japan offered some scientific equipment, but no serious effort was made to find funds to transport these to Samoa because, after discussions with local stakeholders, Dr. Tuivavalagi realized that there is a lack of local expertise in the use of these equipment.)

Duplication of no-going or planned activities

Some stakeholders are concerned that PABITRA might duplicate on-going or planned activities by government or others. While PABITRA supports local initiatives, it does not intend to do what others are doing or intending to do. It is therefore important for PABITRA to continually interact with the public and find out what others are doing or planning to do and to also let others know what it is up to – to ensure that there is effective collaboration and no duplication.

Bioprospecting

Some stakeholders are concerned that PABITRA may be involved in bioprospecting involving search for cures for diseases like cancer and HIV AIDS where huge amounts of money could be made. Bioprospecting is obviously not an objective of PABITRA (Samoa) and it seems that the government has taken steps to protect the country from abuse in this

regard – by requiring that all researchers from outside declare the nature of their research activities. However, it is hereby suggested that PABITRA (Samoa) consider developing a code of ethics for all collaborators – to ensure that researchers are aware of the economic and human/community dimensions of their study in the context of the society where they work.

Top-down approach

Some stakeholders are concerned that PABITRA has a top-down approach and forces certain issues on local collaborators. This concern could be valid – in fact, in any international collaboration like PABITRA, people should assume that there is always room to improve communication and seek ways to achieve this. PABITRA intends to compare the situation in different ecosystems in different islands and for comparisons to be valid, certain data have to be collected in a certain way – irrespective of preferences of local personnel. Beyond these core requirements needed from participating states, it is up to the national bodies to decide on the additional strategies and activities that they would like to add to their project plans.

The current situation and future outlook

This section considers the current areas of focus and future outlook from the viewpoint of the current Coordinator for PABITRA (Samoa).

Current areas of focus

Samoa Transect

The selection of transects for biodiversity studies, is a key activity for PABITRA and several transects, all in Savaii, have been considered for PABITRA (Samoa) and are mapped in the PABITRA website (see under Maps: Savaii Island in <http://www.botany.hawaii.edu/pabitra/samoa/default.htm>). Of these transects, the Aopo Transect has been selected for study by PABITRA (Samoa) at least at the current stage. As such field activities in Samoa will focus on this transect. An expedition to the Aopo Transect has been carried out (as explained in section 7.7 above) and more will follow.

Memorandum of Agreement and Exchange Scheme

No memorandum of agreement (MoA) has been signed between NUS and PABITRA, unlike the MoA that has been signed between USP, the University of Hawaii and the University of Hannover. As such current arrangements with NUS could be considered temporary at this stage. However, it has clearly emerged that the existence of a binding document may have little to do with the level of activity. Thus, even though there is no MoA between NUS and PABITRA, there is no reason for this to limit PABITRA activities in Samoa at the present time and in the near future. Nevertheless, with this in mind, there is an ongoing effort to explore the issues involved and to try to get NUS, PABITRA and UH to sign a MoA and thereby put in place a firmer foundation for future collaboration.

The development of an exchange scheme between NUS and UH is also being explored and the parties involved will be informed of the details and issues concerned.

Funding

In line with the above initiative, there is also a significant effort to identify a major source of funding that could fund PABITRA (Samoa) activities through the ISS and NUS accounting and financial control system.

Academic credit

Also in line with the above initiatives, there is a significant effort to identify a mechanism whereby locals involved in PABITRA (Samoa) activities could be awarded with academic credit for their achievement.

Pacific Science Association

Through the assistance of Professor Mueller-Dombois, the Coordinator of PABITRA (Samoa) was able to meet with officials of the Pacific Science Association during his recent attachment at the University of Hawaii and East West Center. The main issue discussed was how to further promote participation by Pacific islanders including Samoans in ongoing and future professional activities of the association.

The two Samoas

From the very beginning, the advantages of collaboration between the two Samoas are fully realized. This was made easier since Professor Mueller-Dombois and other PABITRA collaborators such as Dr. Whistler and Dr. Tuivavalagi personally know people in American Samoa who are interested in the PABITRA concept. For this reason, American Samoans were informed of the initial meeting and training workshop and as a result, two from American Samoa attended the training workshop – with one, Ms. Mila Misa, staying on for the whole two weeks and continuing to play a key role in the development of PABITRA in American Samoa. There is an on-going effort to maintain and strengthen the link between the two Samoas and explore ways of improving the effectiveness of the collaboration.

Networking

The advantages of networking is quite clear to members of PABITRA which is itself a network. As such there is also an effort to identify other networks, organizations, bodies and groups with which PABITRA (Samoa) could establish mutually rewarding links.

There is also an effort to link up with Samoan university students studying locally (at NUS and USP Alafua) and overseas (USP Suva and elsewhere) who could do some field research at the Samoan Transect (PABITRA Study Site in Samoa) as part of their undergraduate or postgraduate study. As part of this effort, Mr. David Hunter has been requested to act as the Contact Point for PABITRA within USP Alafua.

Ways of twinning local researchers with overseas experts are also being explored.

Creative ideas

A hallmark of PABITRA (Samoa) activities is “creativity” and all creative ideas to achieve the above-stated objectives of PABITRA will be considered.

Personal vision and future prospects

At the 2003 Pacific Science Congress, I was amazed to see how young Fijian researchers, with the assistance of Professor Mueller-Dombois and the PABITRA network, “stormed” the congress and captivated their audience with extremely interesting, scientific presentations with great skill and confidence. That is the vision that I wanted to extend to young Samoans and other Pacific islanders.

I cannot claim credit for the achievements so far as these are a reflection of the personal qualities, commitment and sacrifice of individual members and a result of contributions by

many in the PABITRA network. Nevertheless, based on previous achievements and current plans and progress, the future looks very promising.

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