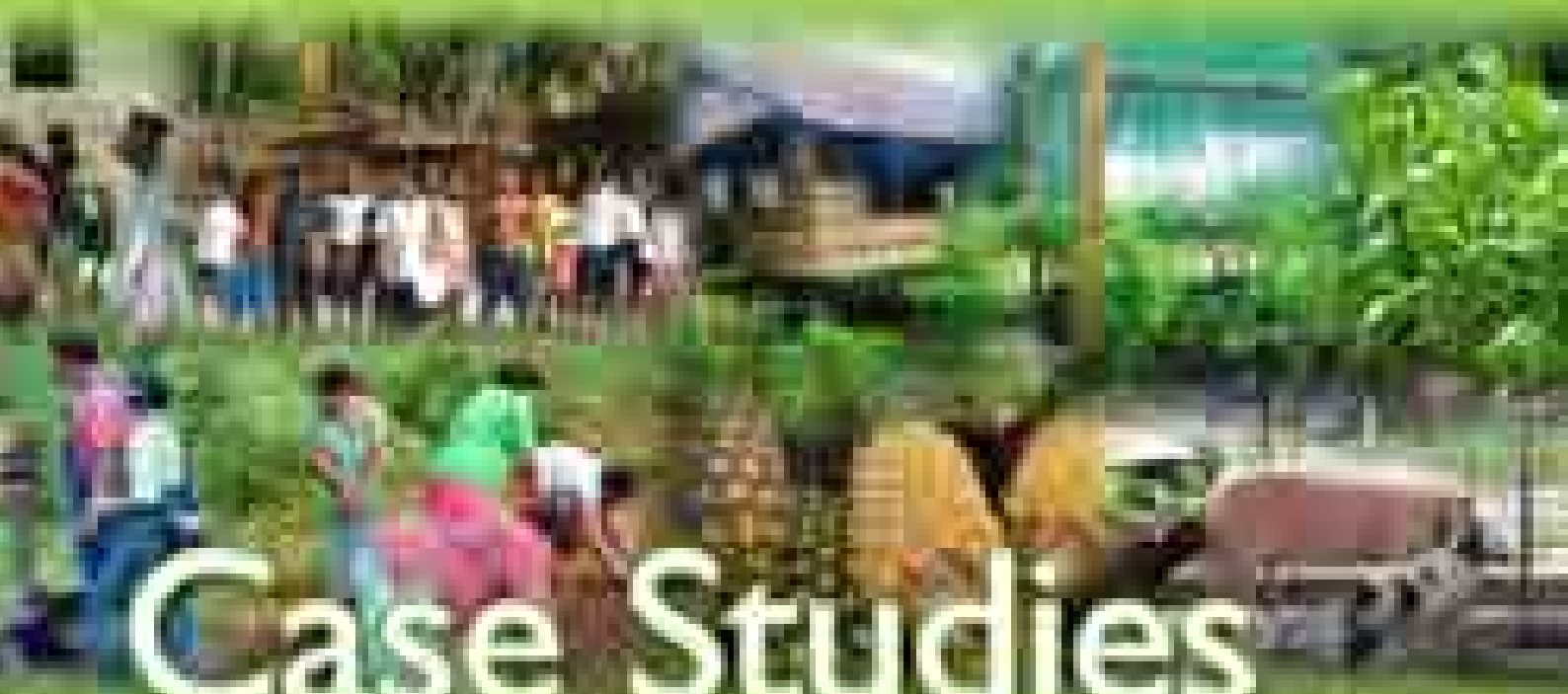

Case Studies

Lessons from the field

THE DSAP EXPERIENCE

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Lessons from the field
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Developed by members of the DSAP team
Secrectariat of the Pacific Community

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AIM OF THIS CASE STUDIES BOOK

This case studies book documents the results of the Development of Sustainable Agriculture in the Pacific project (DSAP). The DSAP project was funded by the European Union, managed by the Secretariat of the Pacific Community and implemented in 16 Pacific Island Countries and Territories of Fiji, French Polynesia, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis and Futuna, Cook Islands, Federated States of Micronesia, the Republic of the Marshall Islands, Niue, Nauru and Palau.

The purpose of this resource is to share, inform, build capacity and promote knowledge on approaches, tools, skills, technologies and experiences of the DSAP project in order to improve the livelihoods of farmers in Pacific Island countries and territories. The contents of this resource are a selection of the DSAP activities implemented in the participating countries. Although not all the activities are documented as case studies in this book, the selection of activities can be considered as examples of best practices of DSAP.

The overall objective of the DSAP project was to improve the food security and livelihoods of target farm families. The project's purpose was to increase sustainable agricultural production.

The result areas for the DSAP project were:

- Farmer specific production problems and solutions identified.
- Appropriate technologies developed from on-farm demonstrations.
- NAREs and NGO staff skills upgraded in participatory methods and technical skills.
- Appropriate technologies promoted and capacity to produce and use promotional materials enhanced.
- DSAP properly monitored at regional and national levels.

The process for the formulation and production of this resource was implemented at the annual GREA meetings. These annual meetings served as an opportunity to learn and share experiences of the DSAP project in the various countries.

About DSAP

The Development of Sustainable Agriculture in the Pacific (DSAP) programme promotes and implements sustainable agriculture that will improve food production thereby enhancing food security and income generating in the Pacific. The programme, funded by the European Union, commenced in 2003 in the 10 Pacific countries of Fiji, French Polynesia, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Wallis and Futuna. Cook Islands, Niue, the Republic of the Marshall Islands, Nauru, the Federated States of Micronesia and Palau joined the DSAP programme in 2004.

DSAP is the result of collaboration and joint consultations between the Secretariat of the Pacific Community (SPC), Pacific Islands national agricultural research extension services, NGOs and regional stakeholders. These consultations examined constraints to sustainable agriculture and rural livelihoods in the Pacific and designed this initiative to regenerate Pacific agriculture using practices that are sensitive to the environment, methods that are sustainable and a programme that involves local relevant stakeholders in the agriculture sector.

SOURCES

The case studies in this publication were developed as responses to farmer-identified problems in sustainable agriculture production.

They are derived from activities made possible through collaborative work with Ministries of Agriculture, other government ministries and members of civil society with support from the various thematic groups within the Land Resources Division (LRD), Secretariat of the Pacific Community (SPC). The studies are only snapshots of DSAP activities at national level, and are meant to be brief. Details of the case studies may be obtained from staff within the Ministries of Agriculture (full contact details have been provided at the end of each case study).

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DSAP Guiding Principles

The Development of Sustainable Agriculture in the Pacific (DSAP) Project aims to make agriculture productive, environmentally sensitive and capable of strengthening the social fabric of local communities by working in collaboration with NARES, NGOs, farmer groups and other relevant stakeholders.

Process
Process is as important as product and should suit the context and be flexible. Careful planning is vital. Accept different agendas, limitations and varied commitment. Above all be honest and transparent. Focus on attitudes and learn from others. Encourage reflection, handing over control and sharing.

Involvement of all stakeholders
DSAP encourages participation at all stages. Involve people of different ages, gender and background. Establish partnerships wherever possible between various stakeholders. Explore collaborations with other potential contributors.

Build local capacity
Sustainability depends on developing local human and social capital. Local communities should be involved at all stages. Respect local knowledge, perceptions and abilities. Make use of these important assets and skills before calling on outside assistance.

Communication
Use appropriate media to let people know what you are doing and how they can become involved.

Innovate
Experiment with methods, approaches and ideas. Above all, have fun.

DSAP is funded by the European Union and implemented by the Secretariat of the Pacific Community (SPC)

ACRONYMS:

DSAP - Development of Sustainable Agriculture in the Pacific
NSC - National Steering Committee
NC - National Committee
REA - Research Extension Assistant
GREA - Graduate Research Extension Assistant
ECA - Extension Communication Associate
NAREs - National Agriculture Research and Extension services
NARI - National Agriculture and Research Institution

Table of Contents

Table of Contents

Foreword

The publications, Case studies: Lessons from the field, the DSAP experience, and A participatory toolkit for sustainable agriculture programmes in the Pacific, the DSAP experience, were written by agricultural research/extension assistants from Pacific countries and territories. These dedicated staff were employed by the Secretariat of the Pacific Community (SPC) on the EU-funded project, Development of Sustainable Agriculture in the Pacific (DSAP).

The individual stories told will no doubt mean more to readers from the particular countries in which the work was carried out. However, there are considerable benefits to be gained and lessons learnt from the diverse and positive experiences and outcomes documented by these young people from all over the Pacific.

The stories embody best practice in using participatory processes to identify priority issues for rural development and in harnessing the individual and collective power of farmers and communities to achieve maximum benefits. Some issues identified as high priority are similar across subregions, while others differ distinctly for various islands, reminding us that while a regional approach may be the most cost effective, location-specific solutions are often necessary. The solutions developed in the course of the DSAP project have mostly been relatively simple, but innovative and appropriate for rural living.

These publications are timely. Depending on their status under the Lomé Convention and later Cotonou Agreement, the project ended in some countries in December 2008, and for others will end in December 2009. The Land Resources Division (LRD) of SPC is now in the process of integrating the procedures and structures, both national and regional, developed by the DSAP project, into its own systems. The aim is to enhance the involvement of LRD's research and development and support teams in extending DSAP's outputs, particularly at the national level. In most cases, efforts will be made to link outputs with activities being carried out under the joint strategies developed between SPC and member countries and territories.

The European Union provided financial assistance for two phases (1989–1999) of the Pacific Regional Agricultural Programme, which was the basis for the DSAP project, and then funded DSAP over the last five years. Rural development takes time and the perseverance and support of the European Union for this area is acknowledged and greatly appreciated.

I wish to thank Dr Siosiua Halavatau (DSAP Team Leader), Dr Danny Hunter (former Team Leader), regional DSAP staff and national staff in the 16 countries and territories involved. Special thanks to Ms Bernadette Masianini (DSAP Communication Officer) for her effort in pulling all the information gathered into these two reader-friendly publications.

Malo 'aupito,

'Aleki Sisifa
Director, Land Resources Division

The *maire* plant - from makatea to on-farm trials

DSAP Cook Islands

The maire (Alyxia elliptica) is a sweet scented shrub that grows on the makatea (coral pinnacles) in the Cook Islands. The maire plant is de-stemmed, joined and braided into an ei or garland and is significant during traditional ceremonies.

Source of information

The Cook Islands Natural Heritage Trust, Biodiversity Website (2005)

The ***maire*** thrives on the ***makatea*** **on Mitiaro, Mangaia and Mauke Islands** in the southern group of the Cook Islands. It has been an **export industry, earning income** for the residents of these islands. At its peak in 2004, **the *maire* industry generated close to NZD 400,000 for the local economy.**

In 2004, DSAP Cook Islands facilitated a community consultation

on Mitiaro Island. Using participatory tools, the islanders identified challenges to sustainable livelihoods, in particular problems in the agriculture sector. This consultation provided important baseline information regarding the state of the maire industry on the island.

As a result, DSAP Cook Islands with assistance

from the Research Division and the Agriculture Department on Mauke Island established on-field trials for the *maire* plants. The main objective of the trial was to determine the growth and production of the *maire* away from its natural habitat, the *makatea*.

Harvesting the *maire* is a challenge for the communities on Mitiaro,

Mangaia and Mauke Islands. The sharp pinnacles of the *makatea* and the rugged track to get to the *maire* can sometimes cause injuries to those out looking for the *maire*. Being able to harvest the *maire* closer to their homes and not having to go out amongst the sharp coral pinnacles would make life a lot easier for the communities on these islands.

© DSAP Cook Islands

Maintaining the maire plants at the research station plot, Mauke Island

The on-field trials were promising initially, but 6 months into the trials, some of the *maire* seedlings did not survive and were replaced. Overall, the seedlings are growing well but at a much slower pace compared to the wild stock of *maire*.

Trials are still in progress and the results will be produced after the DSAP project has ended. The Ministry of Agriculture will disseminate and publicise the results when they are available.

© DSAP Cook Islands

Maire plants in the nursery, Mauke Island.

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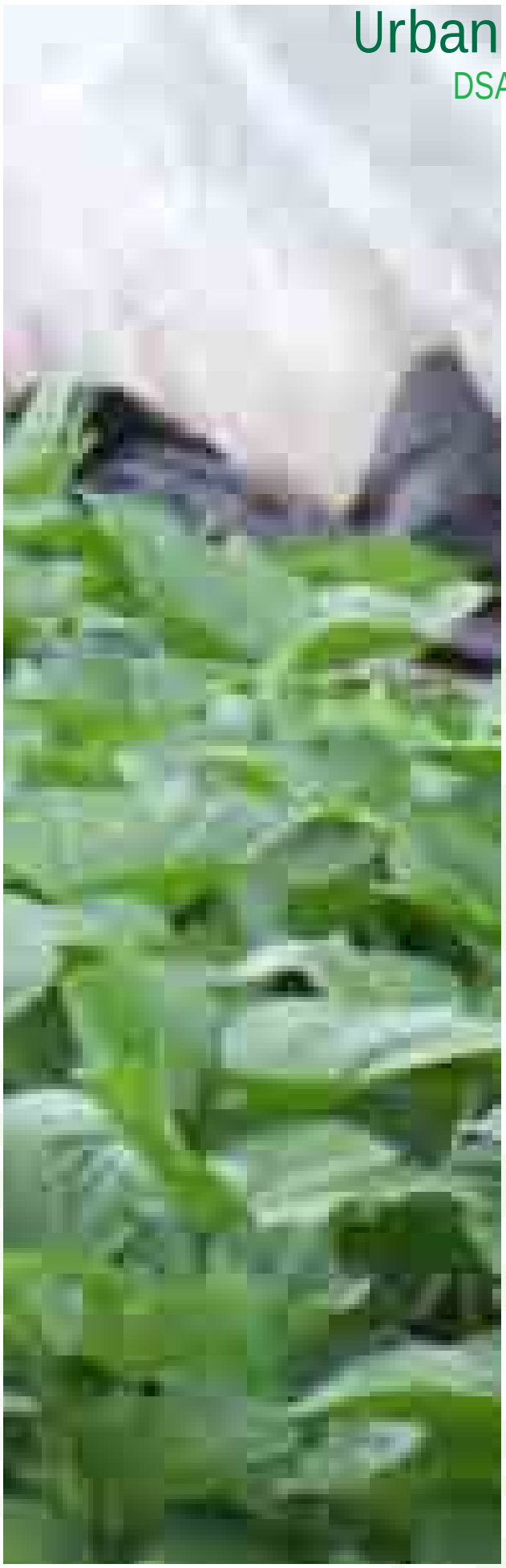
Urban gardening in Pohnpei

DSAP Federated States of Micronesia



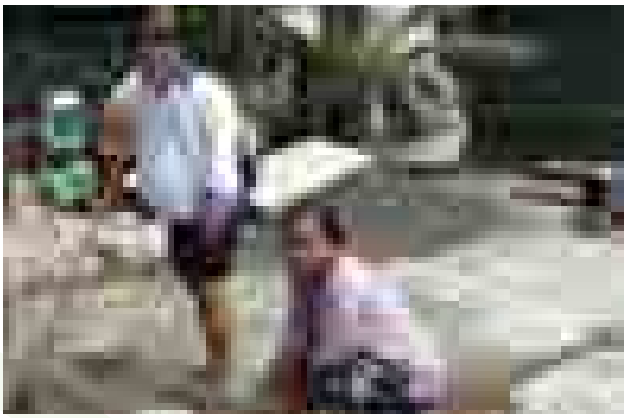
Many of the communities who live in Kolonia Town, Pohnpei, have migrated from the outer islands. A large number of them live in densely populated areas around the town with inadequate space for planting.

The Mayor's office initiated the project to promote urban gardening to residents of Kolonia. The Mayor wanted to assist with improving the livelihoods of his urban dwellers, many of them living in overcrowded conditions, earning low income and only able to afford cheap, imported food with low nutritional value.

A participatory community consultation was held with members of the community, local chiefs, the Mayor and the Senator to identify the challenges the community faced in relation to planting vegetables and crops near their houses, as well as possible solutions to improve the situation.

Working with the urban communities to establish little vegetable gardens in their confined spaces was an exciting challenge. Other agencies came together for this initiative, sharing their expertise and resources and strengthening the network of collaborating agencies.

Preparing soil for pots in Kolonia.



Preparing potting soil in Sokesh municipality.

Planting vegetable seeds using discarded basins in Kolonia, Community 1.

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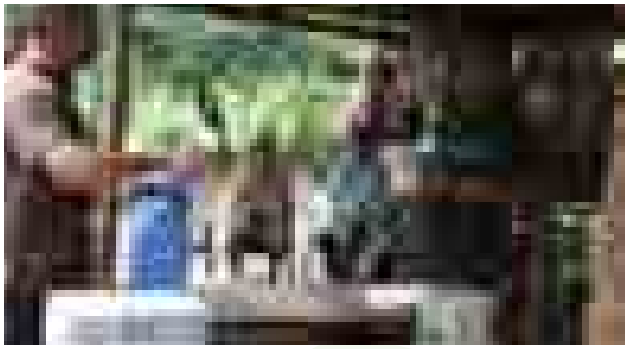
The experience of a key farmer, Kamar, Nett Municipality, Pohnpei

DSAP Federated States of Micronesia

Working with key farmers encourages farmers' creativity and innovative ideas. It is also an opportunity to capitalize on their skills, knowledge and experiences.

Key farmers training at the Pilot Farm.



The late Mr. Falani Aukuso, Deputy Director General, Secretariat of the Pacific Community, gives a wheelbarrow and sprayer to key farmer, Francisco Marcus.

DSAP FSM worked with key farmers to achieve the objective of increasing sustainable agricultural production for home consumption. Using participatory rural appraisal surveys, DSAP consulted with farmers of Pohnpei State, from the municipalities of Nett, Kitti, Sokehs, Madolenihmw and U.key. Key farmers were identified from the results of this survey and DSAP worked with them to promote an increase in agricultural production.

The story of Francisco Marquez, key farmer from Kamar, Nett Municipality

After Francisco was selected as a key farmer, he worked closely with the staff from DSAP FSM and extension officers from LANDGRANT to learn all about the roles and responsibilities of a key farmer. The following process was used with Francisco,

- Identified Francisco during PRA survey, Nett,
- Visited his farm and identified his cropping system,
- Assisted him to extend his farm,
- Supplied materials for a new nursery,
- Supplied vegetable seeds and taro varieties (*Colocasia* sp.),
- Trained Francisco and his community members on basic agronomic aspects,
- Provided training on recommended plant spacing for vegetables,
- Provided training for Francisco and the community members on seed production.

Francisco with eggplants.

MOST SIGNIFICANT CHANGES DUE TO BEING A KEY FARMER			
TECHNICAL/ AGRICULTURAL KNOWLEDGE	**COMMUNAL/ SOCIAL**	**INCOME**	**HEALTH**
Francisco's farm has been extended from 20 x 25ft to 50 x 100ft	Increase in participation in agricultural activities by his community	Five subsistence farmers are selling surplus crops at the market since receiving training and technical advice through the project	There is a change in the diet pattern of the community. Previously 2 cans of corned meat would be cooked with vegetables. Since producing their own vegetables and learning the importance of vegetables in the diet, the two cans of meat are now reduced to one can
Nursery moved from boundary of the farm to a central location near the farm	Increase in the number of people visiting Francisco's farm to learn from his experiences	Two farmers have become fully commercial farmers, using agriculture as an income generating activity	Children are acquiring the habit of eating vegetables.
Adoption of composting methods more efficient			There is an increase in the consumption of edible root crops as a staple. Previously imported rice was the main staple
Increased supply of seedlings from knowledge of producing own seeds			
Knowledge of proper spacing of plants			
Appropriate technology for managing cucumber plants			
Increased number of taro varieties on farm			

"In order to have success in working with communities or key farmers, it is important that the project is honest with them on expectations.
The project has to be sensitive to gender roles and we have to be honest with farmers and not take them for granted".

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Strengthening agricultural productivity

Building capacity of farmers and extension officers

DSAP Fiji

A lot of financial support has been provided to the Agriculture Sector with the aim of increasing agricultural activities, elevating farmers from subsistence to semi commercial and commercial levels, and promoting exports and import substitution. Unfortunately, such initiatives have been unsuccessful judging from the high level of importation of vegetables and other agricultural products. One of the major contributing factors to this is that farmers lack the capacity to operate and participate at commercial levels.

DSAP Fiji saw the need to focus its activities on capacity building programmes at all project sites.

Capacity building programmes were designed for both parties: the farming communities and technical staff of the ministry.

CAPACITY BUILDING PROGRAMMES

FARMER TRAINING

1. Technical training

The farming communities at DSAP Fiji sites received hands-on-training from Research & Extension staff through the establishment of demonstration plots on crop husbandry practices, fertilizer application, chemical application, identification of pests & diseases and nursery management. Since the demonstration plots promoted a slope-land integrated agricultural system, the Land Use Section included *vetiver* grass and calliandra as conservation measures. It is very important for farmers to understand the importance of protecting and managing natural resources.

Training workshops were also organized to educate farmers in post harvest handling, apiculture (by Animal Health & Production staff), quarantine regulations and the basics of farm management (time & financial management, record keeping and budgeting).

"It is advisable to conduct a survey to gauge basic training needs in communities before selecting topics to be covered for training. The topics selected for training and workshops must be based on these needs."

2. Farmer-to-farmer sharing

Farmer field days, excursions to well established farmers in the commercial and export arena, farmers training other farmers, and engaging key farmers as facilitators in workshops had a large impact on the lives of the target farm communities and other farmers from nearby communities. It is advisable to conduct a survey to gauge basic training needs in communities before selecting topics to be covered for training. The topics selected for training and workshops must be based on these needs.

DSAP experience with communities, shows that knowledge of farm management is critical in ensuring sustainability for target farmers. Record keeping, time management, planning and budgeting are crucial in any commercial enterprise. Shifting from subsistence farming to semi commercial and commercial farming means farm management skills are needed for better use of resources and time. Without such skills, farmers will fail to achieve their full potential.

Druadrua women prepare their demonstration nursery.

Druadrua women working with Extension Officer, Asenaca, during vegetable gardening training.

CAPACITY BUILDING PROGRAMMES

TECHNICAL STAFF TRAINING

1. Awareness raising for staff

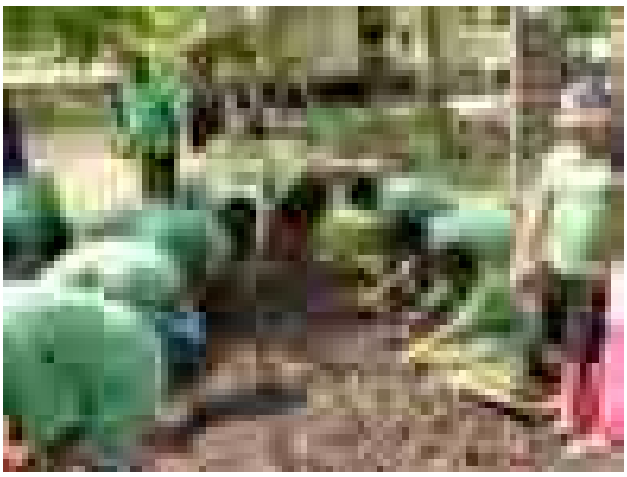
In agricultural development projects like DSAP, the technical staff in government stations are important players. Project implementers must ensure that technical staff are well versed in the objectives of the project. They must also be involved in project planning, implementation, training and monitoring. Prior to project implementation, DSAP Fiji organized tours to Divisions where project sites are located to meet Extension and Research officers and create awareness of the DSAP project, its aims and objectives, target groups, log frame, work plan and activities. These awareness tours were carried out in the Central, Western and Northern Division.

Similarly with communities, training needs must be identified at an early stage and training programmes organized accordingly. In a bid to promote participatory approaches to the technical officers within the Ministry of Agriculture, PRA training was conducted in relevant stations where DSAP project sites were located. Altogether, 3 PRA training sessions were conducted covering the participatory approach to development using various PRA tools, effective communication techniques and community engagement processes. The same PRA training package is now used when there is a demand from other offices outside DSAP project sites.

2. Value-added training

The training needs assessment indicated that technical officers have received a substantial amount of training in technical areas. However, the results identified other areas of training that would assist them to effectively deliver knowledge and skills to their target audience. Such topics include basic computer applications (Microsoft Word, Excel, PowerPoint), using the internet, and human resource development such as motivation, teamwork, time management, and effective communication skills.

Information and communication are important in agriculture development programmes. In information and communication needs assessments carried out at the beginning of the DSAP project, communities identified that they would like to receive agriculture information in video or CD/DVD formats. As a result, DSAP Fiji facilitated training for Information Officers from the Ministry on video production. As a result, the information unit of the ministry has been able to produce agriculture information as audio–visual programmes for screening on television and for wider dissemination.



Druadrua women transplanting seedlings from nursery to garden bed.

For the **sustainability** of **agricultural projects** (or any development projects), there needs to be **regular** training delivered using **language** understood by the target communities. **The facilitator of the workshop** must also have good **communication skills** so that his/her presentation is effective.

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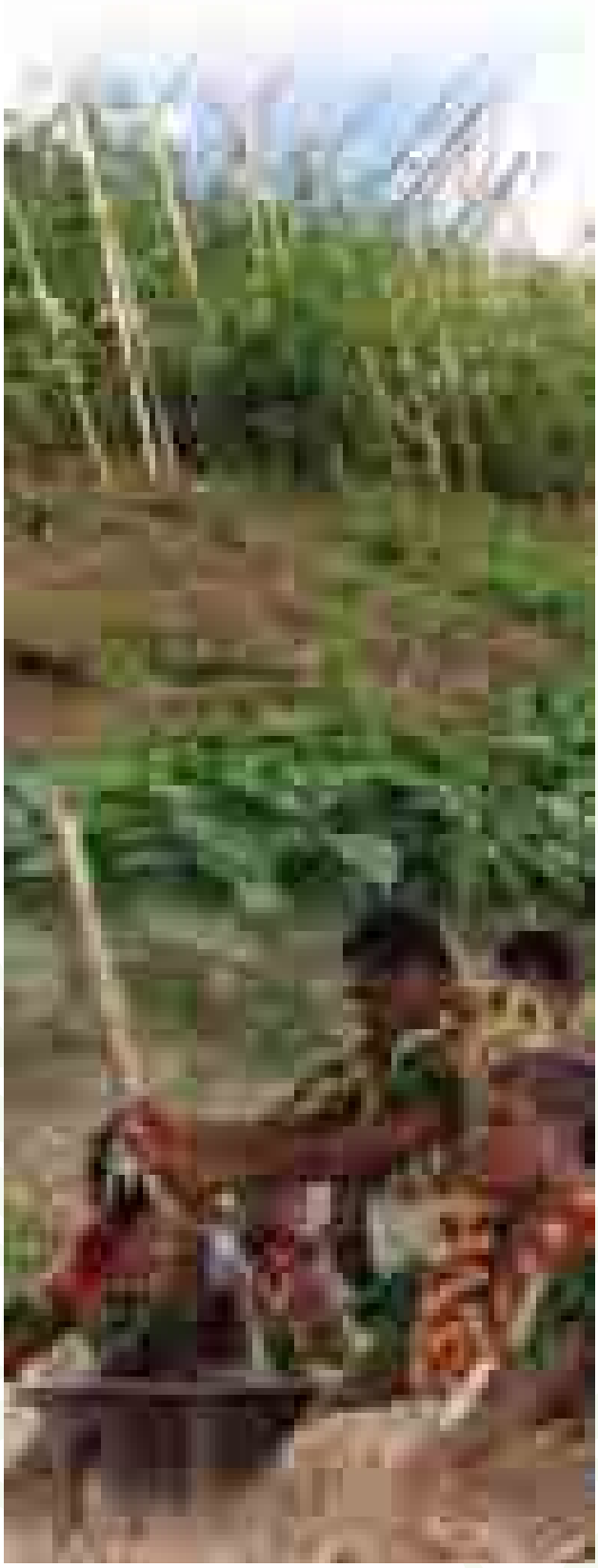
Using traditional structures to promote agriculture - slopeland farming in Tilivalevu village, Nadroga/Navosa

DSAP Fiji



The village of Tilivalevu, Nadroga/ Navosa, is located 15km from Sigatoka town. The topography of this area is undulating to steep land. The families in Tilivalevu never thought their slopes were possible for any other form of agriculture than cattle grazing. Income is generated from wild fruits, root crops and assorted vegetables, with crops and vegetables farmed in the off season of the more fertile Sigatoka valley. Men from the village regularly leave their families for months looking for work as part of the cane gangs during the sugar cane harvest or pine-harvesting seasons. DSAP Fiji assisted the community to find alternative forms of livelihood.

DSAP Fiji activities at Tilivalevu village included the following:

- Soil conservation and enrichment technologies
- Integrated agricultural systems (integration of livestock into cropping systems)
- Food and income security
- Farmers trained in agricultural techniques and appropriate practices
- Participatory approaches to resource development
- Strengthening linkages with ministries and stakeholders
- Enhancement of knowledge and skills of national extension and research staff

METHODOLOGY
Mobilising the stakeholders

Sensitising the community
It is important to sensitise the community to the project activities and the expected outcomes and outputs. Equally important is to be honest with the community on project expectations and to also hear from them their expectations of the project. For the community at Tilivalevu village, this sensitisation process took place using participatory tools with assistance and support from the staff of the Sigatoka Extension Service and the Land Use Department.

Integration with the ministry
Collaboration from the research, extension and land use sections of the ministry was important for the delivery of technical advice and training to the Tilivalevu community.

Using a participatory approach
Training of extension officers in the participatory approach to community consultation was held at the village. This enabled the extension officers to engage in participatory dialogue with the community at Tilivalevu.

Forming a committee
A Local Technical Committee (LTC) with representatives from the Research Unit, the Land Use Section, the Extension Unit and members of the community at Tilivalevu was set up to administer the activities at Tilivalevu village. The LTC provided guidance for the agricultural activities carried out at Tilivalevu.

Community organisation
Three demonstration plots were established at Tilivalevu with the 24 families divided into the three traditional family units (*tokatoka*). There were 8 families in each *tokatoka*. The plots were named after the family units: *Tokatoka Sunahali, Tokatoka Talenaika* and *Tokatoka Marou*.

Implementation

Land Preparation
Each *tokatoka* allocated 1 acre each for the project activities. In October 2004, the community together with staff from the industry worked together in the traditional *'solesolevaki'* system of working and performed land clearing, weeding, ploughing and fencing. Poultry manure was applied 2 weeks before planting to enhance the soil fertility of the steep land areas.

Due to an inadequate supply of water for the plots, each block was provided with five 44 gallon drums and 6 watering cans to assist with the watering of the plots.

Husbandry practices

CROPS	VARIETY	SPACING	FERTILISER RATES AND TIMING	EXPECTED YIELD (t/ha)	AVERAGE ACTUAL YIELD ATTAINED (t/ha)
English Cabbage	KK Cross	1m x 0.4m	Poultry manure at 10t/ha - 2 weeks before planting. N:P:K 200kg/ha. 913:13:21 - Basal before planting. Urea 100kg/ha 2nd and 4th week after transplanting.	15	14.1
Tomatoes	Alafua large	1.5m x 0.5m	Same as above	10	5.9
Capsicum	Blue star	1m x 0.5m	Same as above	10	6.0
Cucumber	Bountiful No.2	1.5m x 0.5m	Same as above	20	17

Insecticides used: Malathon (30ml/15l)
Lannate (30ml/15l)
Stewart (5ml/15l)

Weed control
Manual - hand weeding, hoeing and pulling out weeds around plants
Chemical - *glyphosate* (Round up - 150 ml/15l)

CHALLENGES

- At the beginning of the project, the villagers' mindset was geared towards cattle grazing as the only activity that could work in their area. Through dialogue and awareness-raising and training, villagers realised that other farming practices, such as vegetable farming, could assist them in improving their income-earning capacity.
- The non-involvement of women and youth at the beginning of the project was a challenge. The project encouraged the chief to attend workshops that covered gender issues as well as other workshops on conservation issues. From these workshops he was sensitised to women and youth issues and managed to influence village elders to accept global changes locally.
- Facilitating the different sections of the ministry to work together during the implementation of the project was a challenge. Bringing the different sections together to work as a team for DSAP involved a lot of negotiations and discussion because each section had its own work programme and objectives.

MOST SIGNIFICANT CHANGE

- The sale of vegetables from the three demonstration farms generated approximately FJD 24,000 within 3 months. This money was deposited into 3 accounts - one for each farming group. Members of the group were able to borrow from their account to assist in establishing their individual farms.
- Farmers are taking the leading role in planning their farming activities and are taking ownership of the project. From the three demonstration sites established by DSAP, there are now 19 individual farms with 1 farm for the youth group. Farmers now want to produce vegetables not only for the off-season for vegetables but also during the season.

LESSONS LEARNED

The initial stages of the project are the most crucial and most challenging.

Clear and effective communication between the project and the community is very important. The project must ensure that the community understands its objectives and expectations and the level of commitment required from the community. The project must also inform the community of its own level of commitment to the community. Channels of communication between the project and the community are also identified at this stage so that communication between the two parties is consistent.

Traditional protocols

In Fiji the presentation of a *sevusevu* to the chief and the village elders is an integral part of any visit to a Fijian community. Through this *sevusevu* presentation, the project is informing the community of its intent and this is an opportunity for the first round of discussions where the acceptance or rejection of the project by the community is often made known. If the project has been accepted by the community, the date of the subsequent visit is often scheduled at this stage.

Planning of project activities must include the community

This is an important component of project implementation as planning together with the community ensures that project activities do not clash with other communal obligations. This participatory manner of planning also makes it possible for everyone to understand the role and responsibilities required of them.

Men, women and youth must be involved at all stages of the project

While men have been the decision-makers in traditional Fijian society, it is important to encourage the inclusion and participation of women and youth in all aspects of the project cycle. In projects that are labour intensive like the DSAP one, involving all members of the community is a source of empowerment and education and has multiple positive benefits for the community.

An integrated and holistic approach is important

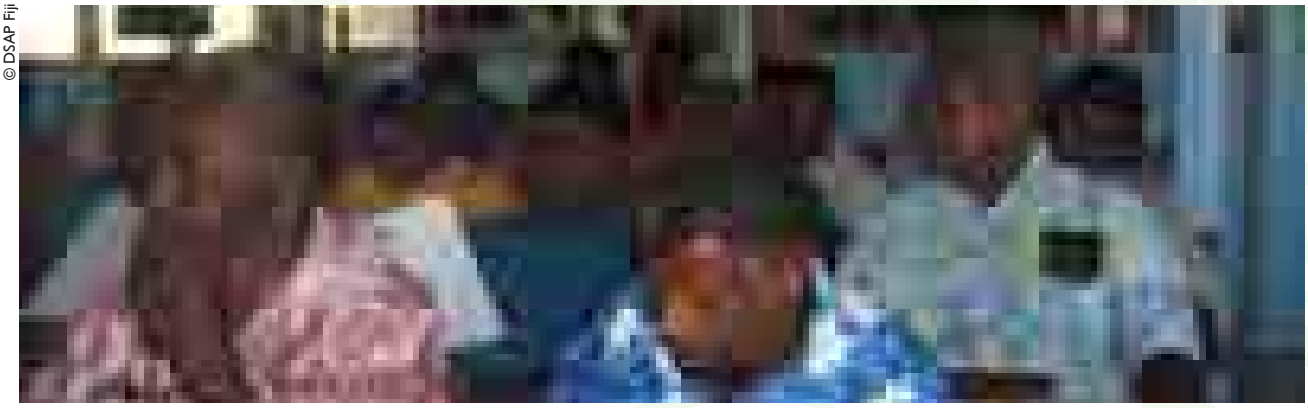
At the project level, it is important to have an integrated approach to working with communities. In this case, the various units within the Ministry of Agriculture worked together in their approach towards the community. The Land Use, Research and Extension units all joined together and shared expertise, resources and time in advising the community. This approach not only benefited the community but also strengthened relationships within the ministry itself.

A holistic approach is also important in the sharing of knowledge and information with the community. DSAP was able to facilitate the community receiving the following information and services: nutrition information; rural banking services; and linking market services for the farmers.

The importance of monitoring and evaluation

It is important that the project staff work with the community on monitoring and evaluation purposes. Community members must be made aware of the value of constant monitoring and evaluation not only for achieving project outcomes but also as an educational tool for the community.

Continuous and constant follow-up visits by project staff is encouraged, particularly in the early stages of the project. Not only does this ensure that the project is being implemented, but it also allows the community to raise issues they may have directly.



Fijian farmers at workshop.

DSAP Fiji Sites

Tilivalevu (Nadroga Province) - The Land Use Section had organised implementing of land conservation technologies because of the physical environment where Tilivalevu village is situated. DSAP continued with the land use technologies and combined them with advice and expertise from the Extension and Research Units respectively. This combination of advice and expertise added value to the farmers' agricultural knowledge and assisted them with the shift from subsistence to semi-commercial agriculture.

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Field Day at Tilivalevu (Nadroga Province).

Nabalabala (Ra Province) - There are major tourism and other commercial developments occurring within the Ra Province, one of which is the establishment of Studio City. DSAP has therefore taken advantage of this opportunity to boost farmer participation in the economy to contribute to minimising importation of vegetables and fruits.

The Nabalabala farmers are mostly cane farmers. Over the past 3 years, their cane production has been stagnant and in some cases has dropped. With this current trend and the downturn of the sugar market, DSAP assited by promoting a farming system that could stabilise and improve the livelihood of the farmers.

Drawa (Cakaudrove Province) - This site is actually a SPC GTZ model area better known as the "Drawa Model Area" where sustainable forestry management has been promoted. The model area consists of four villages but the DSAP site is situated only in Drawa village.

DSAP's Local Technical Committee is promoting sustainable agricultural practices in Drawa so that the site has a more integrated approach towards development.

Young People's Department (YPD) - This is a centre where approximately 100 young people are trained annually to serve as catechists in Methodist churches in Fiji. The site was chosen in line with SPC's focus on promoting agriculture to youth as a means of income generation for the young people in the Pacific Region.

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Nasinu Secondary School students planting bele.

Nasinu Secondary School (Suva) - The Fiji School of Medicine's ACIAR project, OPIC (Obesity Prevention in Communities) promotes healthy youth and healthy communities to several secondary schools within the Suva - Nasinu corridor. They formally requested DSAP to assist in the promotion of local fruits and vegetables to their site at Nasinu Secondary School.

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Young people participating in land clearing and preparation.

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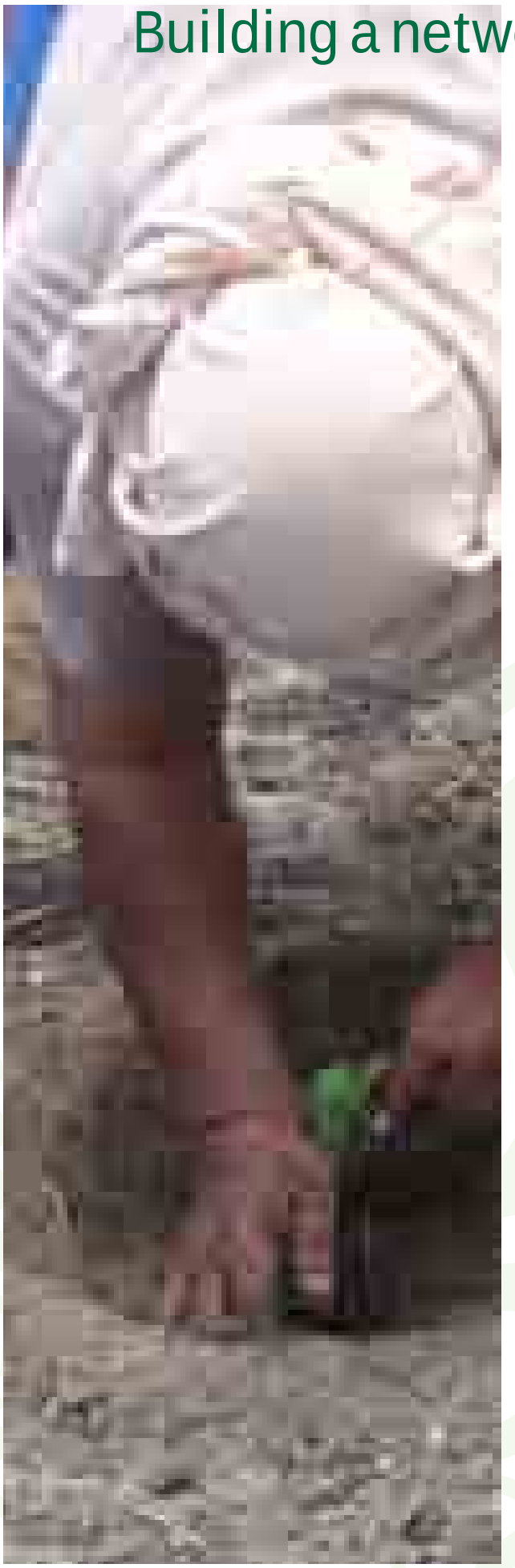
Building a network amongst growers

DSAP French Polynesia



In French Polynesia, growers tend to work alone or as a family unit. Growers do not rely on each other. There is no growers' network ……

Acknowledging that growers were used to working individually, DSAP French Polynesia mapped a participatory approach where farmers continue with their individual work but at the same time have access to a network of information that can only improve their lives as growers.

To achieve this, DSAP at first consulted with the growers. The results from the consultation determined the activities which were broken into the following process:

- work with sufficient number of growers to enable a validation of techniques,
- different trials are implemented with each grower, allowing a greater number and variety of results,
- dividing the work between growers, allowing each grower to be responsible for a small part of the total objective, and
- creating a team spirit around the DSAP project activities through discussions amongst the groups, on-farm open days and visiting other growers.

In order to implement this process the following numbers of sites were set up:

Huahine Island - 100 watermelon growers; 13 were selected for on-farm demonstration plots.

Maupiti Island - 40 melon and watermelon growers; 5 were selected for on-farm demonstration plots.

Fakarava Island - 148 growers; 14 were selected for on-farm demonstration plots.

On agreeing to host an on-farm demonstration plot, the grower enters into an agreement that allows free access to anyone interested in the trial on his farm. The grower also agrees to provide information to visitors and share results with other growers.

The DSAP staff collated results from the growers and disseminated them to other growers through meetings, farm visits and information resources.

DSAP staff member, Moana, giving advice to watermelon farmer, Huahine Island.

The challenges of such an exercise included

Dependency on the extension service as growers preferred to wait for the extension officer rather than use the knowledge and equipment they have been provided with during training.

A decrease in motivation on the part of the growers, who had been so accustomed to frequent contact with the extension service. The training workshops and demonstrations provided for the growers were complemented with frequent visits by the extension officer. The sharing of technical information with the growers meant that the scaling down of visits by extension officers was a necessity; this was found to impact negatively on the growers. Some growers were discouraged by this decrease in frequency of contact and ceased maintaining their plots.

The high costs of travel to the islands, which made follow-up visits by extension officers an expensive exercise. This had repercussions for the project activities and results.

Disappearance of the 'network'–the dynamics that have been built around the activities facilitated by DSAP could disappear with the end of the project. The growers will return to their farming activities without utilizing or sustaining the experience that was gained during the on-farm trials.

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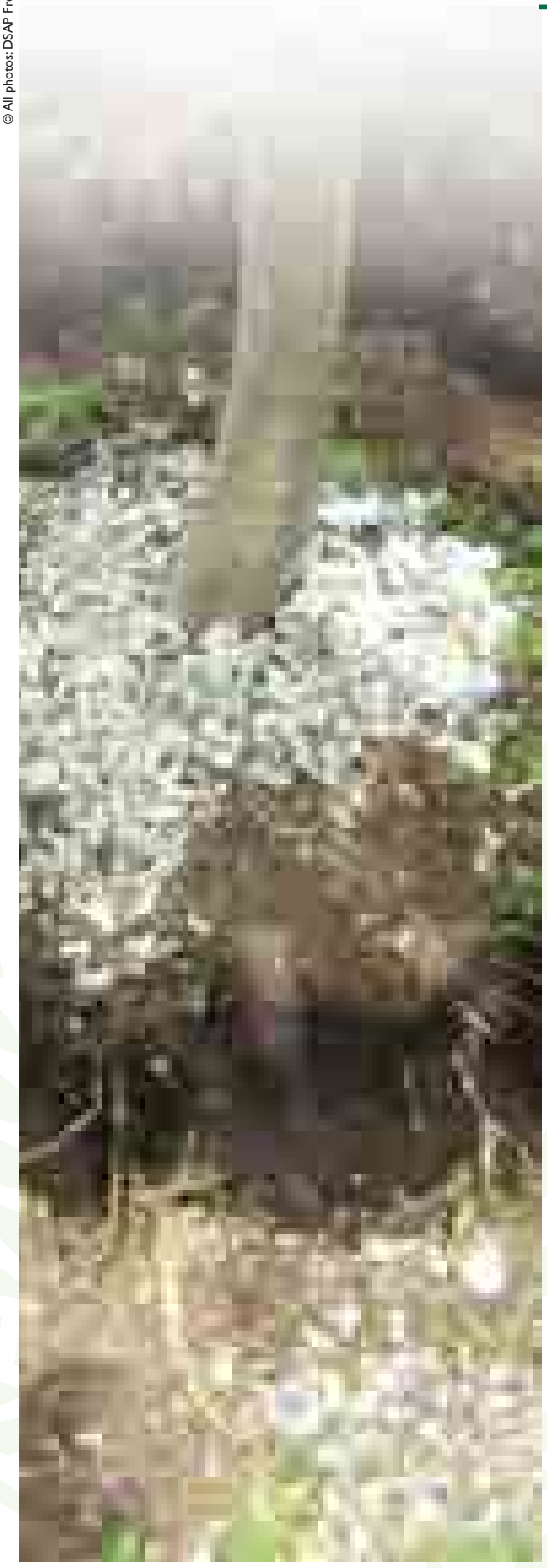
Simple agriculture technologies for the Tuamotu island group

DSAP French Polynesia



The islands in the Tuamotu group are largely atolls with little arable land and limited access to fresh water. The islanders are dependent on boats and planes to supply their fruit and vegetables. A survey conducted among the islanders revealed that the imported fruits and vegetables were expensive and not of a high quality.

Various interventions in the areas of improving food security have been implemented in the Tuamotu's but with limited results. The DSAP project intervention included a participatory approach targeted at identifying and finding solutions to improving food security and livelihoods. During the consultations with the communities, challenges and strengths in setting up fruit and vegetable gardens were discussed.

Map of Tuamotu group.

Challenges included the isolation of the island group resulting in a dependence on shipping and airfreight, which meant high costs of fruit and vegetables; an unfavourable environment for farming due to the poor coral soils and limited amount of fresh water; poor soil fertility from the coconut monoculture on the land; land issues as land is communally owned and there can be issues over land development; and the lack of agriculture infrastructure in the Tuamotu's, ranging from lack of farming equipment and supply of inputs to lack of knowledge on pesticides and fertilizers and lack of markets.

Coconut fibre cutting on Fakarava Atoll.

Strengths that support the setting up of fruit and vegetable gardens include a small number of plant pests and diseases due to the lack of agriculture activities and the island group's isolation; frequent and reliable transportation by sea and air; a small and steady source of income from copra that complements their fishing and tourism activities; and the existence of a tourism sector in the island group, which means that there is potential for a viable fruit and vegetable market.

Visitors observe a grafting demonstration during Fakarava Open Day.

Having identified the challenges and strengths for fruit and vegetable gardening in the Tuamotu Islands, the next consultation involved looking at the problems identified and possible solutions for promoting fruit and vegetable gardening in the Tuamotu group. These consultations to identify problems and solutions were held with two groups: the islands' smallholder producers and the islands' consumers (tourist boarding houses and private citizens).

RESULTS OF CONSULTATION WITH SMALLHOLDER PRODUCERS

PROBLEMS IDENTIFIED	POSSIBLE SOLUTIONS
Poor alkaline soils are not suited to market garden crops.	Demonstration of soil-less coconut fibre farming Using compost and organic fertiliser to help improve soil fertility.
Fertilisers could leak into the island water tables. This leakage over a period of time could contaminate the water table.	Use compost and set up charcoal trials to improve soil fertility.
Purchasing of soil from Tahiti is expensive and there is the risk of infestation by diseases and weeds. There is a lack of suppliers on the island and agriculture inputs are quite expensive.	Use cost effective methods like compost to replace soil. Demonstrations and training on the production of fish fertiliser and biopesticides.
People hold several jobs and have little time to spend managing their fruit and vegetable gardens, for example, watering the gardens.	Use of bucket irrigation system.

RESULTS OF CONSULTATION WITH CONSUMERS

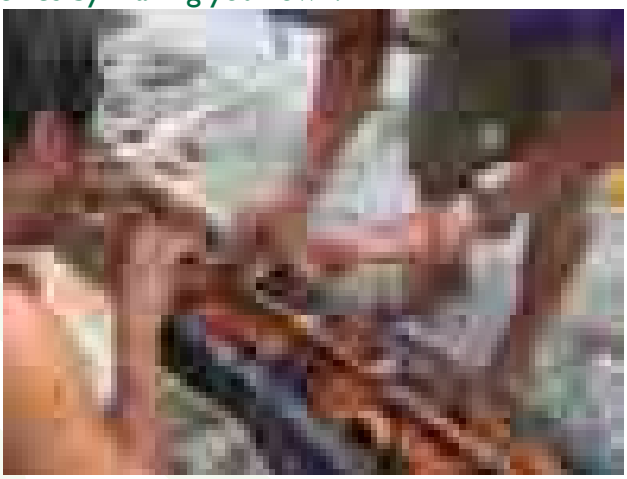
PROBLEMS IDENTIFIED	POSSIBLE SOLUTIONS
Local production of fruit and vegetables is inadequate to meet demands. Fruit and vegetables imported from Tahiti are too expensive.	Consumers to receive training and information on setting up their own vegetable gardens.
Where there is a local supplier, the production is irregular.	Set up annual individual or group cropping calendars to ensure a consistent and regular supply of fruit and vegetables.
Very little variety in what is available locally. Everyone grows the same thing.	Conduct a variety of trials on a variety of subsistence and market crops to promote diversified local production.

SUMMARY OF DSAP ACTIVITIES FOR THE TUAMOTU ISLAND GROUP

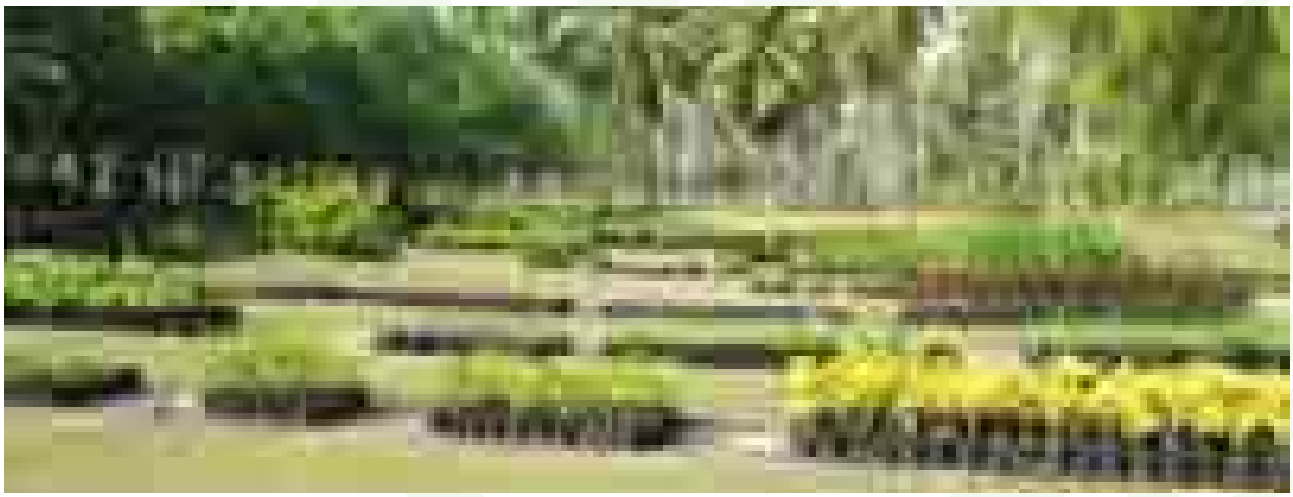
Based on the community consultations, the following activities were identified as DSAP interventions,

- Raising awareness among youngsters about the benefits of eating fruits and vegetables through the creation of school gardens.
- Producing a variety of crops to meet the demand of local consumers.
- Setting up a crop calendar with the growers to ensure a steady and consistent supply of fruits and vegetables.
- Promoting the use of soil-less coconut fibre growing techniques for vegetable growing.
- Using local compost to improve soil fertility.
- Promoting the use of the bucket irrigation system for more efficient use of water.
- Reducing money spent on fertilisers and pesticides by making your own.

Young children listen and observe a grafting demonstration, Fakarava Open Day.



Planting lettuce in a bed of coconut fibre - Fakarava Island.



The nursery of the Service du développement rural, Fakarava Atoll.

Conclusion: Project impact

Less than a year after the community consultations held in the Tuamotu Islands, impacts of the activities are visible not only to the consumers and producers on the island of pilot Fakarava but also on neighbouring islands.

(1) Impact on consumers

Family-run boarding houses, the main consumers on the island, were the first to become involved; **of the 9 family run boarding houses on the main island, 5 took part in the project.**

Since the activities began, the number of vegetable gardens has increased considerably with 7 more gardens! Before DSAP intervention, there were already 5 market gardeners, which means **a 58% increase in the number of market gardeners on this island.** One of the project's partners is now setting up a small greenhouse to intensify his system. He plans to use the vegetables for his own needs and sell the **surplus production** to snack bars.

Finally, several of the project partners have said that they have been buying fewer vegetables from Tahiti (some none at all) ever since they have had their own gardens. In some family-run boarding houses, vegetables, which used to be strictly reserved for clients, are now eaten by everyone. So, two trends can be seen:

- **Decreased dependence on imports** for fruit and vegetable supplies
- **Increased consumption of fruit and vegetables**, a positive point for the health of Tuamotu islanders, whose diet is rich in protein and starchy foods.

Preparing growing trays of coconut fibre, Fakarava Atoll.

(2) Impact on farmers

Most of the farmers on the atolls are small-holder producers. Following the fruit and vegetable needs survey carried out by the DSAP project, they realised that there was a high demand for fruit and vegetables, mainly from the tourism sector, and that it was being met by imports from Tahiti.

In addition, with the work DSAP has done with family-run boarding houses, the farmers realised that if they did not fulfill their role as producers, the boarding houses were still able to receive supplies of fruits and vegetables.

So, to better meet this demand, farmers **increased their farming acreages** and rotated crops to allow for **production on a more regular basis.**

Most farmers on the island already knew about and used both composting and coconut fibre farming. The activities carried out with them consisted of **improving production systems,** e.g. rotations, variety selection, improving the soil, and better dosage of fertilisers.

Using drip irrigation promoted by DSAP on a farmer's plot, Fakarava Atoll.

(3) Impact on other atolls

Broadcasting of technical documentaries, word of mouth, publication of an article about the activities on Fakarava, etc. have made it possible to transmit information on the techniques promoted by DSAP.

In this way, regular contact was established with people who have agricultural projects, teachers, pearl oyster farmers, etc. who wanted information or technical support on composting, setting up coconut fibre farming or irrigation systems.

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  (recipes for homemade pesticides)

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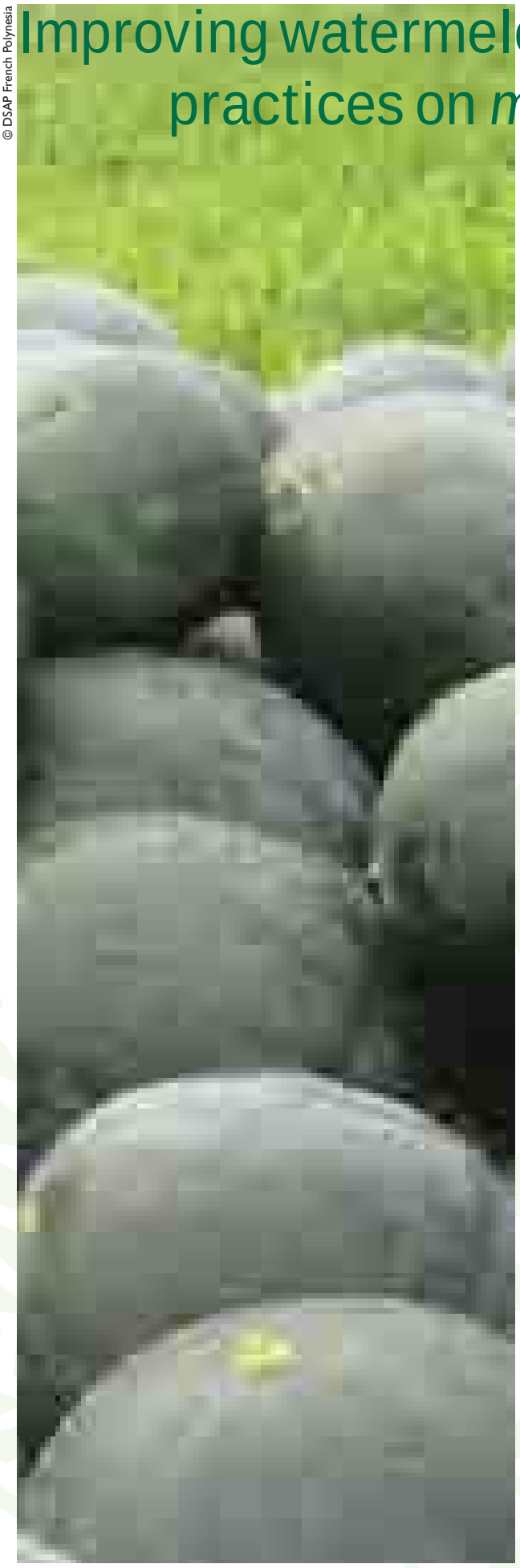
Improving watermelon and melon farming practices on *motu* : Leeward Islands

DSAP French Polynesia



The watermelons are grown on the motu in holes 40cm in diameter and 20cm deep, with spacing of 1.5m x 1.5m. The soil on the motu is sandy and rocky so the holes are filled with arable soil from the neighbouring high island. The farmers usually purchase the soil at a cost of CFP30,000(equiv. USD315) for almost 5 cu.m. This soil is replaced every 3-4 years.

Watermelon farming practices on the *motu* before DSAP

SOIL IS REGULARLY BROUGHT TO THE *MOTU* FROM THE HIGH ISLANDS

This makes the *motu* vulnerable, as weeds and soil diseases can be transferred through this movement of soil.

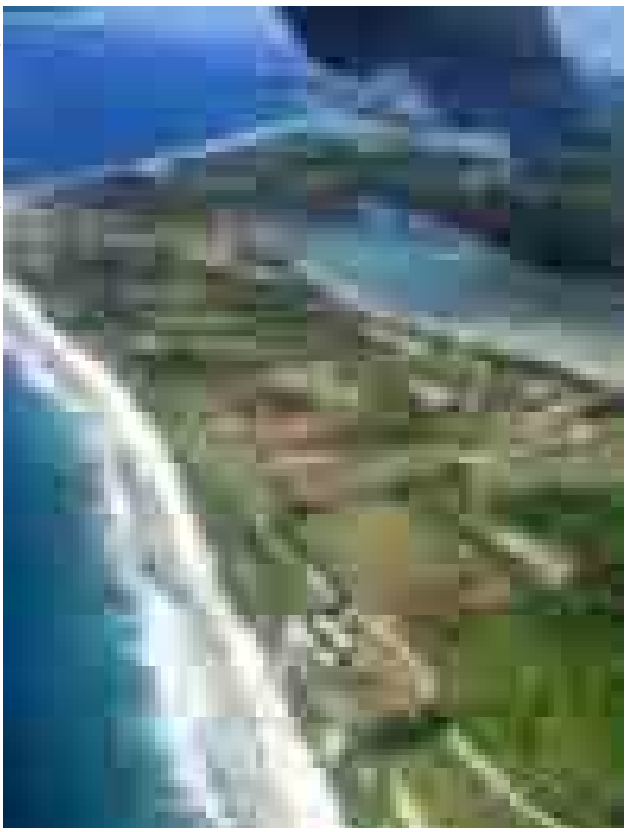
POOR PEST AND DISEASE MANAGEMENT

Application stages, rates and dosages of weedkillers, insecticides or fungicides are poorly understood indicating a lack of training and information for the growers. It was also found that the growers do not wear protective clothing when applying these solutions.

These poorly managed applications of weed killers, insecticides and fungicides also lead to pollution of water tables, and health hazards for the grower and their families, as well as a health hazard for the consumer of the products.

POOR MANAGEMENT OF CHEMICAL FERTILISERS

High fertiliser dosage occurs twice a week for the watermelons and melons on the *motu*. Groundwater tests conducted by DSAP indicated nitrogen, a particularly leachable substance that will cause pollution problems for the water table.



Aerial view of Maeva motu with watermelon fields, Huahine Island.

Preparing the land at a demonstration plot on Huahine.

During the community consultation with DSAP, farmers identified the following as challenges to more efficient watermelon production: high cost of input (fertilisers and pesticides), marketing difficulties, high cost of labour, risk of pollution, lack of proper information and low soil fertility.

The DSAP intervention with the watermelon farmers covered six areas,

1. Increasing yields by improving soil fertility through the use of organic matter.
2. Increasing yields through proper fertiliser management.
3. Increasing yields by adjusting irrigation - water pH.
4. Using bucket irrigation system for more efficient use of water.
5. Mulching for weed control.
6. Proper pest and disease management.

1. Improving soil fertility through the use of organic matter

Two types of organic matter were used in this trial:

- Locally manufactured commercial compost made from the local council's 'green waste', and
- Commercial organic fertiliser made from poultry droppings and pig manure.

Methodology

BEFORE PLANTING	
COMPOST APPLICATION 2 shovelfuls of compost added to each planting hole. This is mixed with the soil.	ORGANIC FERTILISER APPLICATION Recommended application by the manufacturer was used, i.e. 350 g per planting hole mixed with soil prior to planting.
Two trials were conducted and crop growth in these trials was measured according to the addition or not of organic matter.	
RESULTS	
Compost used in addition to chemical fertilisers resulted in 5% increase in yield. There is cost incurred in using compost but this was recovered when grower income increased by 16% when the compost was used.	Organic fertiliser added to chemical fertilisers resulted in a 4.4% increase in yield. Although there is cost incurred in using organic fertiliser, the cost was recovered when grower income increased by 3% as a result of this method.

Conclusion

The results of these trials indicate a clear yield increase and therefore increase in grower income when organic matter was added to improve soil fertility.

Chicken manure for making compost, Fakarava Atoll.

Compost after breakdown of materials, Fakarava Atoll.

2. Increasing yields through proper fertiliser management

Objectives:

- To reduce costs of purchasing fertiliser for the producer.
- To reduce pollution hazards from chemical fertilisers.

Methodology

- Fertiliser amounts calculated according to crop needs and soil characteristics.
- Owing to sand and porous soils, applications were spread throughout the cropping cycle.
- To meet plant needs, nutrient ratios were adjusted according to the crop's development stage. Nitrogen was increased during plant growth and potassium was increased during the fruiting stage.

FERTILISER TRIALS			
TWO COMPARISON TRIALS ON FERTIGATION PLOTS		TWO COMPARISON TRIALS ON TWO FERTILISERS USED IN THE SOIL	
Trial 1 Nutrient ratio of 20/20/20 fertiliser throughout the crop cycle.	Trial 2 Nutrient ratio varied in terms of plant needs, using 3 successive fertilisers.	Trial 3 Nutrient closely matched plant needs 12/12/17.	Trial 4 Nutrient was less close to plant needs 17/17/17.
RESULTS			
Adjusting the nutrient ratio according to the plant's development stage (successive fertilisers) in order to meet plant needs led to a 27 – 123% increase in yield depending on the variety.		Depending on variety, there was a 26.9 – 81.5% increase in yield when using the 12/12/17 fertiliser. The 17/17/17 fertiliser was found to be too rich in nitrogen and also very costly.	
SUMMARY The trials confirmed that fertilisers adjusted to suit the crop's nutrient needs were more effective.			

Conclusion

When comparing the fertiliser quantities used by growers on their plots and the amount used on trial plots, it was found that:

- Growers applied twice as much fertiliser as that applied to the trial plots, and
- Yields obtained by the growers were no higher than the yield from the trial plots.

By choosing fertilisers carefully and adjusting doses to suit plant needs:

- ***Fertiliser use can be reduced,***
- ***Fertiliser costs can be reduced,***
- ***Pollution hazards can be mitigated by using amounts that plants can assimilate, and***
- ***Fruit yield and quality yield can be maintained and even increased.***

3. Increasing yields by adjusting irrigation water pH

Watermelon growers on the *motu* usually use the groundwater lens for irrigation. The water has a pH level of 8. This is higher than the recommended pH level for *Cucurbitaceae,* which is 6. High pH levels can lead to nutrient deficiencies. The aim of this trial was for the plant to be in an environment with a pH level that was conducive to fertiliser absorption.

Methodology

- Adjusting pH level of irrigation water to suit the plant. This was done by adding phosphoric acid or white vinegar in quantities measured by a pH metre. Water pH had to be adjusted each time the soil was irrigated.
- The trial was conducted to compare growth and yields with and without irrigation water pH adjustment.

RESULTS

- Adjustment to pH level of irrigation water resulted in a 37.5% increase in the yield of the watermelons and melons.
- Adjusting pH levels is a costly exercise and the increase in yield was not able to offset the costs of acid at each irrigation.

Conclusion

- The fertiliser quantities required were lowered when the pH levels of the irrigation water were adjusted, thus assisting the plants to absorb the fertilisers.
- It is recommended that free groundwater be tapped as opposed to council water for which a fee is levied.
- Use bucket irrigation for more efficient use of water and time.
- Growers on the motu generally watered their crops daily or on alternate days, often assisted by their children. The aim of demonstrating the bucket irrigation system was to reduce the time spent on watering and to promote an efficient way to use water.

The disadvantages of adjusting pH levels:

- Acid needs to be added at each irrigation, requiring time and commitment,
- Equipment (a pH metre) is required to determine the amount of acid required,
- An acid overdose could occur, which could be harmful to the plant.

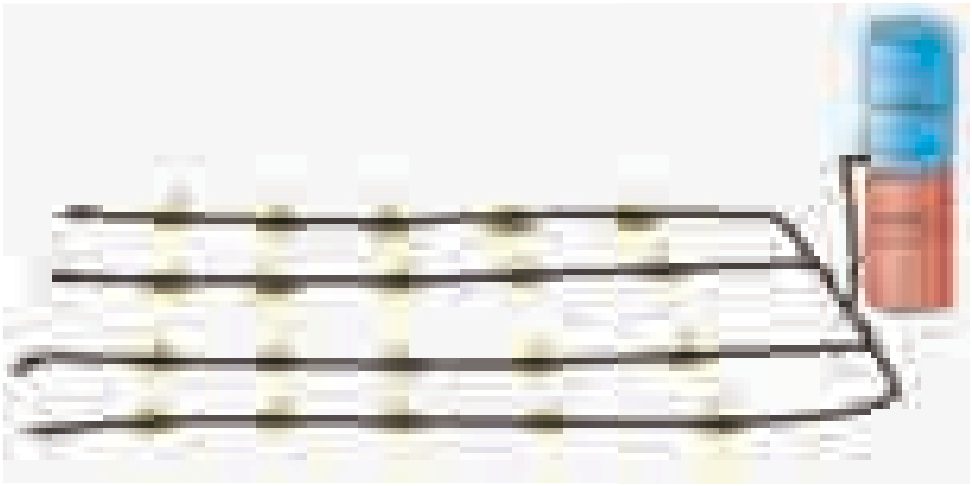
pH-metre and conductivity metre

4. Using the bucket irrigation system for more efficient use of water and time

Growers on the *motu* generally watered their crops daily or on alternate days, often assisted by their children. The aim of demonstrating the bucket irrigation system was to reduce the time spent on watering and to promote an efficient way to use water.

Methodology

- The method proposed to the growers was a gravity-fed system using a raised 200 litre tank

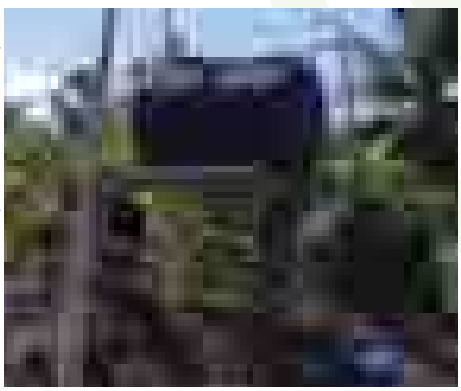


Results

While the feedback from the growers was positive overall, that the bucket irrigation system was time saving, the farmers raised concerns over what they felt were the disadvantages of the bucket irrigation system, that is:

- In the later stages of the growing cycle when the plant needs were higher, extra irrigation was required and growers resorted to watering cans. Manual watering is therefore retained as a back-up to drip irrigation.
- Growers were used to applying large amounts of water and were concerned at the emitters low flow rates.
- The high costs of purchasing the irrigation equipment are a hindrance to more growers using this method.
- The manual watering system was a method that kept young people occupied and responsible and engaged in some physical work.

Setting up a bucket irrigation demonstration, Huahine Island.



Bucket irrigation - tank installed by a farmer on Huahine Island.

Bucket irrigation - large tank installed by a farmer on Maupiti Island.

This drip irrigation system can also be usefully combined with water-soluble fertilisers, a method known as fertigation.

5. Mulching for weed control

The aim of trialing mulching was to control weeds without resorting to chemical weedkillers. This method was introduced to reduce input costs and to reduce pollution of the water table by weedkillers.

Methodology

Three types of mulching were trialed		
150 - micron Polyane film	Woven fabric	Plant mulch
This film is often used in the building trade to insulate and waterseal floors. It is strong, tear-resistant and not too expensive to purchase.	This fabric is specifically designed for weed control but is three or four times more expensive than Polyane film.	Natural mulch is an organic surface cover. Bark and green waste was used.
RESULTS		
A 12% increase in yield was recorded with the use of Polyane film	Growers were not too supportive of using woven fabric owing to its high cost.	The grass clippings used in this plant mulch decayed and weeds infested the trial plot. The grower resorted to weedkillers to control the infestation.

Conclusion

There are advantages and disadvantages in using all the methods that were trialed for weed control. More trials on the use of the three methods need to be conducted to verify appropriate methods that the growers can adopt.

Mulch trial on Huahine Island.

Huahine mulch trial with weed regrowth.

6. Proper management of insecticide and fungicide use

There were several objectives to this trial:

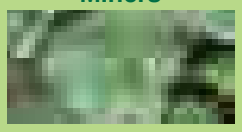
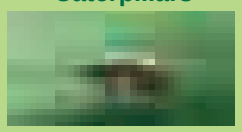
- To reduce crop protection costs to the growers;
- To mitigate pollution hazards;
- To reduce health hazards to the growers handling the chemicals; and
- To reduce health hazards to the consumer from pesticide residues.

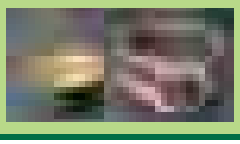
Methodology

A list of chemicals recommended for *Cucurbitaceae* pest and disease control was drawn up based on the following criteria:

- chemical toxicity (least harmful chemicals selected)
- available locally

The list also had an image of the targeted insect or disease, recommended pest control chemicals and recommended doses. This list was then disseminated to all growers.

Pest	Threshold	Treatment	Dose per 10 l	Dose per 200 l
Miners 	3 miners per leaf	Cyromazine Abamectine	4 g = 1 C/C 5 ml = 1 C/C	80 g = 1 *pâté* tin 100 ml = 1 *pâté* tin
Whiteflies 	white flies hovering near young branches	Buprofezine Pymetrozine	3 ml =1 C/C 8 g = 1 C/S	60 ml = 6 tbsp 160 g = 2 *pâté* tins
Aphids 	any	Endosulfan Pymtrozine	17 ml = 3 C/C 4 g = 1 C/C	340 ml =1 cd beef tin 80 g = 1 *pâté* tin
Thrips 	many	Abamectine Acrinathrine	5 ml = 1 C/C 10 ml = 1 C/S	100 ml = 1 *pâté* tin 200 ml = 2 *pâté* tins
Mites 	any	Abamectine Acrinathrine	5 ml = 1 C/C 10 ml = 1 C/S	100 ml = 1 *pâté* tin 200 ml = 2 *pâté* tins
Caterpillars 	many	*Bacillus thuringiensis*	See instructions on label	See instructions on label

	Abbreviation	Equivalent Volume	Equivalent Weight
1 level teaspoon	1 tsp	5 ml	5 g
1 level tablespoon	1 tbsp	10 ml	10 g
1 small level *pâté* tin		100 ml	80 g
1 small level corned beef tin 	1 cd beef tin	350 ml	300 g

Results

	Number of treatments per cycle	Cost of pest control
Producers *(1)*		
Huahine	20 treatments *(2)*	**221.500 F/ha**
Maupiti	11 treatments *(2)*	**117.500 F/ha**
Trial plots		
Test 1 - Huahine	2 treatments *(3)*	**24.000 F/ha**
Test 2 - Huahine	10 treatments *(3)*	**98.000 F/ha**
Test 3 - Maupiti	5 treatments *(3)*	**54.000 F/ha**
Test 4 - Maupiti	7 treatments *(3)*	**47.000 F/ha**
Test 5 - Maupiti	5 treatments *(3)*	**31.500 F/ha**

The following observations were made:

- While growers carried out more treatments per cycle, fewer than 10 were needed to control parasite attacks.
- While producers treated their crops systematically with insecticide and fungicide mixes, treatments were carried out on trial plots only when a problem was identified, in which case specific products were used.
- On trial plots, specific products were chosen and applications carried out based on needs, which led to two to three times lower pest control cost for growers.

Conclusion

By choosing pest control products carefully and using the correct application rate, pest control costs are reduced, pollution hazards are mitigated and risks to grower and consumer health are significantly reduced.

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Establishment of DSAP committees on the outer islands

DSAP Kiribati

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A gender balanced committee that includes all recognized organisations/ groups on the islands should be democratically and fairly formed.

In **Kiribati** there are **DSAP committees at each site that serve as the DSAP contact on the ground.** These committees play an important facilitating role with regards to the **implementation and monitoring of project field activities** at the island/village level. The **extension officer** based on the island is responsible for the day-to-day running and management of the project activities and reports directly to the Committee on issues which require the committee's intervention. Such cases include the failure of certain groups to actively play their role. Under such circumstances, the matter is then taken up further with the island council or **national DSAP office** for appropriate action.

The establishment of a DSAP Committee in rural areas has to be approved by the Island Council, the political power on the island.

The committee meets on a regular basis depending on the subject matter/issues that require their attention and decision. Normally the committee meets at least once every month but can meet more often to discuss specific matters, e.g. World Food Day, National Independence Day. The committee reports directly to the resident agricultural extension officer, who in turn reports to the national DSAP office for financial assistance - transport, venue and refreshments.

Decisions made by the DSAP committee are not final but are taken further by the council representative to the councillors meeting. The Councillors discuss what is being proposed by DSAP and advise the committee of its decision accordingly.

Benefits and limitations of having a DSAP committee:

Benefits:

- DSAP activities decided by the committee are more community-based.
- Farmers are actively involved in the decision making process (bottom-up approach).
- The confidence and support of the rural community is ensured, hence promoting a sense of ownership.
- The scattered nature of the islands, over a vast expanse of ocean, makes follow-up visits and expansion of project activities very difficult.

Limitations:

- Limited funds which in turn restricts widening the scope of the project expansion and extension.
- Absence of extension officers on the outer islands to ensure the continuity and sustainability of project field activities.

Example of a DSAP committee on an outer island.

Membership

The Committee comprises 12 to 15 members including the following:

1. Chief Councilor or his representative (political status),
2. Chairman of the old men's association (traditional/cultural status),
3. Village leaders (democratically elected),
4. Church leaders or their representative (all different denominations on the island),
5. Women's Interest Worker (representing all women's associations),
6. Schools (Principals and Head Teachers),
7. Health (Medical Assistant or Nurse),
8. Youth leader (Island Community Worker).

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Using sports competitions to promote agriculture

DSAP Kiribati

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An assessment of this programme revealed a dramatic increase in the number of young people who are planting crops in their village.

DSAP used sports as an engagement tool to inspire youth to take part in agricultural activities. DSAP organised sports competitions for young people. In order to participate in a sporting activity, a youth member had to plant a certain number of crops, usually long-term crops. These were inspected by the sports committee. After satisfying the requirement, approval for that youth member was granted to take part in the sporting activity.

It is evident that youth are keen on sport and involving and incorporating sport and other DSAP activities into a mechanism to attract them ensures the participation of youth.

Methodology for assessing the impact of agriculture and sports on young people

The impact of the intervention was very difficult to quantitatively assess, but the following may provide assistance in the information collection process, viz.:

Short term:

- Having fun - physical exercise (increase in the number of youth participating).
- Increase in crop production - increase in the number of backyard gardens, and vegetables sold on the local market.
- More food varieties available for home consumption.
- Increase in income and lower incidence of NCDs amongst the local population.

Long term:

- Improved health of young people.
- Food security enhanced for communities.
- Reduced incidence of NCDs (non-communicable diseases) amongst the rural community.
- Attitudinal perceptions towards agricultural activities changed for the better.
- Provision of alternative source of cash income for the household/family.
- Good and productive citizens overall.

Incorporating sport in DSAP activities attracted youth to take part in rural agriculture programmes.

Soccer is one of the main sports that DSAP used to attract the interest of Kiribati youth.

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Investing in our future - school garden competition Marakei and Nikunau Island

DSAP Kiribati

We learnt that competition is quite effective in raising community awareness of the programme

The school gardening programme was implemented on the islands of **Marakei and Nikunau.** This programme was part of the campaign to promote home gardening to schools and households.

Programme objective: To improve the health of people living in the rural community by promoting gardening and the consumption of vegetables.

Process used in the school garden programme

The programme included:

- Setting up a committee responsible for the competition,
- Registration of households and schools participating in the competition,
- Providing information to competitors on the competition requirements,
- Distribution of seeds and planting materials, and
- Setting up the inspection dates.

A large number of households registered for the competition and all primary and junior secondary schools on Marakei and Nikunau Islands. After the committee confirmed the number of people and schools that were participating in the competition, seeds and other planting materials were provided to the competitors.

Each competitor took responsibility for sowing their seeds and planning their planting schedule. Seedlings were inspected and allocated points according to the management and other husbandry techniques used by the competitor. The second and the third round of inspection were spaced out so that the three rounds of inspection were all undertaken within the timeframe of the competition, which was 12 months.

The prize giving was organised to be performed on the day declared by the committee as "DSAP DAY". On that day, different schools organised a float competition where they highlighted the DSAP programme.

Judging criteria

- The garden should not be less than 10m x 10m in size but can be bigger
- Points are accumulated based on the number of inspections carried out
- Plants should include vegetables and other planting materials provided for the competition
- The prizes will be awarded to the best three gardens
- These criteria apply to both the household and school competition

DSAP Day Marakei School gardening competition.

Results

The results of this programme included the following:

- Sweet potato is now popular in Nikunau Island and people include it as part of their diet
- Bananas from Marakei Island are now sold at the local market on the capital island
- Some of the schools maintain their gardens and continue to engage children in gardening activities

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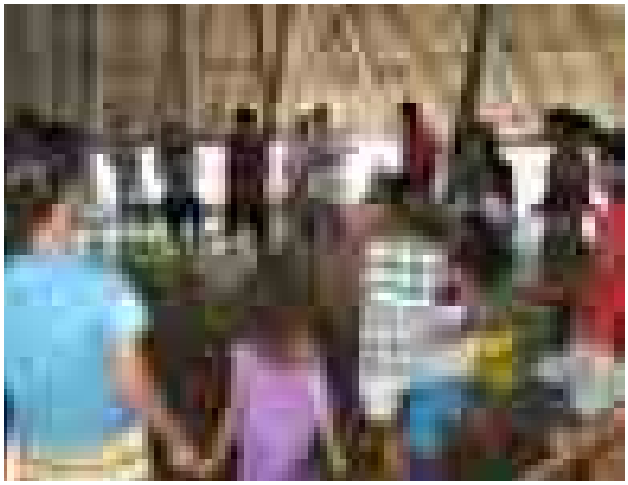
Immersion in the rural villages in Kiribati

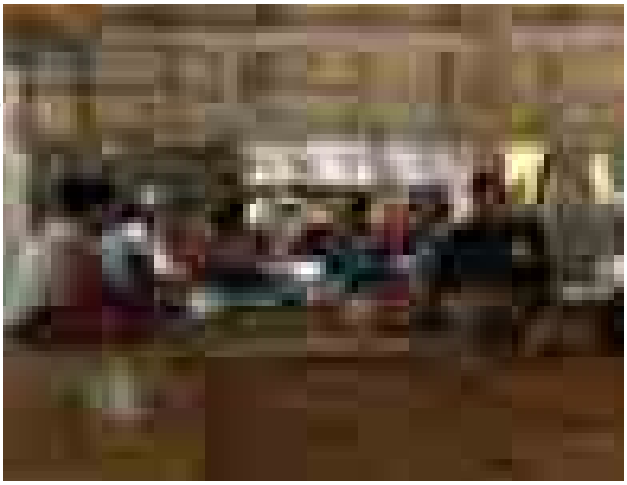
DSAP Kiribati

Immersion is when development workers live with the community during the consultation, thereby gaining a better understanding of the realities of life in the community.

DSAP Kiribati used the **immersion approach** to consult with the community **in relation to the scaling up and scaling out of project activities**.



Aerobic exercise is another way used by DSAP to attract youth interest in Kiribati.



Taking some time off to relax with people in the community provides a good opportunity to better understand people.

The end of the DSAP project required a wider consultation to ensure the continuation or sustainability of the activities that DSAP had initiated amongst the community. Prior to carrying out the immersion, there were a few areas that needed to be addressed by the project staff. These included:

- Identification of problems that needed to be addressed. This information was provided through the baseline survey results and the report from community consultations.
- Designing a work programme that covered the problems to be addressed.
- Conducting a stakeholder analysis to identify primary stakeholders.
- Informing the hierarchy within the ministry. Since the approach deals with the community, political implications need to be cleared.
- Preparing a budget for the immersion.

Sharing meals with community members is one principle of the immersion programme that enhances dialogue with people in rural areas.

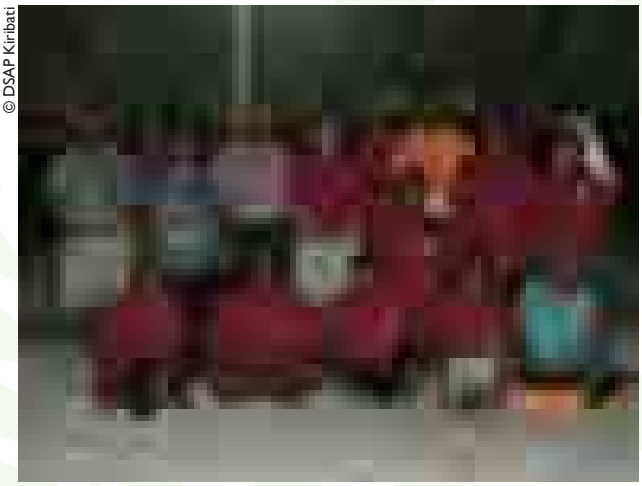
The immersion approach provided an opportunity to engage a wider audience including the community and its partners in the programmes.

When preparing to go to the village for immersion, the project staff and partners must clarify the programme and the role each partner will play.


© DSAP Kiribati

Immersion employs field demonstrations to provide first-hand knowledge on sustainable agriculture practices.

A holistic approach is also very useful during an immersion period. This allows the community to address a wider selection of the issues that affect them. In the case of Ewena Island, Abaiang, the consultations during the immersion period identified health problems, which were attributed to poor nutrition. Health Department staff were already among the partners in the visiting team. Health checks were conducted on a selected number of villagers and a high incidence of non-communicable diseases (high blood pressure, diabetes) was evident. A holistic approach, as in this example, allowed advice on health and nutrition to be provided by the health staff in the visiting team. Health staff also drew up a programme of advice on meals and physical activity for the villagers. Monitoring and evaluation of the health of the community will be conducted at a later stage by the staff of the Ministry of Health.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A Steering Committee oversees the DSAP activities, thus promoting community participation in DSAP activities. This harnesses community ownership of the activities.

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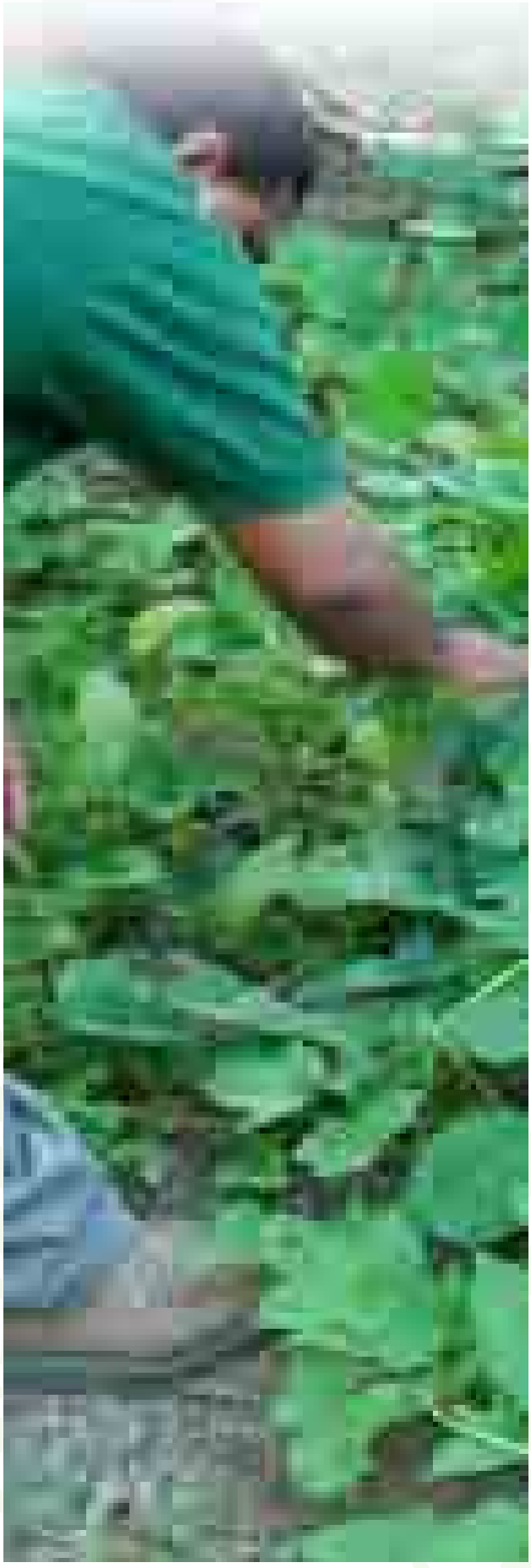
Sweet potatoes a potential crop for Majuro atoll

DSAP Marshall Islands



Sweet potato is an easy crop to establish because of its readiness to grow in any type of soil and its quick vegetative growth, which covers the soil surface, reducing soil moisture loss.

Sweet potato is not a stranger to Majuro. It was introduced in July 2003. However, only a handful of farmers grow a few plants of this short-term root crop.

Sweet potatoes were included in the tissue-cultured materials that were brought into Marshall Islands in 2006 by DSAP Marshall in collaboration with the Ministry of Resources and Development (R&D) and College of Marshall Islands/ Land Grant Cooperative Research and Extension (CMI/CRE). Yams, cassava, and taro were also among the tissue-cultured materials brought from the SPC Regional Germplasm Centre.

The following cultivars of sweet potato (RAB 7, KAV 61, KAV 11, MAS 1, NUG 5, RB 412, RB 3818, RB 455, RB 3570, and RB 4610) were introduced in 2006. They established quite well after the hardening process at Arrak Campus in Majuro.

After a month's hardening, the sweet potatoes were planted on three field sites before being distributed to farmers. The harvested crop was then weighed, cooked and evaluated on taste by farmers. The preferred varieties are now to be multiplied and distributed widely.

The objective of the activity was to provide another staple food crop for Majuro Atoll

CMI CRE Extension Agent, Arwan S., inspecting the harvested varieties of sweet potatoes at Arrak Campus in partnership with DSAP Marshall.

Methodology

- Reviewed the status of staple food crops in Majuro.
- Worked in collaboration with CMI CRE for their facilities at Arrak Campus and technical support.
- Planted the tissue cultured sweet potatoes in polythene bags at the CMI CRE nursery.
- Transferred the sweet potatoes, after a months' hardening process, to the field.
- Harvested the first field site in Arrak.
- Planted the second field site in Arrak.
- Planted sweet potatoes on another field site in Laura R&D farm.
- Distributed sweet potatoes to farmers to plant on their land.
- Cooking time and taste evaluation of harvested sweet potatoes.
- Farmers preferred certain varieties, which are now recorded to be multiplied further.

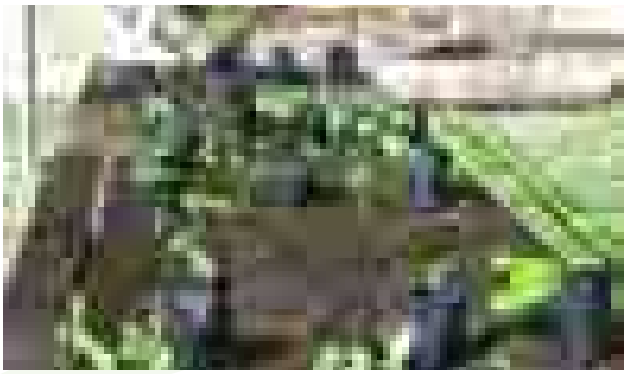
Most Significant Change

Sweet potatoes are another staple food for Majuro Atoll dwellers besides breadfruit.

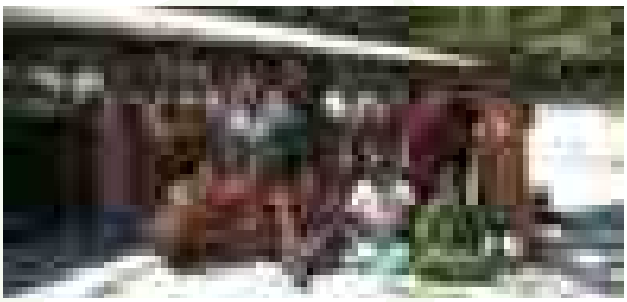
Lessons Learned

- Working in participation with relevant stakeholders helps drive the project forward.
- Partners in development complement each others' efforts rather than competing.
- Record keeping needs to be improved both at the research and extension levels.
- Labeling of crop cultivars is a must, from the nursery to farmers' fields.

Tissue cultured sweet potatoes during the intial hardening process at the nursery in Arrak.



Tissue cultured sweet potatoes at 2-3 weeks growth in the nursery at Arrak Campus.



DSAP activities done by Arno Women's Group.

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Using simple technologies to promote vegetable growing

DSAP Nauru

© DSAP Nauru

The high costs of vegetables that are imported into Nauru has prompted the locals to start their own kitchen gardens for home consumption and income earning.

Two types of intervention were introduced by DSAP Nauru: simple soil improvement techniques and more efficient use of water. **These two interventions were identified through a community consultation as activities that can help strengthen agriculture on Nauru.**

Simple composting

The 6 week simple compost that has been promoted by the DSAP project was trialed by farmers in the Nibok District.

Made from *leucaena* leaves and animal waste, the compost was used by the farmers of Nibok District on their sweet potato and taro plants as well as on ornamental flowers.

Results from the composting indicated that the sweet potato and ornamental flowers benefited from the compost. The sweet potato yielded tubers weighing 2.72 kg. The ornamental flowers showed brighter colours and strong growth. For the taro plants, however, the compost did little to improve their yield. More trials are continuing with the taro plants.

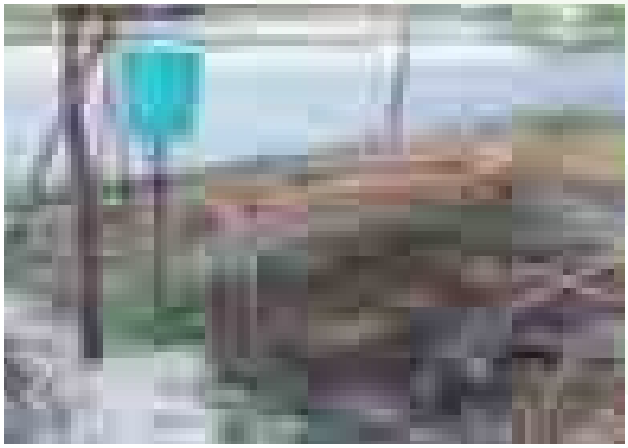
Bucket irrigation

The bucket irrigation system was promoted for its efficient use of water. Three demonstration sites were set up to trial the system.

Results indicated that the system was very useful and economical during the long dry periods.

Locally grown sweet potatoes using compost ingredients.

DSAP staff, Paul, displays locally grown sweet potatoes grown using compost ingredients.



Trialing taro growing using bucket irrigation system in Nauru.

Sweet potato trials.

Farmer Profile 1

Keble Keppa (Nibok farmer)

Before DSAP came to assist Keble with starting his vegetable patch, he knew little about growing vegetables. He used to watch his mother plant banana and papaya and was not at all interested in growing them himself, the reason being he did not like the taste. After his mother passed away he eventually tried and tasted a papaya fruit and to his surprise he liked the sweetness of the fruit. He remembered all the abundant fruits and knowledge his mother possessed, which he had refused to acquire.

Keble loves chillies and wants to grow them from seeds along with papaya. His friends and relatives offered him germination techniques with limited success. He discussed his plans of wanting to start his own kitchen garden with DSAP Nauru.

Now he is growing chillies, rockmelon, watermelon, sweet potato, eggplants and long bean. DSAP supplied the seeds and drip bucket irrigation system and assisted him in setting up his plot.

Keble checking on his rockmelon plant.

Keble's sweet potato plot using the drip bucket irrigation system.

DSAP provided training for Keble in the following areas:

1. Seed germination techniques such as direct seeding varieties and nursery type seeds.
2. Type of soil to utilise for growing healthy vegetables; dark soil is better than light soil.
3. Using the drip bucket irrigation system is a time saver for him.

Results of DSAP intervention:

1. Keble is producing rockmelons, watermelons and sweet potatoes.
2. He has germinated six chilli seeds whereas before he tried unsuccessfully, and now he has planted all six seedlings.

Constraints:

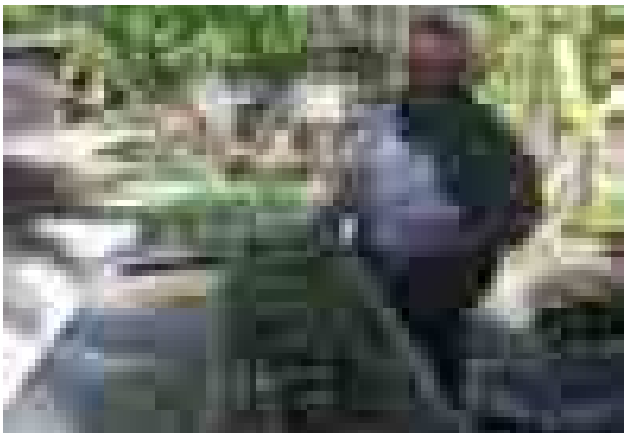
1. No garden equipment such as pick, mattock, shovel or wheelbarrow.
2. Pest management techniques still need to be taught.

Farmer Profile 2

Robert Atsime

Robert is a small time farmer when he is not tending to his very busy schedule for his community of Anetan District. He is also their representative to the DSAP NSC.

Before DSAP, he grew bananas, a few taros and sweet potatoes, cassava and papaya along with some livestock. The constraints Robert faced in growing and expanding his garden plot included work commitments, water management techniques for his plants, and lack of seeds, garden equipment, and pest control techniques.



Robert with bok choi seedlings.

DSAP intervention:

1. Drip bucket irrigation system for watering his plants.
2. Seeds such as cabbage, capsicums, tomatoes, lettuce, muskmelon and cucumbers were supplied.
3. Composting demonstration.

Small freezer (background) used for drip irrigation on bok choi plants in Anetan.

Results:

1. He has utilised the drip bucket irrigation system and also modified it on his seeds ,which DSAP provided.
2. He has produced and harvested *bok choi* plants and lettuce.

Tomato plants in Anetan.

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Practical demonstrations encourage farmers

DSAP Niue

© DSAP Niue

Conservation and sustainable management are key considerations within the Department of Agriculture, Forestry and Fisheries.

DSAP Niue's main objective was to assist farmers in increasing agriculture productivity through the promotion and demonstration of simple DSAP technologies, which included bucket irrigation, organic herbicides and pesticides and composting.

Strength of practical demonstrations

- There is good participation and attendance because of the informal setting.
- Farmers can apply what they learn directly to their own farms. They can also adapt or improve the technologies to best suit their needs.
- The informal setting is also a good way for farmers to share ideas on their own technologies for addressing problems. They can also share traditional practices with other farmers to help them improve their farming.
- This builds a good relationship between the farmers and the organisation and it encourages them to attend future activities.
- Builds good communication, harmony and trust amongst stakeholders and farmers.

Challenges for practical demonstrations

- People's expectations are sometimes quite high. They expect DSAP to assist with everything, which in some cases may be quite difficult.
- Poor planning could lead to poor attendance.

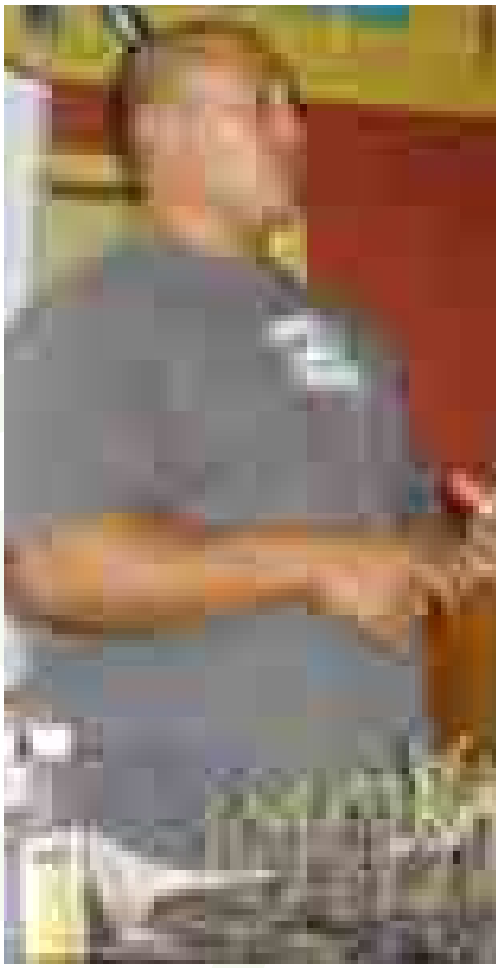
DSAP GREA, Brendan Tauasi, shows participants how to make fruit fly traps using Bactromats and plastic bottles.

Women on a field trip watching Brendan Tauasi demonstrate the process of bucket irrigation.

SEED PRODUCTION DEMONSTRATION

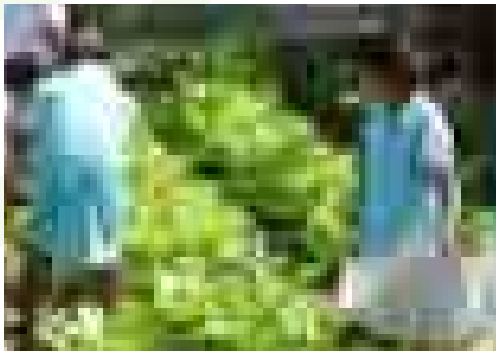
"Participants asked many questions during the demonstration. They were interested in ensuring the conservation of local fruits and vegetables, especially with the increase in hybrid seeds imported by retailers"

The participants brought in their local fruits and vegetables such as *nonu*, local tomato variety, Niuean passion fruit, papaya, water melon. These were used in the practical demonstrations during the second day of the workshop. The practical demonstration on seed production included showing the participants how to extract the seeds from the fruits and how to soak, wash and clean them. They were also shown the best way to dry them by putting them in the sun or in an oven at the right temperature.



Classroom session for the Vegetable Production Workshop.

Demonstration on use of drums for vegetable production during the vegetable production workshop for women in April 2007.



Niue Primary School Students harvesting vegetables from their school garden.

Improved technologies, do they improve livelihoods?

...Inadequate water supply, lack of planting material, incidence of pests and diseases were among priority constraints during consultations that DSAP held with the community...

The bucket irrigation system (BIS) was introduced to address the problem of inadequate water supply. The BIS promotes the wise and efficient use of water, particularly in areas where water supply is a problem.

Four vegetable farmers were selected to have the BIS demonstrated on their farms. The farmers found that the system improved their harvest of lettuce, cabbages and tomatoes. The farmers also commended the BIS since it required less labour input and provided a consistent water supply for the vegetables.

Farmers also received a demonstration on using organic neem oil to manage and eradicate pests and diseases of their crops. Interviews with the farmers indicated an increase in productivity after they put into practice what was shown at the demonstration.

Although the demonstrations have proven successful in terms of increasing agriculture productivity, they have given rise to other problems. An increase in agriculture production results in an oversupply of crops and vegetables in the market. While improved technologies have increased production, the oversupply of crops generates very little income for the farmer in an exercise that is supposed to improve livelihood. DSAP Niue is working on addressing areas like marketing of farmers' crops to ensure that the farming methods they have learnt are sustained over a period of time.

Laying out irrigation pipes for one of the DSAP farmers.

Morris Tafatu (DSAP Core Farmer) with Brendon Tauasi and Gaylene Tasmania setting up the bucket irrigation system on his farm.

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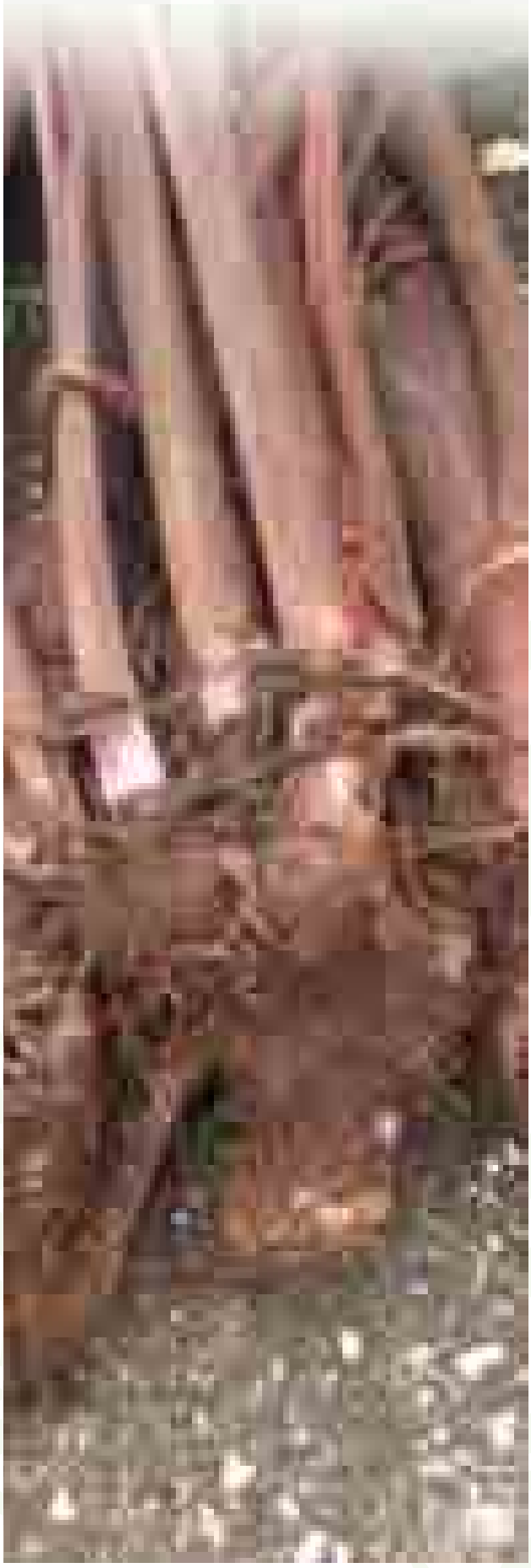
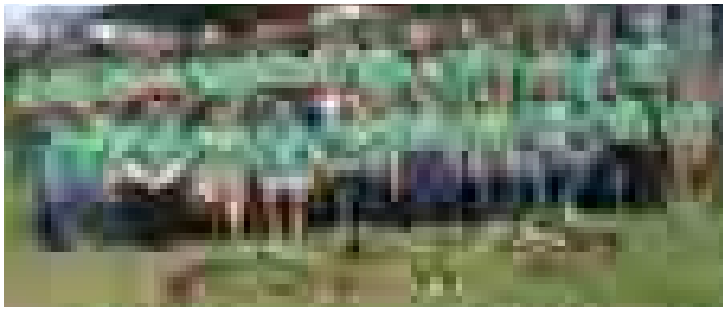
Conserving Traditional Crops

DSAP Niue



Taro is one of the most valuable traditional crops in Niue, and Taro Niue is renowned for being one of the best throughout the region.

Taro exports to New Zealand in the 1980s focused on the two varieties that were in demand by the overseas market. This posed a threat to the other taro varieties which do not get exported overseas. DSAP Niue found that one of the biggest threats to conserving traditional crops on Niue is the loss of these other different taro varieties. It is for this reason that a national consultation was conducted, to ensure the conservation of these taros, and to help the people of Niue continue to grow these taro varieties and document traditional knowledge for future generations.



Participants in the National Taro Consultation, July 2008

Display of different taro varieties at the National Taro Consultation held at the Niue Youth Centre in July 2008

The main objective of the consultation was to bring together the taro growers so they could reach a consensus on the different taro varieties through discussions and analysis of the taros that were displayed. It was also an opportunity for DSAP Niue to conduct proper documentation of the taros through photos and feedback from farmers.

In the lead-up to this consultation 10 taro growers were able to provide the different taro varieties they had in their possession.

Around 96 different taro names were documented during the lead-up to this consultation. To make discussions easier, the growers grouped these taros into 9 groups as follows: 1. Fase 2. Manua 3. Maganonu/Maga Faikai 4. Maga 5. Ifo 6. Lauila 7. Paku 8. Pogi 9. Other taros – Niukini, Maha, Megemege, Sunday, Pulekau.

However, over the two day meeting it was found that during the discussions and visual analysis of the taros, some taros had the same appearance but a different name. Another reason for this was those from the Northern side of the island, "Motu" had a different name to those from the Southern side of the island "Tafiti". Discussions by the farmers saw the list of 96 different taro names decrease to less than 70.

At the end of the whole consultation, shoots of these taros were planted out into a taro field gene bank at Vaipapahi Agricultural Research Farm for research purposes. It is also expected that these varieties will be distributed to farmers in future so they can continue planting these varieties.

Through the use of visual displays of taro resources, farmers were able to come to a consensus on the names of the different taros. Although there is still a lot of work to be done, this is the first step which needs to be taken to ensure conservation of our precious traditional crops. A similar approach will be taken in future to other traditional crops such as bananas, yams and kumara.

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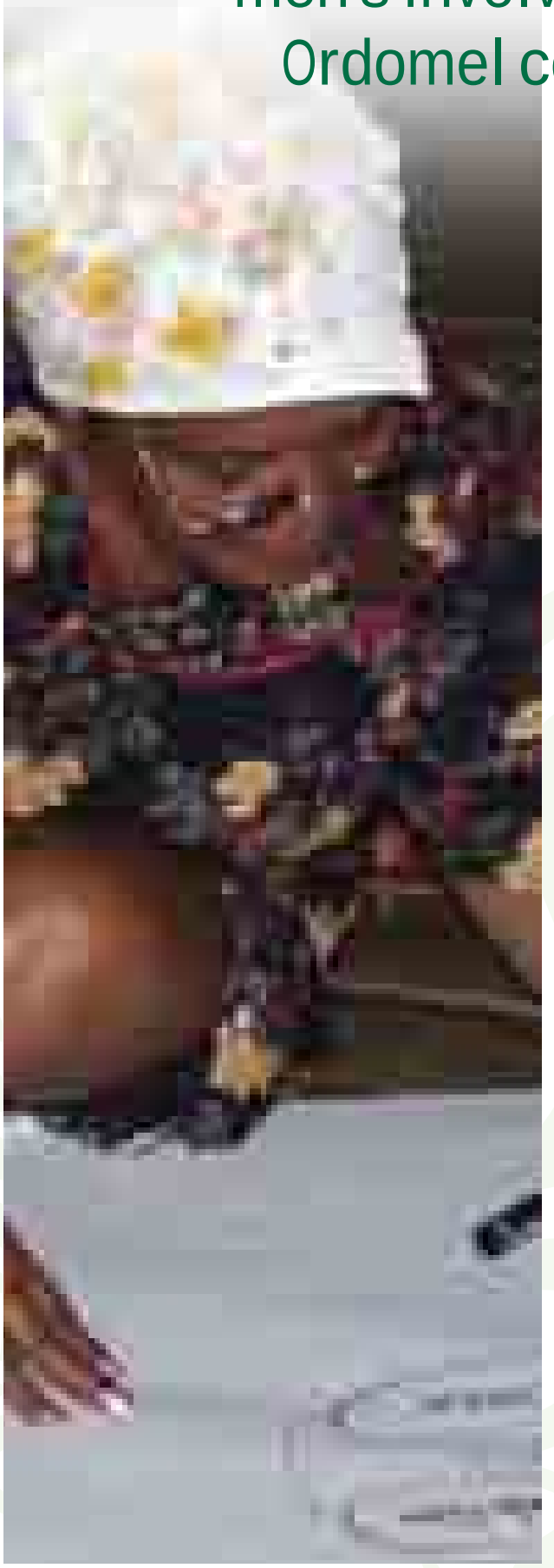
Using participatory tools to encourage men's involvement in agriculture, Ordomel community, Airai State

DSAP Palau



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Palau is a matrilineal society where women play a major role in Palauan livelihood and cultural obligations

In Ordomel community, Airai State, women are totally responsible for farming (planting, weeding, maintenance, harvesting and marketing). The women are also responsible for weaving, domestic chores, child care, cultural activities, community services and church activities, even venturing into the male dominated role of fishing.

At the community consultation held with the Ordomel community, more women than men attended. Young women are already socialising into their gender roles when they assist their mothers grow crops, especially the swamp taro.


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Women farmers using Venn diagrams to identify relationships with institutions they interact with.

Table 1 Activity profile of Ordomel community

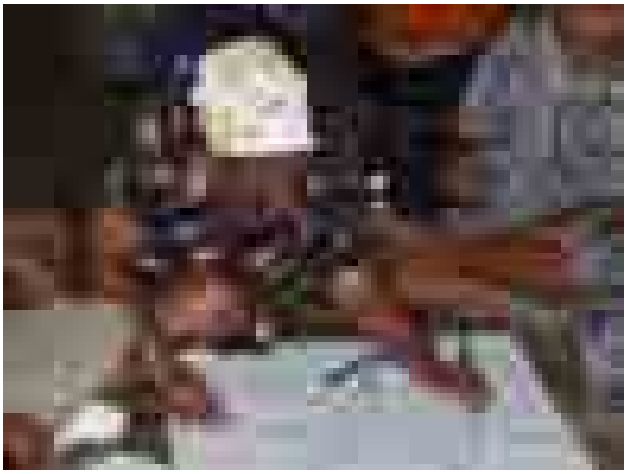
ACTIVITY	MEN	WOMEN	YOUNG MEN	YOUNG WOMEN	HIRED LABOURERS
Fishing	10	8	7	5	0
Farming/ Planting/ Weeding	4	10	0	4	10
Weaving	1	10	1	3	0
Child care	1	10	0	2	0
Marketing	7	10	5	10	0
Cooking	5	10	2	10	0
Washing	2	10	10	10	3
Cleaning	2	10	2	5	0
Gardening	1	10	1	10	0
Cultural	5	10	10	10	0
Church	9	10	10	10	10
Community service	5	10	10	10	0

The activity profiles showed the tendency to overburden the women with activities (Table 1). Women's multiple roles can lead to health related problems such as stress, hypertension, and cancer. So, DSAP Palau faced the challenge of encouraging more participation by men in agricultural activities as, currently, hired imported labourers from Bangladesh and the Philippines are slowly replacing women in farming.

The DSAP Palau objective was to present the findings of the participatory rural survey in Ordomel and to encourage increased participation by men in agricultural consultations and activities.

Methodology

- PRA team of facilitators compiled and analyzed the PRA survey findings.
- Findings were presented, analysed, and summarised for follow up meetings in Ordomel.
- Summarised presentations were translated into the local language.
- Relevant stakeholders were identified in relation to all the issues/problems identified by Ordomel community members.
- The Director of Agriculture invited all these relevant stakeholders to address the issues that concerned their work.
- The Governor of Airai State was invited to open the evening meeting.
- Invitations were sent out to all members of the Ordomel community.
- Special invitations were made to the men of the community.
- The community hall was set up with all presentations on slides.
- Diagrammatic outputs of the PRA survey were pasted on the walls of the community hall.
- Refreshments were provided.



Women farmers using Venn diagrams to identify relationships with institutions they interact with.

Most Significant Change

Men are slowly and gradually helping their wives in planting, weeding, maintaining, and harvesting their crops. These men have successfully jumped over the hurdle of being called 'sissy', a term used for men doing agricultural activities in the Palauan cultural context.

Lessons Learned

To encourage men's participation in attending agricultural consultations, fishing has to be included as an item on the agenda.

Men's participation is also encouraged when refreshments are included.

Extra effort has to be made to increase men's participation in agricultural activities.

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Breaking the barrier to commercial taro production in Morobe Province

DSAP Papua New Guinea

Taro has a long ancient history in PNG's culture and tradition. Therefore, any attempt to convert it to commercial production will be faced with challenges from existing mindsets, given taro's links to the province's values and beliefs.

DSAP PNG, as part of its activities, is trialing and developing the **commercialisation of taro in Papua New Guinea.** This intervention by DSAP has raised the profile of the crop on several fronts: food security and nutritional value, cultural significance, society and ownership, and its economic role.

It is the plan of the Ministry of Agriculture and Livestock PNG and DSAP PNG to organise the taro production system, establishing grades and standards as well as processing, packaging and storage facilities.

In late 2005 the Morobe Government, with assistance from DSAP funded a trip to study the Fiji taro industry. The study trip bolstered the enthusiasm that had existed for some time to up-scale PNG taro from a subsistence backyard food crop to a commercially driven food industry, starting with Lae, Morobe Province.

Taro trials at DSAP nursery.

BREAKING THE BARRIER - COMMERCIAL TARO PRODUCTION Poapom, Butibam Village

Tim Kahata expressed the need for taro production to come back to Butibam, and for women and youth to take ownership of the taro project

Poapom hamlet in Butibam village is one of the selected sites for taro demonstration in Morobe Province. Mr Tim Kahata one of the clan leaders in the traditional AHI area, which covers Butibam and six other villages, approached DSAP PNG to establish a taro demonstration farm on his traditional land.

The story told by the son….

Tim recalled when as a small boy he used to walk under huge taro plants in his father's (the late Kahata) taro gardens in Butibam village. In the early 1960s, old Kahata noted 2 large holes penetrating one of the taro corms. The old man took the corm to the Department of Agriculture Stock and Fisheries Research station at Bubia to find out the probable cause of the hole on the corm and a possible solution. In the 1960s, the response to old man Kahata was, "...the holes in the taro appear to be a new type of pest problem". It was not until years later that those pests were identified as taro beetle. For old man Kahata, that response meant the beginning of the end to his beloved taro crop. With the passing of old Kahata, came the demise of taro production in Butibam village. According to Tim, those beetles have since competed with humans for the taro corms, and the beetles have won.

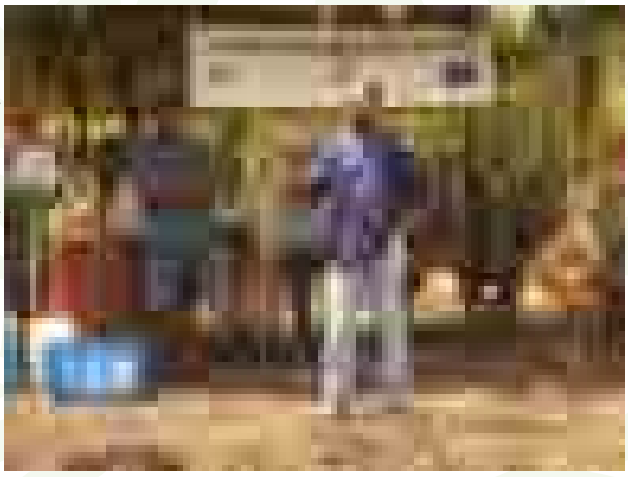
But there is a new chapter to the taro story at Butibam…..

When Tim heard that the DSAP PNG taro project was introducing a "new" control for the beetles, he bought the recommended chemicals (Bifenthrine EC 100 and Mustang EC 200) and was successful in using it to control the taro beetles in his taro plantation. There was now no turning back. The opportunity was now here to revive his father's beloved taro crop. He is now a key farmer for the taro project in his district and has a taro demonstration plot on his land.

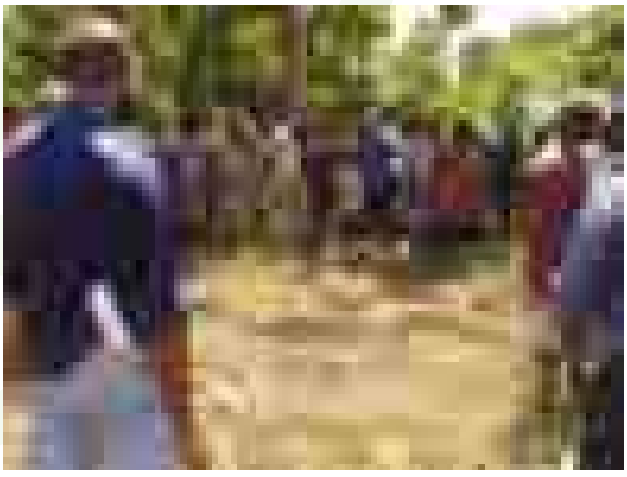
Methodology for Tim Kahata's demonstration plot

- A plot of 25m x 25m (625 taro stands) was cleared. The area was sprayed with glyphosphate to control the kunai grass.
- The area was marked at 1m x 1m spacing. This is a specific recommendation by the DSAP taro project to minimize taro leaf contact, thereby managing the spread of taro leaf blight.
- A second application of glyphosphate was carried out before holing began for the taro stands.

Note - the majority of the planting materials for the demonstration plot was harvested from the DSAP PNG Demonstration and Training Farm at Paohom.



Tim Kahata making a point



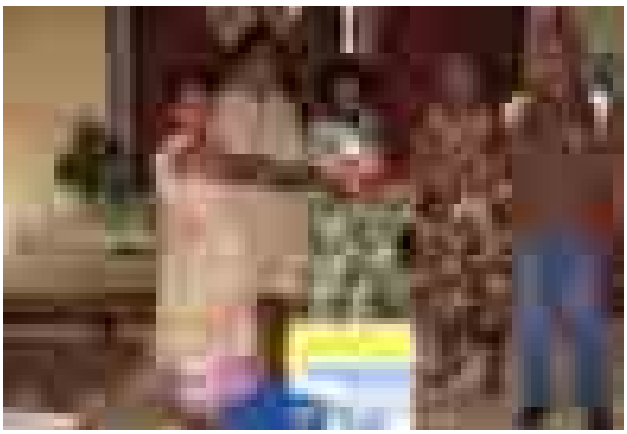
Tim Kahata and part of the crowd listening to one of the speakers.

FROM TRADITIONAL TO COMMERCIAL, WOMEN LEAD THE WAY

From the 1970s to 1990s subsistence farming has been decreasing. This has largely been due to increasing population pressure in and around the urban villages in Ahi. The other reason for the decrease in subsistence farming has been the impact of the taro beetle and other diseases attacking the taro. Only a small number of farmers continue farming for their household.

In 2005 DSAP PNG, with support and assistance from the Morobe Provincial Government, facilitated a taro study tour to Fiji.

Upon returning from the study tour, the skills and technology gathered on the Fiji trip were adapted in demonstration plots at Bumbi Demonstration Farm. Women from the five Ahi villages were invited to the demonstration plots. With assistance from DSAP PNG and the Lae District Department of Agriculture, a demonstration plot was set up in the centre field of Butibam. As a result of visiting the demonstration plots, and the availability and dissemination of information and solutions to control the taro beetle, the women of Butibam are leading the way in this surge of growing taro. From a handful of women, there are now 35 female farmers in Butibam who have a combined total of more than 10,000 taro plants growing in their little household gardens.



Presentation of pump, buckets and taro beetle chemical (Mustang) to the Geyamsao Hetmeris (Mothers' Group).

Bali supervising a farmer during taro planting session.

GREA S. A. Mesa explaining taro quality aspects to women farmers.

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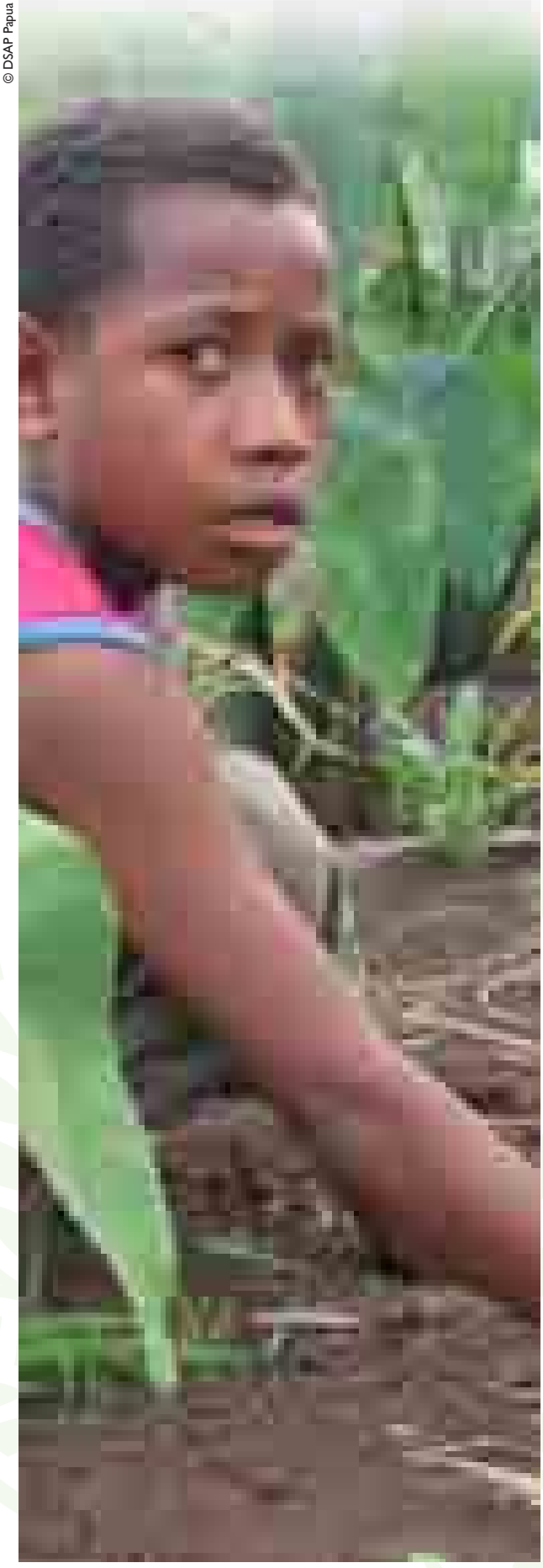
Strengthening institutional agriculture in Papua New Guinea

DSAP Papua New Guinea



Boarding schools were spending large amounts of money on imported food items, especially rice and canned items for student meals. One of the project objectives was to increase the food security of the schools, thereby reducing this dependency on imported food items.

There were two approaches applied in strengthening institutional agriculture in Papua New Guinea. One was to improve the teaching capacity of agriculture science teachers in the school and the second was to apply the improved knowledge and skills of the teachers to benefit the school students and the school.

DSAP PNG conducted a needs assessment with agriculture science teachers of selected schools. The results of the needs assessment indicated that the teachers needed more resources to effectively and efficiently teach agriculture science. The results also identified the activities needed for strengthening institutional agriculture. Technical staff from the Department of Agriculture (DAL) provided specialist training to upgrade the technical skills and knowledge of the teachers, especially on new and improved farming methods.

CASE STUDY: KUPIANO HIGH SCHOOL

Kupiano High School, Central Province, was the site for project activities in animal husbandry and crop production (new technologies).

Methodology

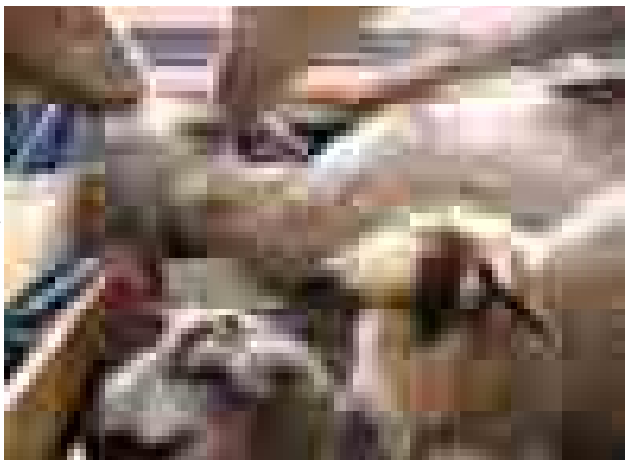
The teachers received training in the cultivation of rice, taro and cassava using improved farming techniques of composting and bucket irrigation. Information was shared and training provided in making plant derived pesticides for crop gardens. Teachers also benefited from training in animal husbandry (sheep and poultry) and in farm management.

The students benefited from the teacher training as they learnt skills from participating in on-farm practical sessions; e.g. managing animal farms (sheep and poultry) as well as learning how agriculture is an income earner.

DSAP Taro School, Markham Road Primary School students with Mr Trenien, receiving taro planting materials from DSAP.

Mr. Francis Wambon of DSAP (Port Moresby) presenting rice seeds (bags) and rice information brochures to Kupiano Principal, Mr Andrew and students of Kupiano High School.

Markham Road Primary School students (Upper Primary) weeding their taro project

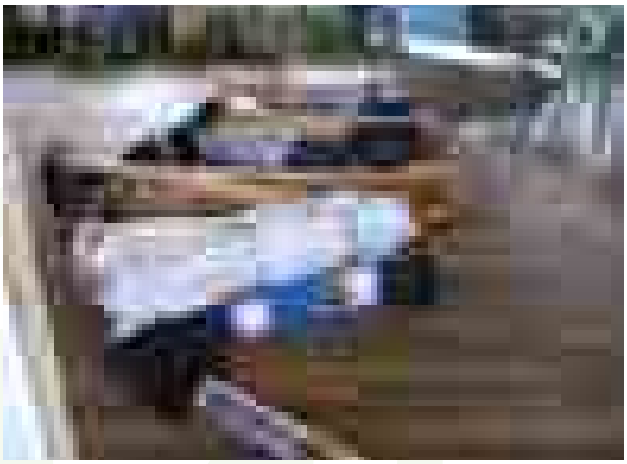


Up-scaling from poultry to sheep production: Kupiano High School, NAQIA, and DSAP Project initiative. Sheep being transported from Port Moresby to Kupiano in Central Province.

Results

The outcome of the training that DSAP PNG provided for the teachers was monitored and evaluated against students' academic performance in agriculture science. Acquiring knowledge and skills and putting them into practice is supposed to improve the academic performance of the students. The students' records were then compared to previous results before the DSAP intervention. During the evaluation period, it was noted that student performance in agriculture science had indeed improved since the DSAP intervention.

Field training: Kupiano High School teachers, Mr Vagi and Mr Arenu are shown how to differentiate varieties of taros during field training in Poaham, Lae.



Tools that DSAP PNG donated to Kupiano High School.

Sales from the poultry were good; 50% was sold to the school to provide food for the boarding students, and 50% was sold to neighbouring communities.

In the beginning DSAP had to provide materials and resources for the practical sessions. These included tools, seeds and livestock. After the training, and the harvest and sale of crops and poultry, the agriculture department is now self sufficient and is able to support itself financially.

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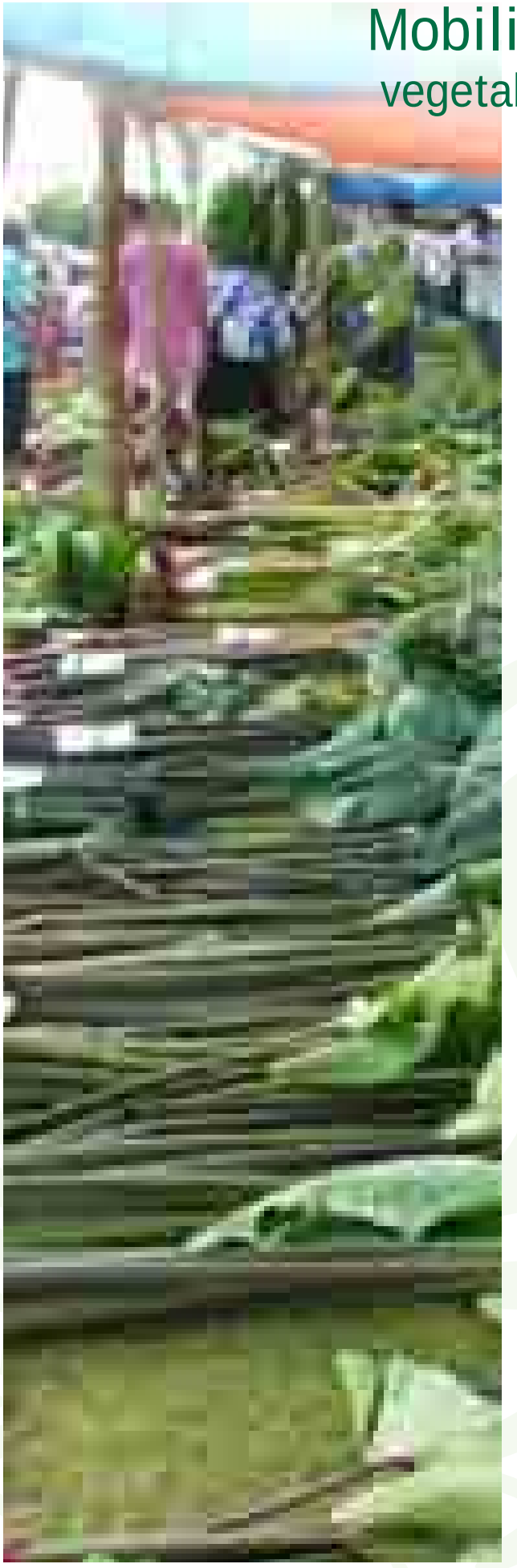

Mobilising the community - vegetable gardening, Letui village

DSAP Samoa

The project in Letui village was all about empowerment. It was empowering the villagers with simple technologies that improve agriculture productivity, in particular knowledge of vegetable farming.

Judging of farmers' yams during Farmer Field Day.

"When we were preparing the first demonstration plot, the villagers thought that nothing would be able to grow on that piece of land. For the extension staff, this negative perception was an indication of a low level of support. But sometimes this type of perception is a sign of a larger problem, that there is a lack of knowledge of vegetable farming. This lack of knowledge results from a lack of information."

With training, support and advice from the staff of the crops advisory unit of the Ministry of Agriculture, Savaii, the villagers of Letui village received training and demonstrations on vegetable growing.

Farmers proudly displaying their taros during the competition.

SCOPE OF THE VEGETABLE GARDEN PROJECT, LETUI VILLAGE	
Demonstration Plot	¼ acre.
Number of families involved	40 households.
Farming system	Mixed cropping, mono-cropping, integrated pest management, organic farming system.
Crops grown	Chinese cabbage, head cabbage, herbs, sweet corn, green pepper (capsicum), long and short beans, radish, tomatoes, taro.
Marketing	Villagers sold their produce within the village, and to hotels and shops nearby.
Daily diet	Vegetables are now a regular and daily part of the meals of the families in the village.
Income from sales	The village was able to earn TALA 800.00 from the sale of the first harvest from the demonstration plot.
Bank account	With assistance from the extension staff, the village opened a bank account with money from the sales of the vegetables. A committee has been set up by the villagers to monitor and manage the funds.
Time spent on farming activities	At the beginning of the project, the villagers appointed a committee. The committee in consultation with the rest of the village, scheduled 3 days a week (Tuesday-Thursday, 6 am-12 noon) for all members of the village to work on the farm. The committee is also the link between the village and the ministry.

The benefits of this vegetable gardening project in Letui were that it strengthened food security for families, the health of the villagers greatly improved as tending to their gardens was a form of exercise, additional income was earned from the sale of the vegetables, and there was a strengthening of relationships amongst the villagers as working together provided greater interaction, dialogue and understanding. The villagers also benefited through increasing their knowledge of agricultural methods and technologies.

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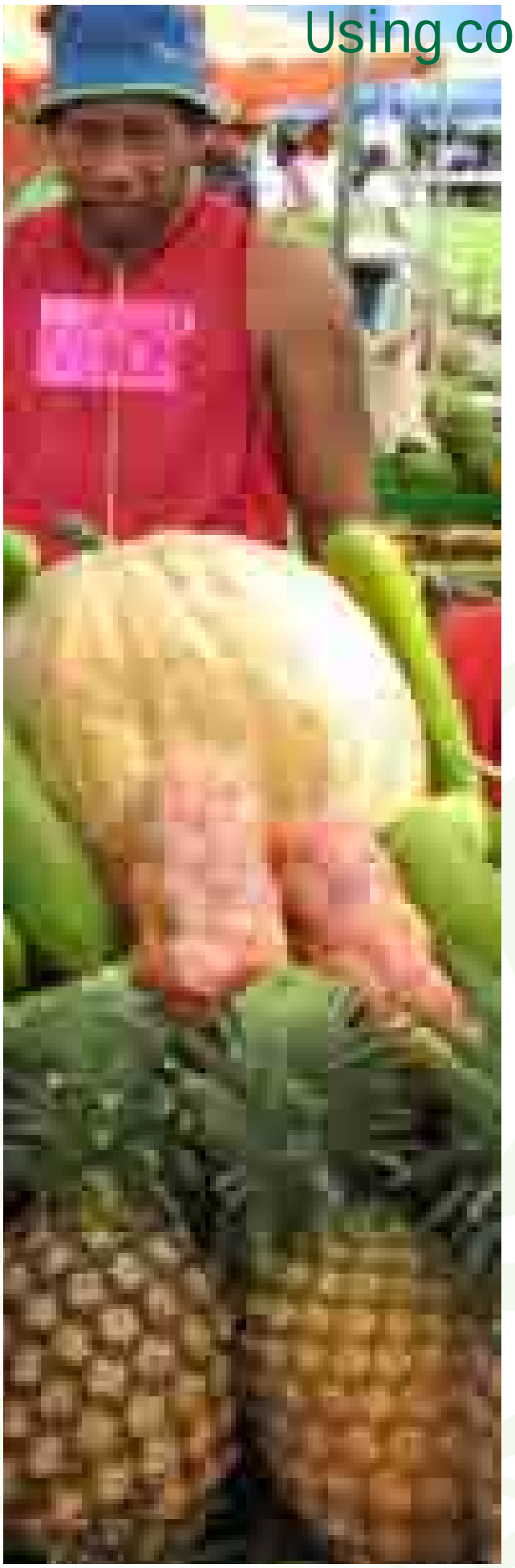
Using competition to promote agriculture

DSAP Samoa



Vegetable farming is a new farming practice for communities. The villagers mostly grow traditional crops, namely taro, coconut, cocoa and taamu.

Competition is one of those participatory methodologies that motivates people to participate in an event. It can be used to promote a new technology or innovation.

The objective of the competition was to motivate villagers to diversify their farming, have access to quality food for good health, increase their food supply and have an alternative source of income.

The villagers of Sasina, Aopo and Mauga had heard of the success of the DSAP sites at Letui Village and were keen to learn how to grow vegetables.

Crops Advisory staff of the Ministry of Agriculture based on Savaii worked with the villagers, demonstrating how to grow vegetables. To sustain interest in growing vegetables and in the main objective of food security, a competition was held amongst the four villages.

To prepare for the competition, community consultations were held to finalise the criteria for the competition. The different communities identified and selected their representatives to work with the facilitating agencies. Training sessions were planned and follow-up technical visits scheduled to ensure that proper advice and support was available for the villagers.

The media was also part of the competition. They provided publicity for the agricultural activities of the four villages and radio, television and newspapers were updated with interviews and stories from the competition.

Collaboration with other agencies like the FAO Food Security Project and the South/South Cooperation provided the four villages in the district of Gaga'emauga Numera 3 with further technical advice and materials for the competition.

Taamu competition.

Yam competition.

OUTCOME AND IMPACTS OF THE COMPETITION:

- Agriculture skills of the villagers were improved through technical advice and training provided by the collaborating agencies.
- Farmer-to-farmer sharing of ideas and knowledge occurred as farmers visited each others gardens during the competition.
- Inter-agency collaboration occurred through sharing of technical expertise for the benefit of the farmers.
- Farmers earned about TALA 1, 500 from the demonstration plots, which enabled them to finance their cultural and social obligations during that period.

Vegetable competition

Taro competition

CHALLENGES OF USING COMPETITION TO PROMOTE AGRICULTURE

- An inconsistent supply of seeds can delay the competition period.
- The markets are flooded with produce, which leads to low prices for produce.
- Maintaining interest in farming after the competition presents difficulties.

BENEFITS OF USING COMPETITION TO PROMOTE AGRICULTURE

- There is motivation to invest in agriculture as it can improve the economy at village level.
- Agriculture is acknowledged as a money earner, and the rural to urban drift is not as strong when people realize they can make money through agriculture.
- Members of the community take ownership of the competition as they are involved in all aspects of it from the beginning to the end. Capacity is built and new skills are implemented in their daily lives.
- Relationships are strengthened between collaborating agencies as they share resources and expertise for a common objective.

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Participatory Innovation Development (PID)

DSAP Solomon Islands

Participatory innovation development recognises farmers' own methods of farming, which include indigenous knowledge. PID is very inclusive as the farmer is part of the process of developing and testing the innovation with the technical staff. This is a participatory approach that can contribute to improved practices for sustainable development.

Participatory innovation development (PID) **adds value** to the research and extension system in the Ministry of Agriculture. **It is particularly useful** in areas where extension services are poor, the research agenda is not clear and where recommendations are few. PID has the potential to improve agriculture and social programmes. In agriculture, PID can include the developing of a planting technique resulting in an improved crop production or the upscaling of an activity to improve performances under local conditions. It involves the extension officer working with the farmer in his field to develop improved practices.

Working on an innovation

How to identify an innovation?

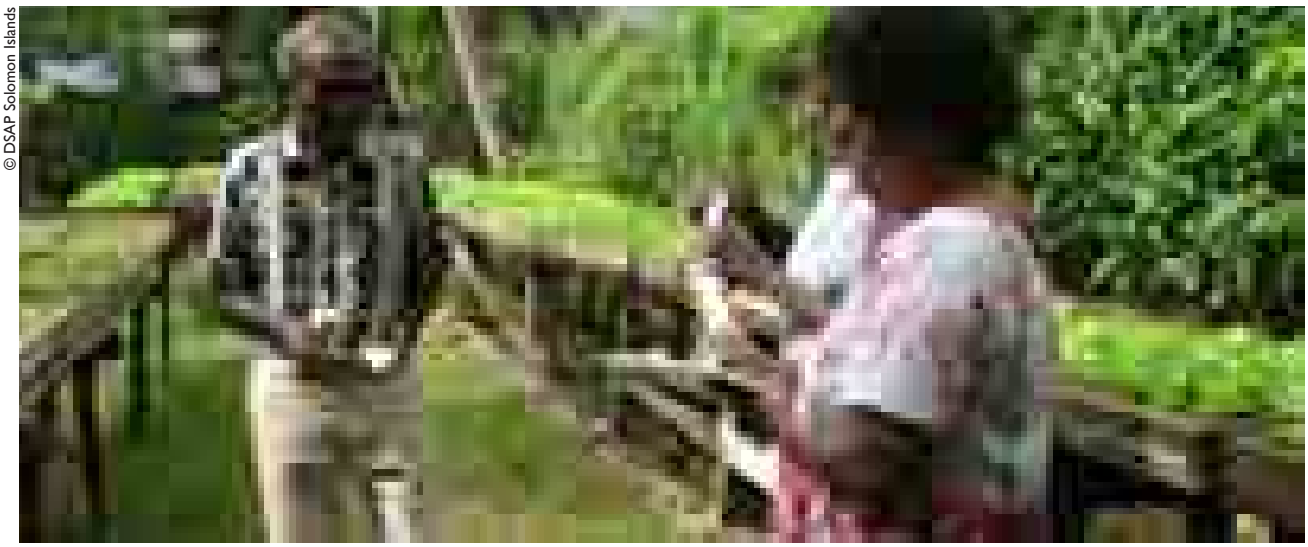
- Identify farmers who are performing way above the average farmer. Identify what makes them perform better than other farmers.
- Look for practices that improve livelihood but are not practiced by a majority of the population in that area.
- Look for practices that are new to the area.

Steps to verify PID

- **Innovation has been identified.**
- **Verify innovation using the TEES test.**
- **Identify gaps in the innovation that need verification and verify the facts.**
- **Identify gaps in the innovation that need improvements.**
- **Identify the costs of improving the innovation.**
- **Identify relevant expertise to assist in developing the innovation.**
- **Identify where to trial the innovation.**
- **Involve the farmer right from the start.**
- **Seek consent from the farmer to record the innovation.**
- **Record the innovation.**
- **Give credit to the farmer.**

The TEES test can be applied to determine an innovation.

T - Technologically sound
E - Economically viable
E - Environmentally friendly
S - Socially acceptable



Farmer sharing information with staff from the Ministry of Agriculture.

Farmer's garden, Solomon Islands.

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Farmer schools and community-based training centres

to facilitate agricultural productivity

DSAP Solomon Islands

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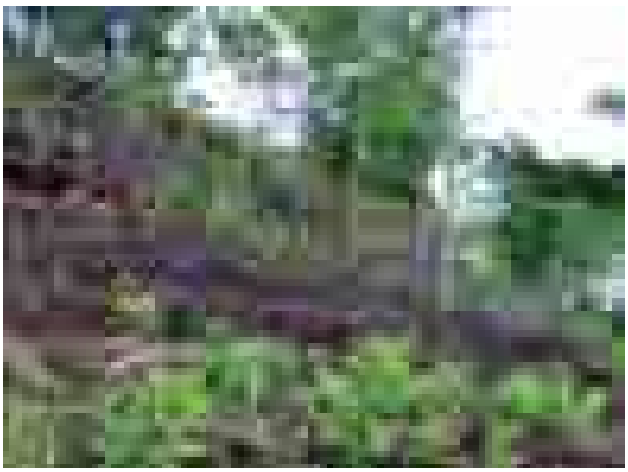
Farmer schools and community-based training centres provide avenues for training in remote, rural areas and in areas that are far away from agriculture training centres.

Farmer schools (FS) and community-based training centres (CBTC) are centres of learning built by the community to address issues of interest. Communities gather in these centres to learn new technologies and share knowledge.



Contour and alley cropping using glyricidia and vetiver grass at the Gaunafiu Farmer School.

The farmer school involves the community building a centre for learning and also allocating small pieces of land around the centre for use as demonstration plots. Farmers come together to the centre to learn new farming technologies and to share farmers' knowledge.

This concept of a Farmer School is different from the Asian concept of Farmer Field Schools (FFS), which was used to address plant protection issues, and where the field is used as a classroom for learning.

The Gwaunafi Farmer School, Central Highlands, Malaita.

Community-based training centres are also community-based initiatives, which involve the community building a house for learning and accommodation for resource personnel or participants from other villages. What makes a CBTC different from a FS is that the CBTC addresses other livelihood issues such as carpentry, mechanics and life skills.

Members of Toroa CBTC, Wanione, Makira Ulawa Province, sharing knowledge on coconut oil production.

Farmer schools and community-based training centres have been used successfully by NGOs like the Kastom Gaden Association (KGA) in many rural areas in the Solomon Islands for many years.

DSAP Solomon Islands, in its collaborative work with KGA and other NGOs, has used these centres to facilitate farmer participation.

USING THE FARMER SCHOOLS OR COMMUNITY-BASED TRAINING CENTRES

It is important to consult and liaise with other stakeholders using the centres so that programmes or activities do not clash.

Sometimes communities charge for the use of these centres. These small fees help in the maintenance of the centres.

These centres were built by the communities to address specific community issues. It is like a one stop shop for the community's issues. By going through these centres to reach the community, collaborative work between the government, community and civil society is improved. The maintenance and managing of these centres is the community's responsibility and this promotes participatory development as the community already has a central location to meet to discuss their needs.

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Participatory establishment of paper mulberry nurseries for women

DSAP Tonga

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The women decided that each household should establish a paper mulberry nursery with 200 plants. This was the birth of the Hunga and Noapapu Islands paper mulberry nurseries project. The project went on to become a major success in terms of communal work and more importantly the recognition of gender equity.

DSAP Tonga entered the communities of Noapapu and Hunga Islands through the NGO Tonga Community Development Trust (TCDT). The Ministry of Agriculture and Food, Vava'u, selected the two islands, as they were lower down on the scale of agriculture activity.

Community consultations were held with the communities. The different views and priorities of the men's group and women's group were a highlight of the consultation. The men identified infrastructure on the island and its relation to agriculture as a priority, **while** the women regarded improving the production of handicraft plants and vegetables as priority agricultural activities.

"The reality of working in communities is that there are challenges already existing. These challenges could range from internal conflicts to dissatisfaction with previous projects. BUT in such instances, if sustainable development is the goal, then the project has to deal with the challenges in a manner that is participatory and inclusive and with a great deal of understanding and flexibility."

© DSAP Tonga

During the community consultation (PRA), DSAP asked the men if they could offer the women an opportunity to make decisions regarding the usage of DSAP funds to tackle the identified obstacles to agriculture production. The men gave their approval and support and the women decided that each household should establish a paper mulberry nursery with 200 plants.

In 2006, DSAP together with community leaders from Hunga, walked from house to house inviting households to join the proposed activities for establishing paper mulberry nurseries.

DSAP facilitated training for the women in making seedbeds and raising vegetable seedlings, installing the bucket irrigation system and in transplanting vegetables.

In early 2007, it was found that the women's efforts had put 14,450 mulberry plants in the ground. At the first year of maturity, these were worth PA'ANGA 50,000 for the entire crop. This amount is expected to increase four times when the mulberry is mature, harvested and processed as tapa.

The strength of this project on Hunga Island lies in the **process** that was used to **identify the problems** and bring the community together on the project. **Using a participatory approach,** where the voices of the members of the community were heard, resulted in **empowerment. The community is involved** in the entire cycle of project management.

Strengths of participatory approach

- Strengthens linkages between NGOs, Ministry of Agriculture and target communities.
- Sensitises community leaders to the importance of gender equity.
- Unites a divided community.
- Encourages transparent decision making.
- Enables the community to own the project and then together plan and agree on activities.

Limitations of participatory approach

- Time and patience are needed to introduce and build positive competitive change. It does not happen overnight.
- Outsiders must learn quickly and be aware of local protocol.

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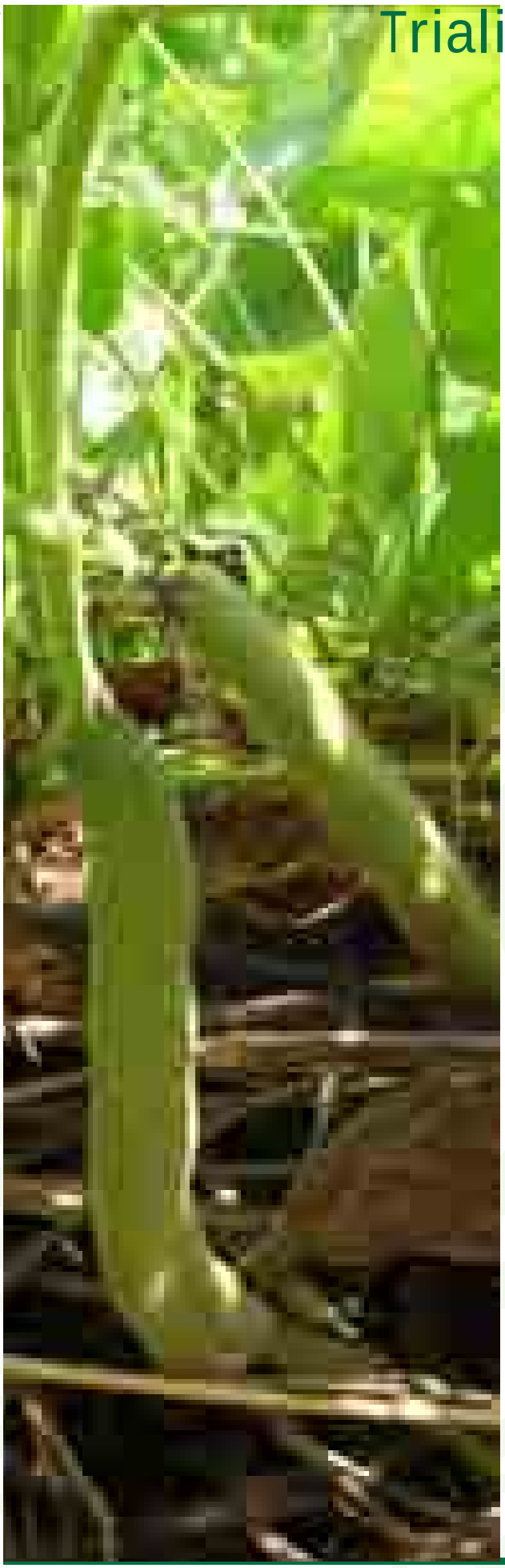

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Trialing the mucuna bean - farmer-led extension

DSAP Tonga

DSAP took the mucuna bean to the farmers after the community consultations identified that poor soils were a major challenge to agricultural productivity.

Mucuna pruriens*, known as the velvet bean, or locally named *punungamo'ui was introduced into Tonga under the EU PRAP project in the 1990s. Studies had shown that the velvet bean increases the nitrogen level and mobilises phosphorous in volcanic soils.

However, Tongan farmers were not able to access this technology as it was confined within the research stations.

After farmers raised the issue of poor soil fertility, DSAP initiated the farmer-led extension and provided the farmers with mucuna beans which they trialed on their farms.

METHODOLOGY OF THE FARMER-LED EXTENSION PROCESS

- Carry out initial participatory consultation with the farmers, identifying and prioritising agriculture problems.
- Carry out secondary consultation, using tools like transect walks to identify with the farmer soils that are infertile.
- Plant mucuna beans on some identified infertile soils.
- Leave a "no mucuna beans' plot adjacent to the plot with mucuna beans for visual comparison.
- After 6 months prepare both plots (with and without mucuna beans) for planting.
- Plant cassava in both plots. Cassava is used as it is a common crop for all farmers.
- Observe the cassava plots for growth vigour differences.
- Organise farmer field days for sharing and learning with other farmers.
- Repeat the process with other farmers who want to try the mucuna beans on their plots, except this time scientists are involved to verify any new claims from the on-farm trials.
- Integrate the farmers' findings with scientific verifications.
- Use the local media to promote the farmers' reactions and experiences with the mucuna beans.
- Create publicity and instructional materials for dissemination through the government and civil society network to promote the use of the mucuna beans to improve soil fertility.

"The farmers led the way in trialing the mucuna beans on their farms. There are benefits and limitations to farmer - led extension".

Benefits

- Farmer-led extension works well with 'best bet' technologies.
- Farmer-led extension benefits from farmer knowledge and values.
- Farmer-led extension strengthens relationships with all parties involved (ministry, other farmers).
- Farmer-led extension creates a sense of 'ownership' for the farmer, which results in active participation.
- Farmer-led extension feedback is a credible source of information for extension management systems.
- Farmer-led extension is effective in influencing farmers to adopt new technologies or methods.

Limitations

- Farmer-led extension cannot be used to introduce new technologies that have not been tested in the country.
- Farmer-led extension can be expensive to establish and monitor if farmers are scattered throughout the country.

The impact of mucuna beans on squash input costs

DSAP Tonga worked with commercial squash farmer Minoru Nishi Jnr on an economic analysis of the effect of mucuna bean fallow on squash input costs. Mucuna was used for its ability to provide nitrogen for the soil, thereby reducing land preparation activities.

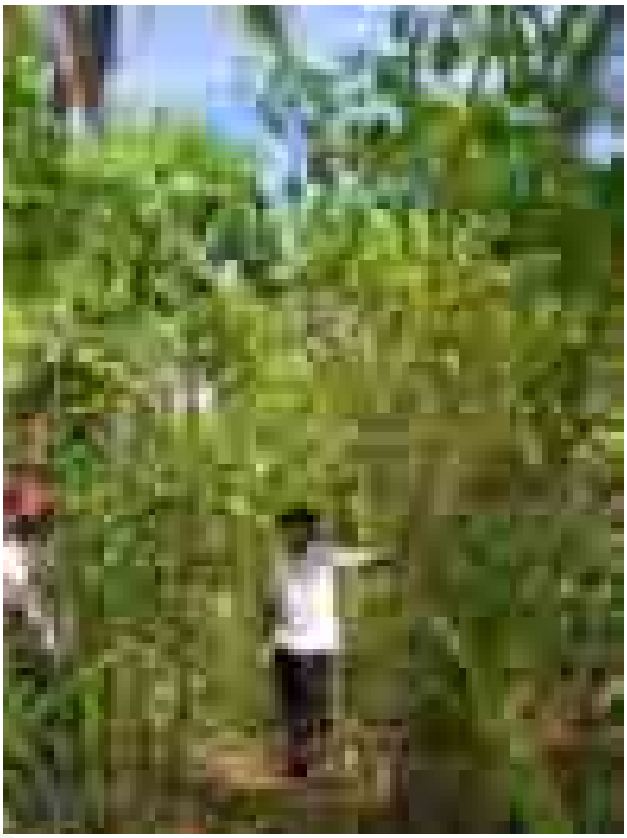
	NO PUNUNGAMO'UI FALLOW (Farmer Normal Practice)			PUNUNGAMO'UI FALLOW		
INPUTS	**QUANTITY (unit)**	**PRICE PER UNIT (T$)**	**TOTAL INPUT COSTS (T$)**	**QUANTITY (unit)**	**PRICE PER UNIT (T$)**	**TOTAL INPUT COSTS (T$)**
1) Squash seeds	700 (g) /(~2acres)	$226.15/700g	$ 226.15	700 (g) (2acres)	$226.15/700g	$ 226.15
2) Slashing	-	-		20 (min)	$20.00/20min	$ 20.00
3) Ploughing	3 (hr)	$200.00/hr	$ 600.00	-		
4) Disk harrowing	20 (min)	$60.00/hr	$ 20.00	10 (min)	$10.00/10min	$ 10.00
5) Planting	20 (min)	$150.00/hr	$ 50.00	20 (min)	$150.00/hr	$ 50.00
6) NPK	600 (kg)	$38.00/40kg	$ 570.00	600 (kg)	$38.00/40kg	$ 570.00
7) Urea	160 (kg)	$36.00/40kg	$ 144.00	-		
8) Insecticides:	(L or kg)					
Insecticide 1	1 (L)	$28.00/L	$ 28.00	1 (L)	$28.00/L	$ 28.00
Insecticide 2	1 (kg)	$60.00/kg	$ 60.00	1 (kg)	$60.00/kg	$ 60.00
Insecticide 3	1 (kg)	$50.00/kg	$ 50.00	1 (kg)	$50.00/kg	$ 50.00
9) Fungicides:	(L or kg)					
Fungicide 1	750 (g)	$140.00/750g	$ 140.00	750 (g)	$140.00/750g	$ 140.00
Fungicide 2	2 (kg)	$40.00/kg	$ 80.00	2 (kg)	$40.00/kg	$ 80.00
Fungicide 3	2 (kg)	$22.00/kg	$ 44.00	2 (kg)	$22.00/kg	$ 44.00
10) Weeding	10 (min)		$ 36.00	10 (min)		$ 36.00
11) Boom spraying	30 (min)		$ 75.00	30 (min)		$ 75.00
12) Harvest operation			$ 790.00			$816.00
TOTAL COSTS			**$ 2,913.15**			**$2,201.15**
YIELD			**9.5MT**			**10MT**

Summary of Farmer Nishi's costs

For 2 acres of squash, the use of mucuna beans was able to reduce the land preparation costs from the previous amount of T$600.00 to T$30.00. The use of mucuna beans also reduced the cost of urea fertiliser from T$144 to zero. Farmer Nishi also noted that the harvest of squash from the mucuna bean fallow was 10.2 MT whereas previously it was around 9.5 MT.

THE IMPACT OF MUCUNA BEANS ON CASSAVA BITTERNESS

Farmer Niu Lofia also tested mucuna bean fallow on cassava. Like Farmer Nishi, he had a plot with mucuna fallow and an adjacent plot with no mucuna. Farmer Lofia noted that the yield of cassava from the mucuna fallow plot improved significantly compared to the yield from the non-mucuna fallow plot.



Cassava plants, "Punungamo'ui" fallow plot

Cassava plants, "No Punungamo'ui" fallow plot

IMPACT OF MUCUNA ON WEED REGENERATION

Research staff from the Ministry of Agriculture, farmers and DSAP staff conducted weed counts on the on-farm trials. The observations were in 1m x 1m quadrats and the objective was to compare species and number of weeds during the mucuna bean fallow. The trials showed that mucuna beans can change the concentration of weed species that regenerate after fallow. However, there are on-going trials to further investigate and confirm these findings.

Images of weeds regeneration under the "pununga mo'ui" and "no pununga mo'ui" quadrats

Pununga mo'ui fallow quadrat

No Pununga mo'ui fallow quadrat

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Using the bucket irrigation system

DSAP Tonga

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Water scarcity was identified as one of the five most important agricultural problems faced by farmers in Tonga.

The bucket irrigation system (BIS) ***was introduced to the Ministry of Agriculture, Food, Forestry, and Fisheries, Tonga, in early 2003. Farmers rely on rainfall for their vegetables and crops. The rainfall pattern indicates most rainfall occurs in the November - January period, which is the off-season period and summer time. The vegetable growing period is from May to September, which also happens to be the period for low rainfall. During DSAP participatory consultations with Tongan farmers, farmers identified the need for wise and efficient use of their meagre water supply. DSAP Tonga introduced the farmers to BIS, a drip irrigation system designed for efficiency in irrigating vegetables and crops.***

Princess Siu'ilikutapu (sitting inside van) and her Lapaha Women's Vegetable Group members on site visit to Ma'a Lahi Organic Vegetable Project. Farmer Mr. Hasiata kneeling in front (R).

Farmer's response...

Mr. Latu of Havelu, Tongatapu commented that since using the BIS, he was able to harvest his lettuce 4 weeks after transplanting. Previously, Mr Latu would handwater his plants and it would take 5 weeks before he could harvest. Mr. Latu also reported that with the BIS, his lettuce heads weighed more than 1 kg per head.

Another farmer Mr. Manisela of Vaini, Tongatapu, reported to DSAP that using the BIS he was able to earn Tongan Pa'anga 2,000 from less that a quarter acre of watermelon. As a result, he has up-scaled his BIS to 200 litre drums.

Princess Siu'ilikutapu of Lapaha, Tongatapu, encouraged her vegetable group members to grow vegetables, enabling the mothers to serve their families a variety of healthy meals.

Mr. Ma'u Kakala of Talafo'ou, Tongatapu, said that since his adoption of the BIS, all the members of his family are involved with farm activities and as a result they now earn more income.

© DSAP Tonga

3-week old head of lettuce weighing over 1 kg.

LESSONS LEARNED

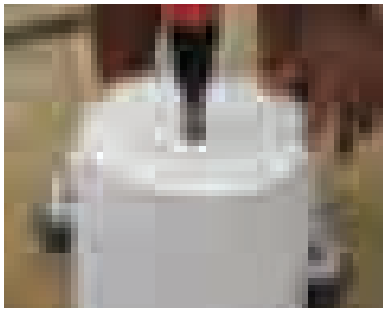
- It is important to carry out an awareness programme prior to implementing the BIS. Introducing new and effective agricultural technology increases farmers' demands to access the technology. The increasing number of farmers wanting to use the technology presents challenges to the participatory technology development approach, especially when new farmers access the technology by themselves without the knowledge of project staff to provide guidance and advice.
- There is a strong feeling that students from primary school level should have been included in respect to the importance of healthy eating habits and the importance of water for vegetables and crops.
- Other stakeholders must be involved in all stages of the BIS development.
- Incentives such as BIS components and vegetable competitions help ensure the sustainability of the technology.
- The demand to up-scale BIS is an indication of effective technology. Youth and women's groups in villages have managed to up-scale by connecting the BIS directly to the village water supply. This gives them 24/7 access to BIS, and hence they can grow successful vegetable gardens near their houses.
- Backyard plots engage more family members in various activities.

FOLLOW-UP

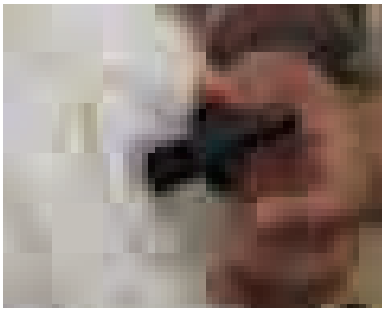
- Securing a local supplier with cheaper prices.
- Upscaling from BIS based on farmers' innovations to bigger tank volumes such as 200 to 3000 litre container.
- The ability to connect drip tubes directly to the main town water supply.
- Involvement of other stakeholders such as the Ma'a Lahi Project, youth and women's development with their commitments to extend and expand irrigation project principles.

Setting Up A Bucket Irrigation System

The Bucket Irrigation System was introduced to Tonga in 2004 through training conducted by MAFFF. However, after a series of PRA throughout Tongatapu, water scarcity was identified as one of the top five agricultural problems. DSAP Tonga took up the technology and implemented initiatives with some farmers to trial its suitability.

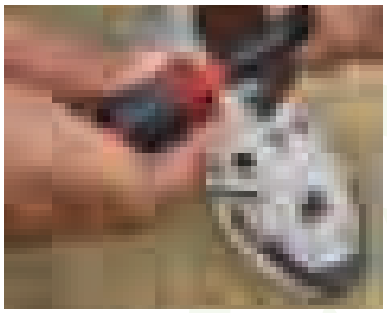


1. Drill a hole at the bottom of the bucket. The hole should fit the male tank fitting.

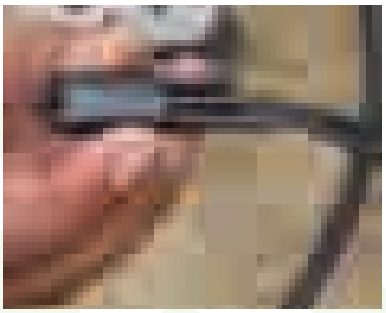


2. Unscrew the tank fitting, insert it in the hole, and tighten by hand.

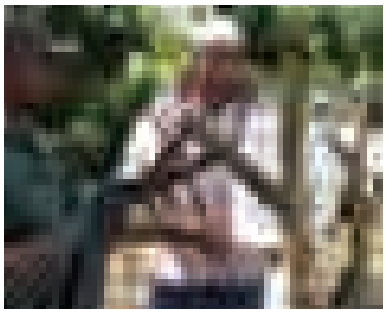
3. Connect one end of the 1m long main poly pipe to the tank fitting and the other end to the take-off.



4. Connect the other end of the take off to one end of the 30 m long drip tape.



5. Close the other end of the 30m long drip tape by using the end cap. Cut a piece of the drip tape about 3 cm from the end. Fold over the end of the tape (as shown) and insert it into the end cap to hold the bend together, closing off the end of the tape.



6. Elevate the bucket to a height 1.5 m from the ground by suspending it on a crossbar or placing it on a stand.

7. Lay the drip tape in the row to be irrigated. Make sure that the drip holes are facing upward and the tape is laid on flat ground (slope must never exceed 5%).

8. Must use clean water to fill the bucket once in the morning and once in the evening every day.

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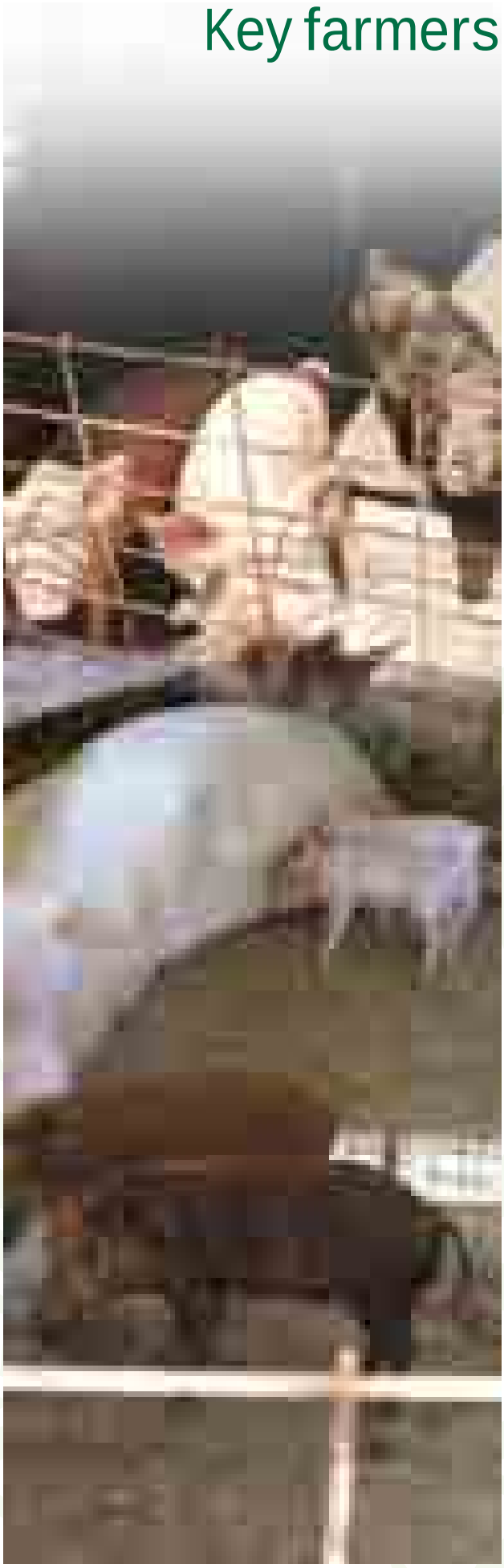
Key farmers as extension agents– promoting pig farming

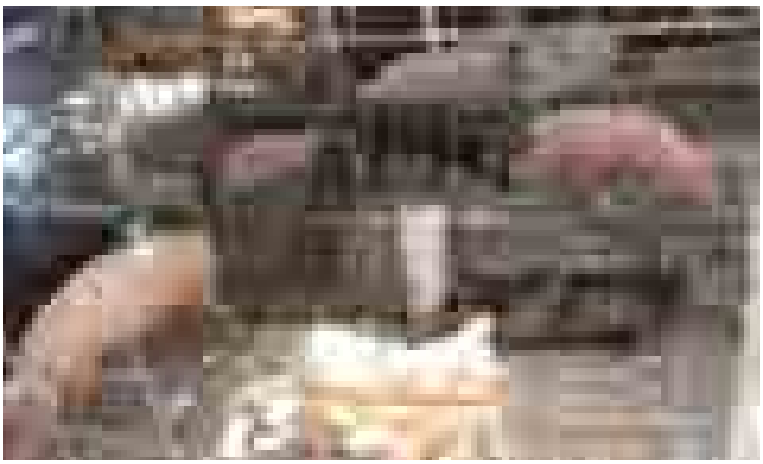
DSAP Tuvalu



During the community consultation (PRA), farmers commented that there has been very little improvement in the area of livestock production in the past few years.

An objective for DSAP Tuvalu is to improve pig production in the country and to increase the number of farmers raising pigs.

Pigs play an important role for Tuvaluans. Not only are they a source of food and money for the family, but they are also used in communal gatherings. Many of the farmers keep the local breed of pigs in their pens. However, according to the farmers, this local breed is slow to grow and is labour intensive in terms of caring for and managing the piggery. Many farmers have stopped breeding local pigs in favour of purchasing meat from the shops.

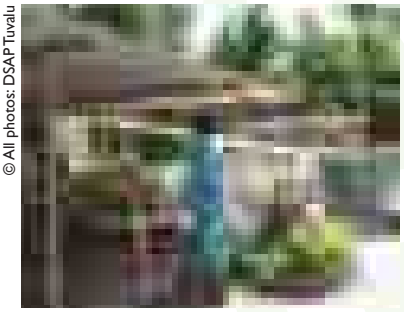


Piggery on Nukufetau Island.

DSAP intervention included training the farmers and extension officers on each island in pig production. This included selecting a key farmer to assist the extension officer with training of other farmers and interested members of the community.

Key farmers are those who implement successful personal agricultural activities on their island. They are community members who have a willingness to learn and share their skills and expertise. DSAP Tuvalu builds the capacity and skills of these key farmers who in turn help others in their community by sharing the agricultural information and knowledge they have gained.

Key farmers are an important agent for agriculture services as they can assist extension officers in locations where there are not enough officers for the local population.



Piggery on Niutao Island.

Setting up demonstration plot, Vaitupu Island.

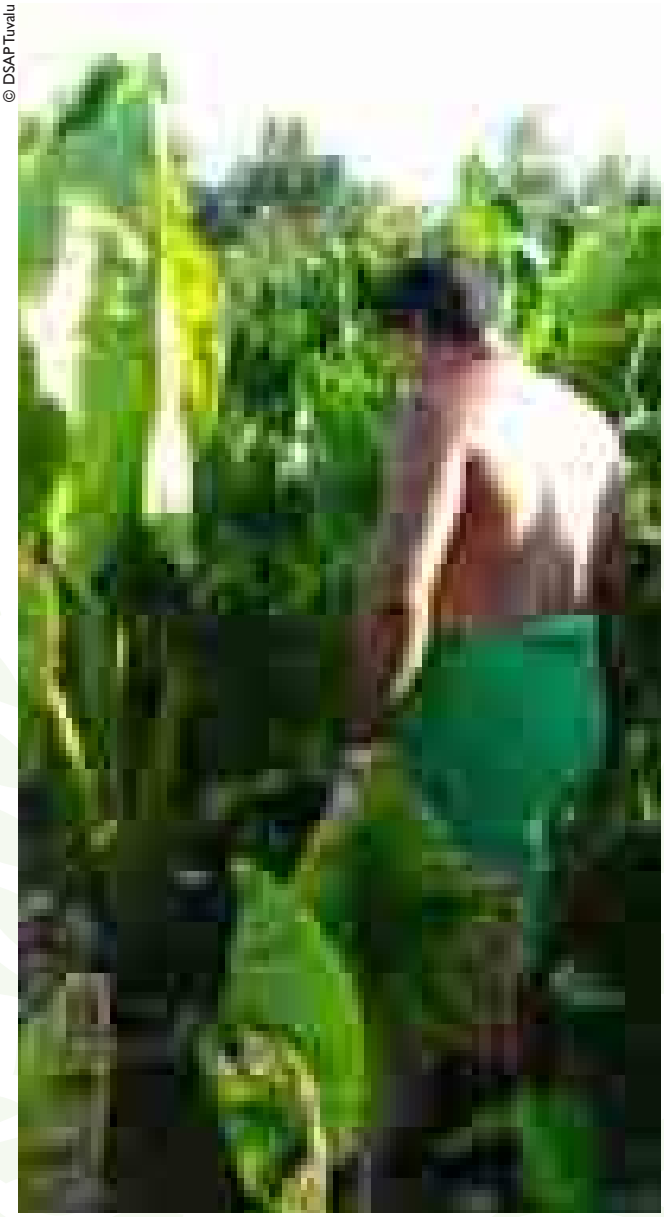
Workers on the demonstration plot on Vaitupu Island.

Process

- Agriculture extension officers on each island are requested to assist with identifying members of the community who can take on the role of key farmers.
- The members of the community who have been identified are approached and asked if they are interested in being a key farmer. The roles and responsibilities of a key farmer include implementing and managing a Farmer Field School (FFS) in their community.
- DSAP engages with the key farmers in formulating strategies for the FFS on their island. Assistance is provided for the key farmer to design their project and then he/she is provided with materials to help with their FFS.
- Based on the farmer's knowledge and experience, training is provided in the area in which the key farmer will be sharing information and knowledge with other farmers.
- DSAP provides assistance to the key farmer, enabling the key farmer to have on-farm demonstration plots/projects for members of their community to view.
- On-going support is provided to the key farmer in terms of technical assistance from the local extension officer or from DSAP.

Benefits of using key farmers

- Key farmers can be used to distribute quality planting materials or quality breeds of livestock. This is because the key farmer receives direct technical assistance from the Department of Agriculture and their demonstration plots or projects will have the planting materials or livestock recommended by the Department of Agriculture.
- Key farmers can train other farmers or other members of the community who are interested in agricultural activity. This is particularly useful in areas where there is a shortage of extension officers to serve the population; key farmers can step into the role of extension agents.
- Having key farmers creates interest and keeps motivational levels up in agricultural activities as key farmers themselves work hard at ensuring their work is successful.
- The relationship between the community and the extension officers or the agriculture department is strengthened due to this engagement by members of the community.



Farmer in the pulaka pit.

Pig farmer on Nukufetau Island.

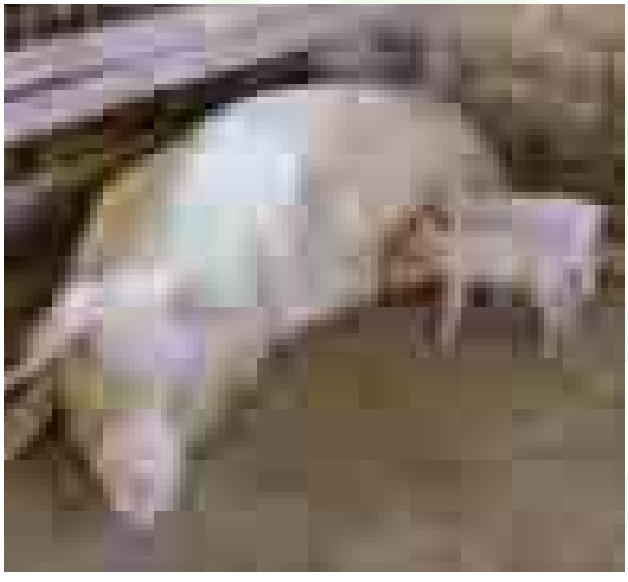
Challenges of using key farmers

- Sometimes the expectations of key farmers exceed what the project is able to offer.
- Remote locations and high costs of travel can often mean a reduction in visits between the key farmers and DSAP.
- Inadequate infrastructure (phones, fax and internet) also means low frequency of contact between key farmers and extension officers in remote rural locations.
- Sometimes a key farmer can change his/her mind and may not want to share the information and knowledge they have gained with other farmers.
- Farmer literacy levels and their ability to share the correct and relevant information are important points to consider.

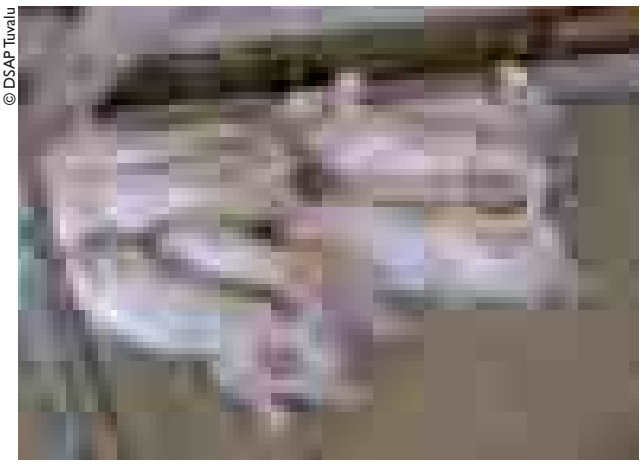
PIG FARMER NOW KEY FARMER FOR VAITUPU ISLAND

Soni Malona is a pig farmer on the island of Vaitupu. In his local piggery (made from local pieces of wood to fence the pigs in, in a dedicated area), Soni spent a good part of his time finding local feed for his pigs (coconut, green leaves and fish) as well as keeping his pig-pen neat and tidy. Soni was approached and asked if he was interested in being a key farmer for the island. The roles and responsibilities of the key farmer were explained to Soni and he accepted this new position with excitement. Although Soni was an experienced breeder of the local breed of pigs, it was a challenging activity as it was labour intensive and provided very little return to his family.

In May 2006, Soni joined other selected key farmers from all over Tuvalu and they participated in the first round of training sessions preparing them for their new roles. Once they returned to their islands, DSAP Tuvalu provided the key farmers with materials and resources to assist them with setting up demonstration (demo) plots on their land. The demo plots help with the sharing of information and skills with other interested members of their community.



Piggery farm on Nukufetau Island.



Piggery farm on Nukufetau Island.

Soni returned to his home on Vaitupu Island having completed training in pig breeding and with the materials to set up a proper pig-pen including a septic tank for the waste, three improved breeds of pig and pig feed for one year.

Soni Maloni is enjoying his role as a key farmer. On the one hand he is learning improved methods to manage his pigs, which is making life easier for him in many ways. On the other hand, he is able to help other members of his community become better pig farmers.

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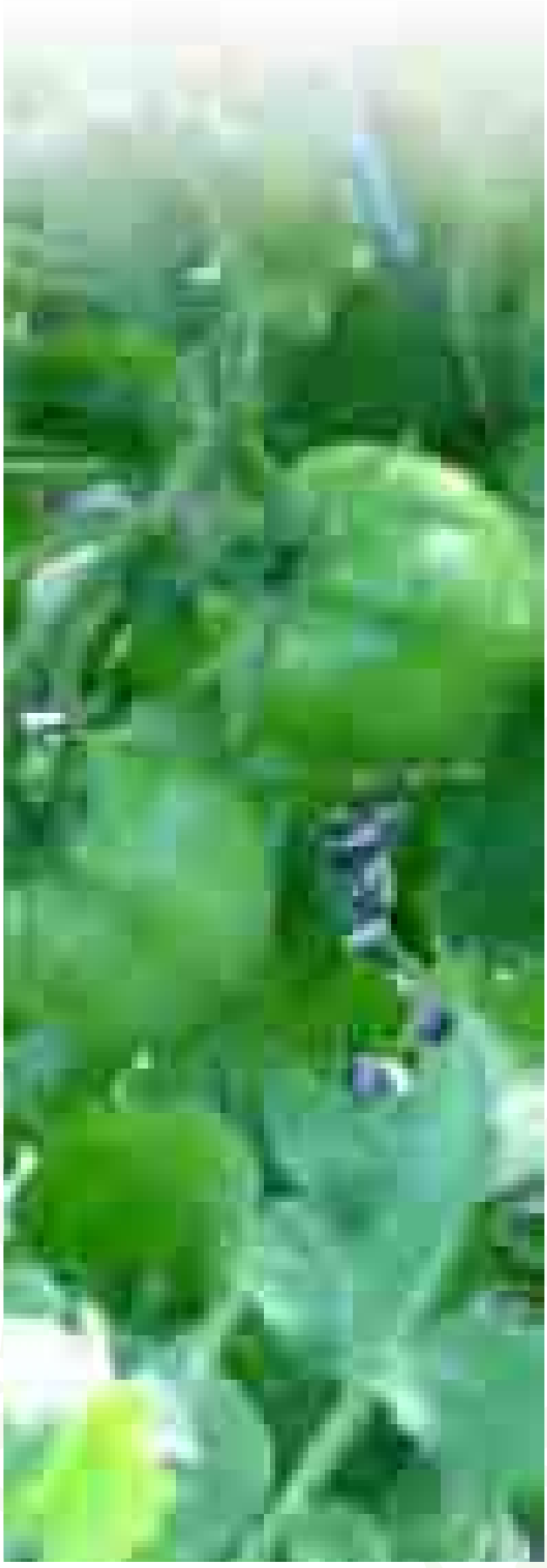
It starts at home–
backyard gardens on Funafuti Atoll

DSAP Tuvalu



The poor soils on the atoll islands of Tuvalu remain a challenge for families wanting to set up gardens in their backyards. DSAP Tuvalu's intervention has included providing technical advice and assistance, in particular to women who main-care for these home gardens.

Recognising the high level of food security that home gardens can provide for a family, the objective of the DSAP intervention was to promote home gardens to increase food security for the family. There is a high incidence of non-communicable diseases like diabetes in Tuvalu. This has been largely due to the change to diets that have very low nutrition value and low vegetable content, compounded by a sedentary lifestyle. Home gardens help members of the family not only because they have a constant supply of vegetables for their meals, but because working in the home gardens is a good form of exercise.

The community consultations indicated that many farmers were discouraged from planting because of the low soil fertility on the atolls. As part of the DSAP intervention, farmers were trained in making quick compost that assisted with improving soil fertility and in using quality planting materials. DSAP worked with community groups, in particular to encourage their members to set up gardens in their backyards. The project provided training and support in setting up a garden, making quick compost and maintaining the gardens. DSAP also provided the communities with seeds and on-going technical advice.

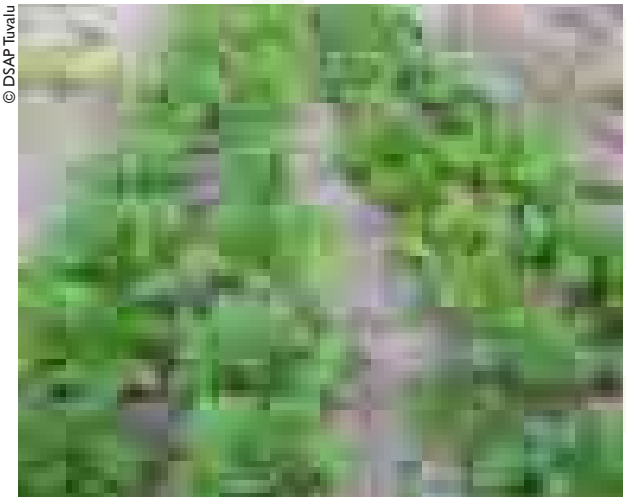
From the garden to the table: Cooking classes for the women of Tuvalu

With the increasing health problems on Tuvalu, DSAP has been working with staff from the Health Department to promote the importance of eating the right food. Members of the Right Food Group include locally grown crops like pawpaw, taro and *pulaka* in their diets and now grow vegetables in their backyards, including cabbages, tomatoes and capsicums.

One of the reasons given for the lack of vegetables in the diets of the community has been lack of knowledge on how to cook the vegetables. With assistance from staff of the Health Department, DSAP organised cooking classes for the women.

The women of the outer island of Vaitupu were the first to hold cooking classes. The women were running a home garden competition and decided to hold a cooking class on the day of the judging of their home gardens. The cooking class involved the women sharing their ideas, knowledge and skills about cooking the different vegetables planted in their gardens. The class was a lot of fun for the women as they shared their ideas and skills, with the best moment being when it was time to eat the delicious meals they had cooked. From their own gardens to the tables, it was a very proud day for the women of Vaitupu.

There is increased interest, by women in particular, in setting up these little gardens next to their homes. The cooking classes have become an opportunity for women to exchange ideas and share knowledge.



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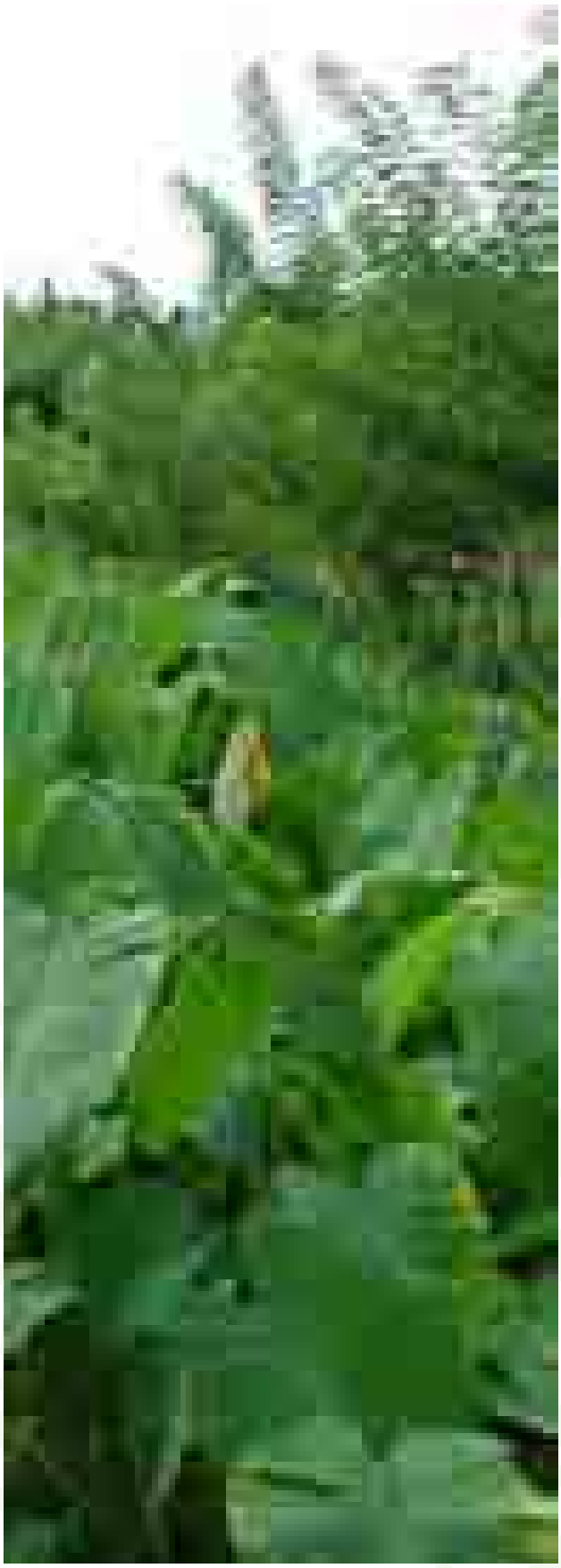
Short term study on alley cropping with *Gliricidia*

DSAP Vanuatu



Alley plots using Gliricidia sepium were established because of its ability to withstand occasional pruning and to acclimatise to most of Vanuatu's islands. It is also resistant to most pests and diseases.

In Vanuatu, alley cropping has been promoted by previous projects based mainly on observations. However, there is a need for documentation of its ability to sustain food production and maintain soil fertility.

Gliricidia alley croping

Methodology

Main aims of the alley cropping trial:

- To see if use of *Gliricidia* alleys can sustain sweet yam (*D. esculenta*) production over time (3 years).
- Monitor soil fertility status of *Gliricidia* alleys at the beginning of the establishment and at time intervals during the trial.

Indicators

- Number of extension officers promoting alley cropping using *Gliricidia*.
- Number of farmer demonstration gardens (alley cropping).
- Number of farmers adopting the techniques from key farmers.
- Number of farmers seeking advice on the use of alley cropping technology.

Site

Two plots with an average size of 500 m^2 (25 m x 20 m) per plot were monitored. An alley was spaced at 5 m, with hedgerow plants planted at 1 m spacing. One plot had a *Gliricidia* alley, and the control plot (had no alley).

According to Quantin (1989), the soil is classified as weakly unsaturated humic ferralitic soils on limestone plateaus.

The plots were left fallow for approximately 3–4months before replanting with sweet yams for the next cropping season

Method of monitoring

- Field observations,
- Weight of sweet yam production and food crops planted within the plots, and
- Soil analysis determining soil fertility status.

Gliricidia alley croping with taro at VARTC

Findings

Prunings

One yam-cropping season (approximately 9–11 months) produced 650 kg of fresh prunings from 4 prunings.

Table 1: Nutrients of fresh pruning added to soil

Value	Mean nutrient values for prunings of Leaves and petioles
Total N (%)	3.43
Olsen P (mg/kg)	0.377
K (me/100 g)	2.81

Sweet yam harvest

Sweet yams (*D. esculenta*) were planted to assess the crop yield production of the area in the 2005–2006 yam cropping season. The following results were obtained:

Table 2: Crop yield production for Sweet yam in the 2005–2006 yam cropping season

Treatment	Yield (kg)	Average yield per plant (kg)
Alley plot (428 plants)	1,060	2.48
Control plot (556 plants)	2,083	3.75

Sweet yam yield showed that alley cropping had a lower plant yield weight (2.48 kg), while the control plot showed a higher plant yield (3.75 kg).

Yield of an alley plot area (25 m x 5 m)

Tuber yield from sweet yam plant grown in an alley plot

Soil fertility status within the alley plots

Table 3: Soil fertility status of alley plot from establishment and after 3 years

Treatment	Time	pH (water)	Total C (%)	Total N (%)	Olsen P (mg/kg)	K (me/100g)
Alley plots	Establishment (2004)	6.27	3.42	0.336	4.4	1.86
	After 3 years (2007)	5.85	3.35	0.322	3.4	0.352

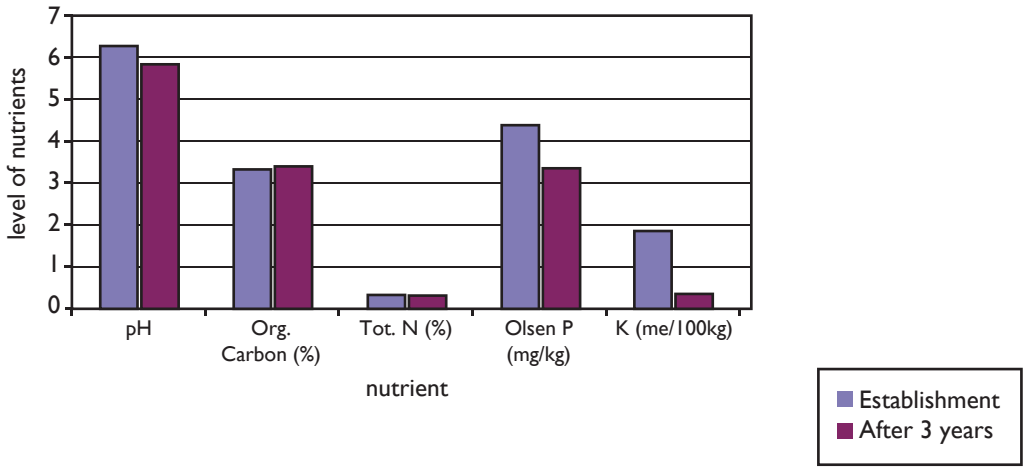


Figure 1: Soil nutrient status of alley cropping trial on establishment and after 3 years of cropping

Soil nutrients status from samples collected within the plots showed a decline from when the alleys were established, until three years of cropping.

We can conclude from this short-term study (3 years) that alley cropping with *Gliricidia sepium* on weakly unsaturated humic ferralitic soils on limestone plateaus did not improve the soil status of the major nutrients, even though prunings were added to the soils. It should be noted that it is a short-term result, and monitoring of the alley plots is still being carried out to further verify the long-term results, especially for soil status and crop yields.

The following observations were made during the trial:

- The hedgerows provide a good working environment during maintenance (weeding).
- Planting is much easier for alley plots during soil preparation.
- Pruning is an extra task for alley plots, but is much faster when the *Gliricidia* is only 1-2 months old, i.e. the older the hedges, the more time needed to prune them because woodiness develops.
- The hedgerows take up more planting space than areas without alleys.
- Prunings control the weed to grow faster in alley plots.

Outcome of results collected to date

- This technology is being promoted in DSAP sites. To date, the technology is being upscaled from individual plots to community gardens (kastom karen), in North Pentecost.
- Field visits and training provided to other farmers and field officers
- A video was made on the stages and results of the trial
- Documentation and publication of finalised results of the technology

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Effect of yam staking on maligi and salemanu cultivars

DSAP Vanuatu

Yams play an important role in the traditional and social obligations of many Ni-Vanuatu farmers. However high prices, labour intensive practices (planting, weeding, staking and harvesting) and the impact of yam anthracnose disease may result in the yam losing its position of importance.

A short-term study (one cropping season) was conducted to compare staking against unstaking of *malingi* and *salemanu* yam cultivars. These yams are commonly cultivated in North Pentecost. It was observed that some farmers plant these yams without staking them.

Methodology

The objective of this trial was to assess yield, staking against unstaking of malingi and salemanu yams, and occurrences of yam anthracnose at 5 and 7 months after growth.

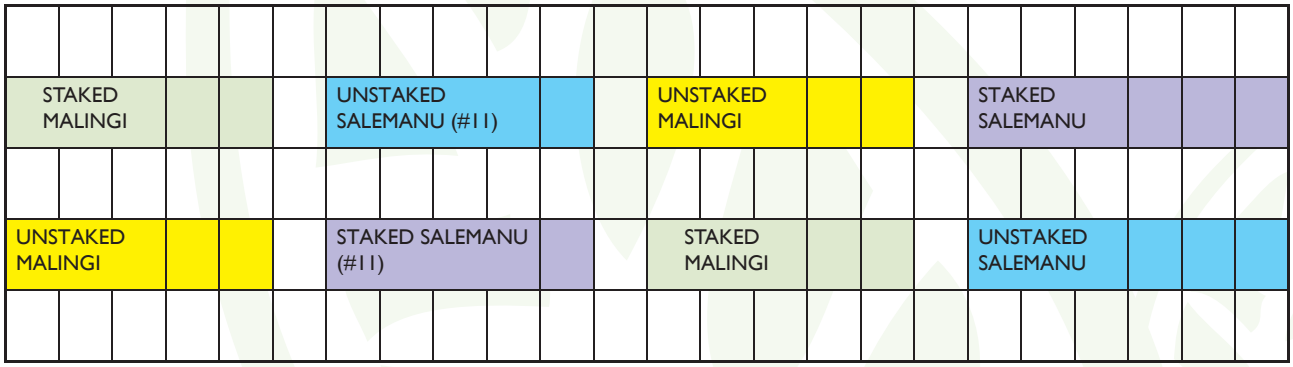
The trial was established in 2005 at the DSAP demonstration plot at Chapuis Station. The yams were harvested in 2006 (one yam cropping cycle)

Site

The trial was conducted at the Chapuis Agriculture Station. The site is classified as a weakly unsaturated ferralitic soil on a limestone plateau (Quantin, 1982)

Layout

Yams were planted in a randomised block design, with two replicates per treatment, as shown below, in an area of 125 m^2:



Yam scoring assessment

Assessments for yam anthracnose were made at 5 and 7 months of yam growth.
Scoring ranking was done with the assistance of the Vanuatu Agriculture Research and Technical Centre:

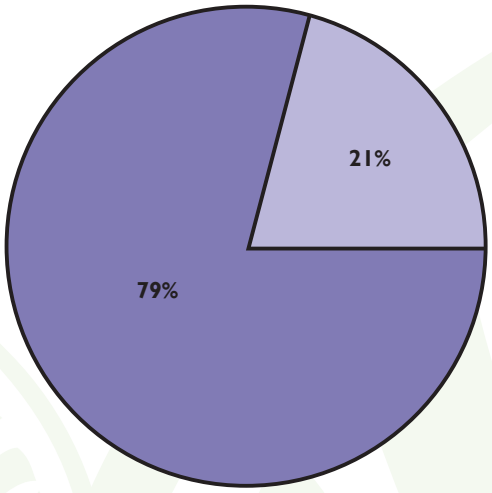
1 = resistant- being able to withstand the infection (0 - 30%)
2 = tolerance- ability to stand against continued infection (>30 - 60%)
3 = susceptible- easily affected by the infection (>60 - 100%)

Results

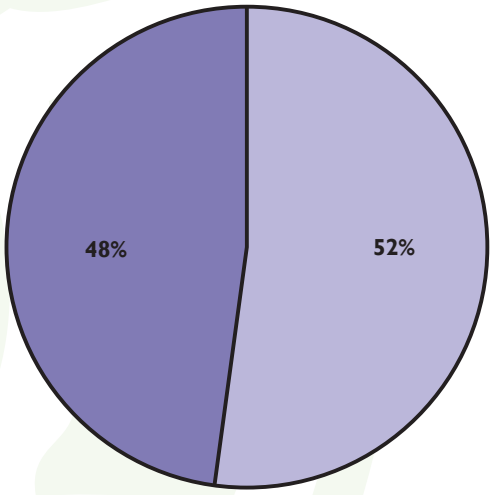
Yield result

TREATMENT	TUBER WEIGHT (kg)
salemanu-unstaked	4
salemanu-staked	15
malingi-unstaked	13
malingi-staked	12
staked	27
unstaked	17

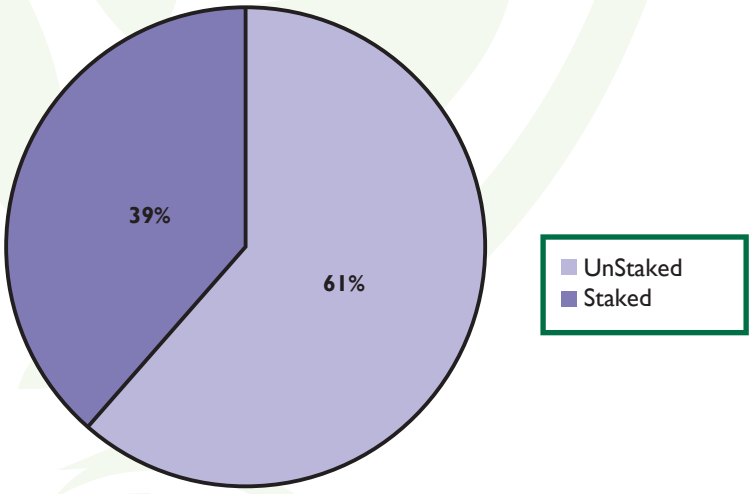
Staking trial for salemanu yams



Staking trial on malingi yam



Yam yield for staked and unstaked



Conclusion

From observations of anthracnose scoring, it was found that after 5 months of growth, unstaked malingi yams were scored as resistant (0 - 30% infection) to anthracnose, while staked maligi was scored as tolerant (>30 - 60% infection). In contrast, all salemanu treatments were scored as tolerant (>30 - 60% infection).
After 7 months of growth, scoring of treatments showed that: salemanu staked and unstaked and malingi staked were susceptible (>60 - 100% infection) to anthracnose, whereas unstaked malingi was scored as tolerant (>30 - 60%

Vines of unstaked malingi yams at 7 months growth

Vines of staked malingi at 7 months of growth

Effect of yield from the trial conducted, shows greater yield for staked yams (61%), compared to unstaked yams (39%). Between the two cultivars used for the trial, malingi yield showed that there was not much difference (4%) between staked (48%) and unstaked malingi (52%). Salemanu yam yield showed a higher percent (79%) of yield for staked yams.

Unstaked salemanu at harvest

Yield of unstaked malingi

It can be concluded that staked yams have a higher yield than unstaked yams. However, for malingi cultivars, there is only a small difference (4%) between staking and unstaking.

Unstaked malingi cultivars showed less anthracnose infection than staked maligi plants.

In particular, the short-term trial, showed that farmers have valuable knowledge on cropping practices and food crops that must be documented.

Impact of study

1. DSAP Vanuatu organised a workshop with key farmers and AAO to provide information obtained on this trial.
2. DSAP Vanuatu is currently documenting successful appropriate technologies.
3. DSAP Vanuatu will conduct a training workshop on handing over documented results of the trials to DARD, AAOs and key farmers.

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Farmer-led extension–using farmers to test new varieties

DSAP Vanuatu

Salili kumala (Ipomea batatas) was distributed to farmers as it matures at 3 months and is therefore a versatile crop for food security.

Salili kumala was identified by the farming systems unit during the TCP- FAO project. The name was given from the area (Salili area, Port Vila), where the kumala was found to be cropped by farmers for selling at the Port Vila market.

Methodology

Kumala vines were distributed among 12 women farmers during the PRA in 2003. But by the time DSAP staff returned to monitor the adoption process (2004), the vines were already well distributed among other farmers.

Data collection and monitoring

- Select farmers who are growing *salili* kumala.
- Let the farmer give her views on what she thinks about *salili* kumala.
- Let the farmer describe how she planted and maintained the plant.

Advantages

- Kumala matures quickly, so it is easy to bulkup and distribute.
- No language barriers between staff and farmers.
- Farmers see what they hear about, and believe what they see.
- Other farmers, especially women, find it easier to share their views and experiences among other women farmers.
- Creates bond between existing farmers.

Limitation

- Takes time for a farmer to bulkup *salili* kumala before sharing it with other farmers.
- Farmer may take time to bulk it up because she/he will use *salili* kumala for family/social obligations.

Chief Frederick, showing his kumala plots to other farmers during farmer field visit

Distribution: Mota Lava experience

On Mota Lava, only eight mounds (24 cuttings) were planted by Chief Frederick on 1 August, 2004. In 2005, the key farmer and AAO (Frederick Marau), prepared a first supply of 856 vine cuttings to distribute to other Mota Lava farmers. As of 2006, 110 farmers were furnished with *salili* vine cuttings. Distribution is beyond monitoring by GREAs and AAO!!

Source of information

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School gardens in Wallis and Futuna - food security for tomorrow's generation

DSAP Wallis and Futuna

Summary

Emergence of school gardens in the territory

- **Expected outputs**: create gardens with children in the schools in order to teach them vegetable gardening techniques and raise their awareness about eating green vegetables.
- **Target group**: pupils in CM2 (year five, i.e. last year of primary school), pupils in 'COP' and household management classes (children in difficulty at school), their parents, and the teachers.
- **Number of schools involved**: 4
- **Number of teachers involved**: 8
- **Number of classes involved**: 5
- **Number of children involved**: approximately 100
- **Project partners**: Health Agency, Catholic Education Department, Territorial Rural Affairs and Fisheries Service, Agricultural Junior Secondary School ('BEPA - Brevet d'Études Professionnel Agricole' [agricultural vo-tech] class), Radio France Outre-mer and DSAP.
- **Duration of programme**: school year.
- **Sustainability of 'school garden' programme**: probably ensured by teachers; included in school curriculum.
- **Results**: encouraging, high degree of motivation on the part of the children and satisfaction from all partners concerned.
- **Unexpected outcomes**: Training for primary school teachers in market garden production techniques.

Implementation of school garden project

1. Awareness of the need to work in the schools, during meetings involving the Health Agency, DSAP and the Rural Economy Department.

2. Contact the Catholic Education Department to present a school garden project. Call for expressions of interest to see if some schools might be interested in working with DSAP on this project.
Response positive; DSAP has been asked to work with two COP classes at Malaetoli School and the household management classes at Lano on Wallis, (the classes for children in difficulty) plus CM2 (year 5) classes on Futuna in two schools - Vélé and Poï.

3. Preparation of the gardens at the schools by the DSAP team with the help of the Rural Economy Service: clearance, ploughing or ridge preparation, and fencing around the garden.

4. Visit to an existing plot at another school, with the children (in partnership with BEPA, 'Brevet d'Etude Professionnelle Agricole'). The children from the host school explain to their guests how they take care of their garden. Purpose: to involve as many children of all ages as possible in the project, thereby giving them a sense of responsibility about their work.

5. Classroom work (DSAP component)
- Course on how to identify vegetables.
- Plant needs.
- How to respond to plants' needs.
- The benefits of a diet that includes green vegetables to achieve a balanced food intake.

6. Organising work on site
- Demonstrations and technical advice to children at the plot.
- Distribution of tomato and lettuce plantlets.
- Planting out work by children.

7. Daily plot upkeep by the children: weeding, watering, tying up, etc.

8. Twice-weekly plot visits by DSAP at each school
These twice-weekly school visits ensure that the crop beds receive regular attention and that cropping techniques are learnt as the plants grow.

The areas addressed are as follows:
- Weeding
- Tying up
- Nursery seeding
- Watering
- Staking
- Shade
- Soil amendment and addition of organic material
- Composting
- Harvesting and taste testing at the school

Highlights
From the school garden project

Learning cropping techniques

- The children were very receptive and understood what was taught to them. This was evident when they taught students from other classes how to make their own plots. This was without assistance from other adults.
- The schools have added 'School garden' as part of the curriculum since 2007.
- The children took the methods learnt at school and implemented them in their family gardens.

Motivation and pride

- Children and teachers were highly motivated to perform the daily work needed to take care of the gardens: a well-kept garden, healthy vegetable crops. Their initiative in extending their gardens also showed how keen they were on the project.
- The children displayed great pride in their gardens. Official visits have been made several times and RFO (Radio France Outre-mer) TV came and filmed the project. The main players in the programme were the children and their teachers.
- Official invitations were sent to the Prefecture, Labour Inspector, Director of the Rural Economy Service and RFO to visit the school gardens.
  This feeling of pride boosted the self-worth of these children, who often feel ashamed about their school performances because of the way others look at them.

Students of the Territorial Polytechnic School of Agriculture in Wallis during DSAP gardening Hour with the students.

Indicators of success

- Inclusion of the 'School garden' programme in the 2007 school curriculum.
- The teachers observed an improvement in pupil participation in classes and greater self-confidence on their part.
- The teachers feel confident about doing the 'School garden' programme without the DSAP team. They learned market garden production techniques alongside the children.

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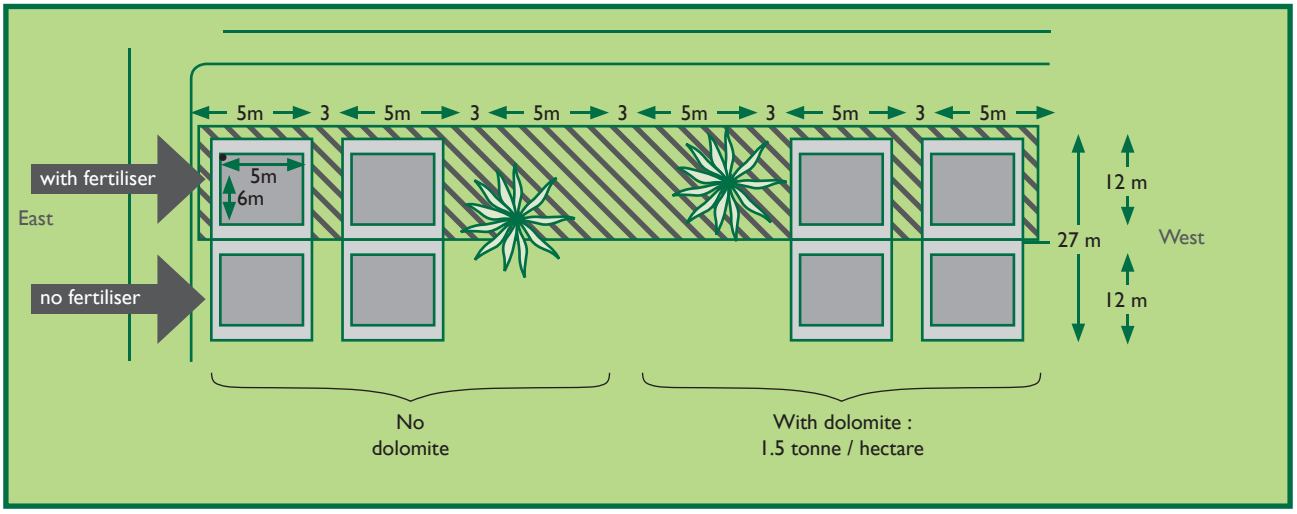
Improving the toafa soils for agriculture - Wallis Island

DSAP Wallis and Futuna

A growing population means an increase in demand for land. This puts pressure on the amount of farm land available, leading to an increasing problem of low soil fertility as the fallow periods are shorter.

The toafa is a land reserve on Wallis Island, 100 m above sea level. Ferns and pandanus trees are the main plant life on the toafa.

Improving the toafa soils for agriculture - Wallis Island
Trial 1



Trial area: 50 x 27 m, (1350 sq. m)

Treatment 1

- Plough width-wise using a disc plough to a depth of about 25 cm.
- Spread on dolomite at a rate of 1.5 tonne per hectare on half the plot, i.e. two 25 x 27 m parcels or 675 sq. m.
- Cross-plough length-wise with a disc plough to start to incorporate the dolomite into the soil.
- Use a sub-soiler to dig the lime down into the ground and deep-plough to a depth of 50 cm. Space between two rows: 50 cm.
- Add basic NPK (0-32-16) fertiliser at a rate of 2.5 tonne/ha on half the plot (see Appendix 2). Total amount used: 135 kg for 540 sq. m.
- Use a Rotavor to break up the clods and prepare the bed for sowing.
- Plant the legumes:
  - Stake out the demonstration plots, i.e.
    Plots of 45 sq. m/parcel for each variety of legume (see plot plan).
  - Calculate planting density (*Centrosoma molle and Dolichos Lablab*)
    - 4 parcels (45 sq. m / parcel) of *Dolichos Lablab* on the plot, i.e. 180 sq. m
    - 4 parcels (45 sq. m / parcel) of *Centrosoma molle* on the plot, i.e. 180 sq. m

Treatment 2

Taro crops were planted on plots that had previously been planted with *Dolichos* and *Centrosoma*. There was also a control plot without any improved fallow. Taro was planted on all 4 plots.

Treatment 3

1 Legumes shredded.
2 Legumes ploughed into soil using a disc plough.
3 Local taro varieties planted (Uli taro): 18 plants per parcel, spaced 80 cm from each other.
4 Mulching with coconut fronds, in the traditional way.
5 Regular upkeep on the plot: 3 applications of weed killers over the 6 months.
6 Harvest, weighing.

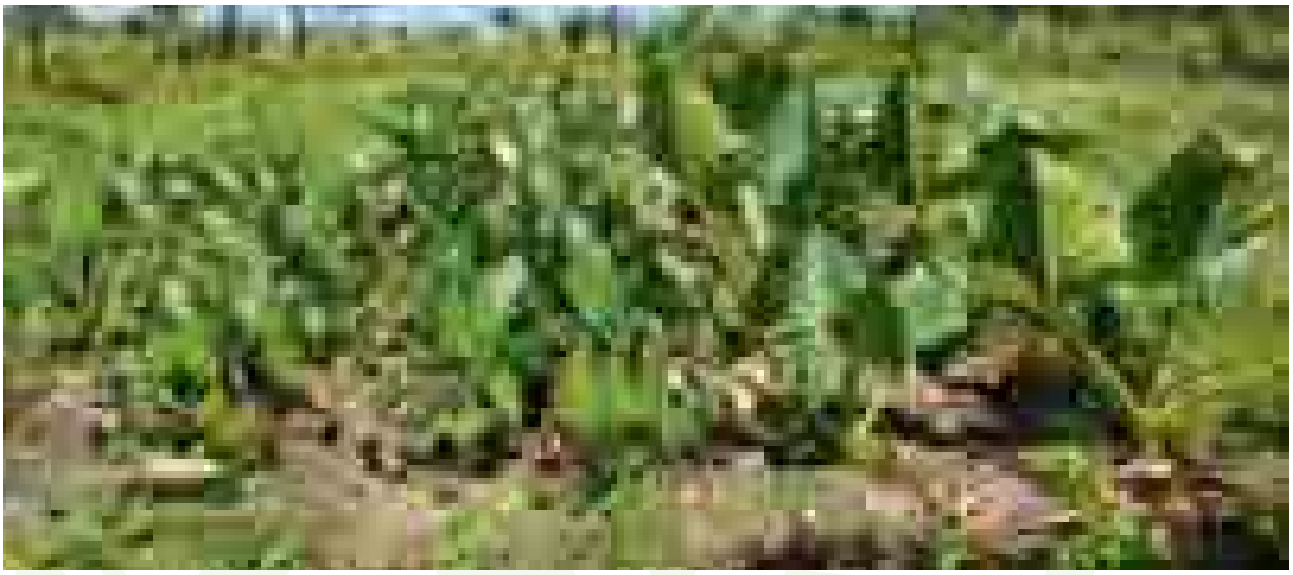
RESULTS

- *Centrosoma molle* and *Dolichos Lablab* were planted on adjacent fallow plots. *Centrosoma molle* (local variety) pushed out *Dolichos Lablab* (imported variety).
- The life cycle of both plants is approximately 9 months for *Centrosoma molle* and 8 months for *Dolichos Lablab*. When there is no activity in the plot, the *Dolichos* dies at the end of its cycle. *Centrosoma* on the other hand slowly overtakes the *Dolichos Lablab*. The *Centrosoma molle* reproduces through runners measuring a few dozen centimeters long.
- *Centrosoma molle* stays close to the ground and produces a dense cover 30-40 cm thick. Sunlight does not penetrate this cover and no invasive plants were found where this legume was planted.
- *Dolichos Lablab* has high biomass levels with heights from 60 cm-1 m. There were no invasive plants where *Dolichos* was growing but at the end of the cycle the legume loses its leaves, leaving the field vulnerable to invasive plants and other legumes planted nearby.

Conclusion

It is worthwhile using *Centrosoma Molle* for improved fallows that have to stay on the plot for a long time. This legume can also be useful with catch crops, i.e. if this legume is planted before the end of the main crop's cycle, it creeps along the ground and so does not hinder the growth of crops such as taro, yams or bananas.

In contrast, *Dolichos* cannot be used for catch crops since its growth could inhibit the growth of the main crop. Nevertheless, this legume can be used by farmers when they are planning a short fallow period on a plot. It rapidly grows a large quantity of biomass.



Parcel of taro & kape on the toafa "Wallis" during DSAP trial on the use of Dolichos Lablab and Centrosomo molle as fertilizer for the poor soil of the "toafa"(desert).

Analysis of the results.

- We noted a beneficial effect from the calcium (yield doubled when there were no legumes) on the control plots (simple to double) and a less marked but still measurable effect on plots with legumes.
- *Dolichos Lablab* yields were significantly higher than those obtained with Centrosoma molle (local legume).
- Legumes would not grow without PK fertiliser, including those on plots treated with dolomite.

Conclusion

Surprised by the fact that legumes would not grow without PK fertiliser, we did not plan to have a control plot with just PK fertiliser as we were mainly trying to compare the effect linked to legumes. So, we cannot say whether the increased yields found on plots with legumes as compared to the control plots were linked to the legumes or to the PK fertiliser. Since their effects cannot be differentiated, we have to set up another experiment with a control plot that only has PK fertiliser but no legumes.

For that reason, a new trial is underway, to clarify this unanswered question about amendments.

Trial 2

This was conducted using several control plots without legumes, one without any amendments at all, the second with just PK fertiliser and the third with NPK fertiliser.

We made good use of the conclusions of the previous experiment and put dolomite on all the parcels, including the control plots. So, the dolomite factor will no longer be a variable.

The goal of the new trial was to compare the yields obtained with taro crops (same varieties planted on all the parcels) after an improved fallow period, i.e. a year of intercropping with legumes (between 2 cycles) or without improved fallow.

Parcel distribution:

Parcel 1: only legumes (*Dolichos*)
Parcel 2: legumes (*Dolichos*) + PK
Parcel 3: only legumes (*Centrosoma*)
Parcel 4: legumes (*Centrosoma*) + PK (0-32-16)
Control plots (T-): parcels on which no crop has ever been planted (no improved fallow).
Parcel 5: normal control plots (without legumes) = the reference for all the parcels
Parcel 6: control plot (without legumes) treated with PK
Parcel 7: control plot (without legumes) treated with NPK

On each parcel, 36 "Uli" taro plants will be planted, i.e. the black taro of Wallis.

Each parcel will have the same upkeep: regular weed-killer applications (every month) and mulching (with banana or coconut leaves) using traditional farming methods. There will not be any watering or ridge making.

In 6 months, taro corm yields will be compared.

Recommended protocols to improve toafa soil

- Nitrogen was provided by legumes, a family of plants that have the capacity to live in symbiosis with a bacterium (*rhyzobacterium*). This bacterium can fix atmospheric nitrogen and then provide it to the legume plant. When legumes are cut down and ploughed into the soil after a fallow period of one year, they provide organic matter and return nitrogen to the soil as their biomass decomposes.

- Phosphate (P) and potassium (K) were provided in the form of basic fertiliser at a rate of one tonne/ha. Phosphate and potassium are minerals that are vital for plant growth and, in this case, they are not provided by the legumes.

- Calcium was added at depth (subsoil) in the form of dolomite, which is quick-acting for correcting the soil's pH (bringing about a decrease in acid levels) and for forming a consistent clay-humus complex.

- Organic matter was provided by green manure (the legumes) that was ploughed into the soil after growing. Nitrogen, phosphate and potassium are then fixed by the organic matter at the surface and are available for future crops (subsistence crops).

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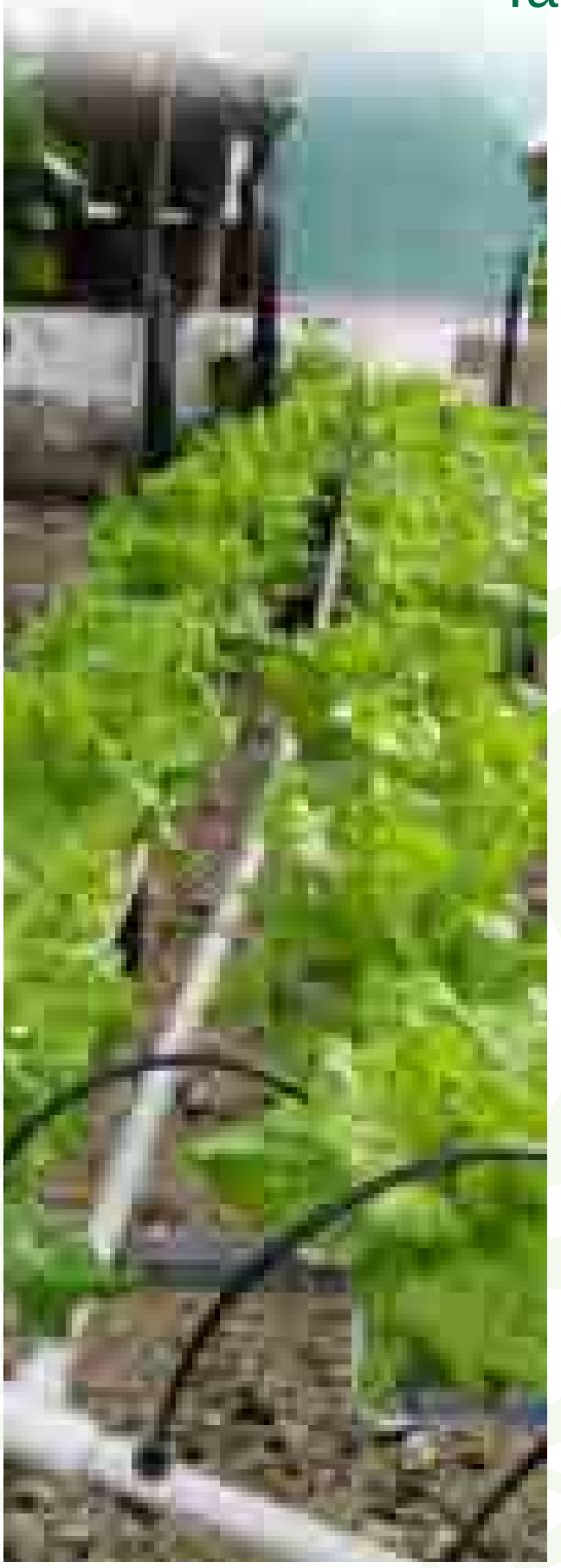
Promoting hydroponics and vegetable farming - Futuna Island

DSAP Wallis and Futuna



We had to look for alternatives to encourage the farmers to continue planting vegetables. The bad weather had destroyed their vegetables and dampened their enthusiasm.

In October 2003, DSAP Wallis and Futuna held community consultations on Futuna Island. The islanders identified vegetable gardening as an activity they would like to learn for improved food security. Using participatory tools, key farmers were selected to be part of on-farm trials, receiving training and demonstrating their plots of vegetables for others to learn from and benefit.

The key farmers selected for the on-farm trials were enthusiastic and embraced the knowledge about vegetable gardening. The whole island was excited with coverage from the media, and farmers being interviewed and sharing their experiences of vegetable gardening and its impact on the livelihood of their families.

In 2006, this flourishing vegetable growing activity on Futuna Island was dampened by the constant bad weather. Farmers lost their motivation to continue as the rains destroyed their crops and pests ravaged the little that was still standing.

Trial table, one-week-old salads.

Maketalena "Farmer" with 2-week-old lettuces on the trial table.

DSAP ECA Malia Tafili & Make admiring a 1.5 k lettuce.

Healthy statistics indicate a need for Futuna islanders to include vegetables in their rich diet of starchy food and meat.

COP students listening to Pipiena's explanation while admiring the beautiful lettuces.

DSAP was challenged with identifying methods of agriculture or technologies to encourage the farmers on Futuna to continue vegetable farming. Hydroponic farming was a solution and Futuna Island received one of the trial hydroponic sets.

In August 2007, trials of the hydroponic kit on Futuna were set up. To date, the kit is working well and producing vegetables. There has been significant interest generated by the media coverage of the hydroponic trials.

HYDROPONIC SYSTEM VS TRADITIONAL GARDENING

	TRADITIONAL GARDENING	HYDROPONIC SYSTEM
1)	Too much work	Less work
2)	Plants are exposed to different diseases	Plants are healthy and have fewer pest problems
3)	Vegetables are available according to their seasons	Crops are available throughout the year
4)	Activities suitable for grown ups only	Activity fun for all ages. It gets the whole family involved
5)	Slow growth - 3 months until harvest	Faster growth; 1 month from seedling to harvest
6)	Climate change affects high yields	High yields
7)	Can be self funding but depends on other factors	Self funding because it pays for itself over and over each year
8)	Natural sun	Use electricity but at a very minimum cost
9)	Need prepared and fertile soil	Can be done anywhere and does not need much space or regular changing of place
10)	Price is by kilogram	Price is by plant and cost is usually low
11)	Soil lettuce can be bitter because of lack of water	Never bitter even after harvesting time

Television coverage included the need for vegetables in the diet, educating the islanders on the benefits of a nutritionally balanced diet.

Pipiena Masei (site of the hydroponic trial) showing the students of Class COP-Futuna how to measure the fertiliser.

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LIST OF DSAP PRODUCED AGRICULTURAL INFORMATION RESOURCES

#	TITLE	FORMAT	YEAR PRODUCED	LANGUAGE
1	DSAP General Promotion	A1 Poster	2004	English
2	What the farmers said - PRA Results	A1 Poster	2004	English
3	DSAP Processes	A1 Poster	2004	English
4	Neem General Promotion	A1 Poster	2005	English
5	Derris General Promotion	A1 Poster	2005	English
6	Bucket Irrigation General Promotion	A1 Poster	2005	English
7	Quick Composting General Promotion	A1 Poster	2005	English
8	Simple Technologies for Pacific Island Farmers - Making your own neem-based pesticide	A3 Brochure	2005 2008 2006	English French Palauan Samoan
9	Simple Technologies for Pacific Island Farmers - Making your own derris-based pesticide	A3 Brochure	2005 2008	English French Ponapean Palauan Samoan Marshallese
10	Simple Technologies for Sustainable Agriculture - Bucket Drip Irrigation System	A3 Brochure	2005 2008 2008 2008 2008 2008	English French Kosraen Yapese Chuukese Ponapean Palauan
11	Simple Technologies for Sustainable Agriculture - Quick Composting	A3 Brochure	2005 2008	English French Wallisian Futunien Samoan Palauan Ponapean Chuukese Yapese Kosraen
12	Simple Technologies for Pacific Island Farmers - Making your own neem-based pesticide	DVD/CD	2005	English
13	Simple Technologies for Pacific Island Farmers - Making your own derris-based pesticide	DVD/CD	2005	English
14	Simple Technologies for Sustainable Agriculture - Quick Composting	DVD/CD	2005	English
15	Simple Technologies for Sustainable Agriculture - Bucket Drip Irrigation System	DVD/CD	2005	English
16	DSAP Generic Promotion version 1	A3 Brochure	2004	English
17	Promoting the banana circle in Kiribati	A1 Poster	2005	English
18	Promoting the taro industry in PNG	A1 Poster	2005	English
19	The DSAP process	Roll up Banners	2005	English
20	Controlling and Managing the Leaf Miner - DSAP Niue	A3 Brochure	2006	English
21	Controlling and Managing *Phytophthora palmivora* - DSAP Samoa	A1 poster	2006	English Samoan
22	Controlling and Managing *Phytophthora palmivora* - DSAP Samoa	A3 Brochure	2006	English Samoan
23	Alley Cropping Brochure - DSAP Vanuatu	A4 Brochure	2006 Updated 2008	Bislama - Vanuatu Pijin
24	Bebe Kumala Brochure - DSAP Vanuatu	A4 Brochure	2006 Updated 2008	Bislama - Vanuatu Pijin
25	Dolichos lablab - DSAP Vanuatu	A4 Brochure	2006 Updated 2008	Bislama - Vanuatu Pijin

26	Fallow Improvement Brochure - DSAP Vanuatu	A4 Brochure	2006 Updated 2008	Bislama - Vanuatu Pijin
27	Mucuna Brochure - DSAP Vanuatu	A4 Brochure	2006 Updated 2008	Bislama - Vanuatu Pijin
28	Net Yam Brochure - DSAP Vanuatu	A4 Brochure	2006 Updated 2008	Bislama - Vanuatu Pijin
29	DSAP Generic Brochure	A3 Brochure	2006	English
30	DSAP Update Bulletins	A4 newsletter	Issue 1 - 20 2003 - 2007	English/French
31	Making an A - Frame for hillside farming - DSAP Solomon Islands	A3 poster	2007	English
31	Niue Roll Up Banner Stands	Roll Up Banners	2008	Niuean
32	Fiche Technique - Fabrication de compost, DSAP French Polynesia	A5 Brochure	2008	French Tahitian
33	Fiche Technique - Compostage facilite, DSAP French Polynesia	A5 Brochure	2008	French
34	Fiche Technique - Culture sur bourre de coco	A5 Brochure	2008	French
35	Fiche Technique - Fabrication d'engrais de poisson	A5 Brochure	2008	French
36	Fiche Technique - Recettes maison de «biopesticides»	A5 Brochure	2008	French
37	Des Techniques Pour Une Agriculture Durable - Culture de pasteques et de melons sur motu en Polynesie Francaise	Book	2008	French
38	Pacific Agroforestry - An information kit - translation	Book	2006 - 2008	French
39	Coconut fibre farming as used in the Tuamotu Archipelago, DSAP French Polynesia	A5 Brochure	2008	English
40	A Participatory Toolkit for Sustainable Agriculture Programmes in the Pacific - The DSAP Experience	Book	2007 - 2008	English
41	Case Studies - Lessons from the field - The DSAP Experience	Book	2007 - 2008	English

To obtain copies of any of the DSAP information resources listed above, contact:

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