

SUB-REGIONAL OFFICE FOR THE PACIFIC ISLANDS

TCP/TUV/3201

**ASSISTANCE TO SMALL SCALE ATOLL FARMERS CULTIVATING SIGATOKA
DISEASE FREE BANANA FOR FOOD SECURITY
IN TUVALU**

**ATOLL BANANA GROWING
21 MARCH - 02 MAY 2012**



FUNAFUTI, TUVALU



**FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS**

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Thank you

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1. SUMMARY

The demand for food will continue to grow and it will become increasingly challenging to meet the demand. The soaring food prices and the dependency on food sources coming from outside supply, is putting increasing pressure on food affordability on people of Tuvalu. In addition to import, fish protein is consumed on most days. To increase food production and affordability the banana production project was borne which will benefit all the communities in all the inhabited islands.

To increase the availability of planting materials 152 tissue cultured plant were picked up in Fiji to meet the target audience, schools, church communities, women and seamen groups and the Agriculture officers will provide technical guidance to everyone.

During the visit to growers it was apparent that there was minimal contact between agriculture officers and growers. If the visit was made some of the problems would have been picked up and a solution made to solve it.

A large part for the poor growth is due in part to salt water intrusion which happens during the 2011 dry period. In many areas salinity can still be tasted in the underground water. Due to the salinity of the water some growers were asked to uproot their plant and replant them shallower or to make mounts especially in depressed areas and plant on it.

The non addition of compost prior to planting showed very poor growth. Mineral deficiency is apparent everywhere because the plants are not getting new supply of decayed organic matter. Thick mulching is a must to prevent evaporation and feed the plant as the materials rot.

Poor growth is also attributed to shading and lack of soil moisture. Growers were advised to empty used washing water under the plant and remove shade. This has thrown up some challenges to the local agriculture officer to contribute to the success of the project firstly by translating the banana growing leaflet to remind growers what to do to have a healthy plant.

2. TUVALU

Tuvalu is made up of nine widely scattered low-lying coral atolls with a total land area of approximately 26 square kilometres. While the land area is comparatively small, the country owns one of the largest Exclusive Economic Zones (EEZ), covering an area of more than 900,000 square kilometres of ocean. The total population is approximately 11600 inhabitants.

Atoll agriculture and fishing have always been the main sources of subsistence livelihood of the people of Tuvalu. Coconuts, pandanus, breadfruit and giant taro (*Cytosperma chamussionis*) are the main basic food crops while subsistence fishing, poultry and pig-farming are the main source of protein for the population.

The atoll soils are young, shallow, alkaline, and coarse-textured because of its immaturity. They consist of a shallow layer of organic material in varying thickness. The soil is lacking in the trace

element iron, manganese, copper, zinc and exhibit pH value ranging from 8.2 – 8.9 restricting the availability of these element for plant growth.

The soil has a low level of organic materials due to its coarse-texture and rapid rainfall infiltration which does not lend itself to conventional agriculture methods. The removal through clearing and burning reduces the ability of the plants to contribute to the soil forming process and robs the soil of essential nutrient.

Furthermore Tuvalu faces several challenges such as the environment risk of rising sea level, high cost of fuel and high shipping costs, long distances to foreign markets, global food price increases and poor in-country market access for local produce. Despite all these constraints, Tuvalu struggles on and fights the battle in providing local food and food security for its people.

A few decades ago, the real price of imported staple foods was reasonable low and people's consumption habits relied heavily on cheap imported staples such as rice, flour and noodles to meet dietary needs. The current trends in global high fuel price and soaring food prices has demonstrated the danger of relying heavily on imported food, prompting the Government to revert back to strengthening and encouraging the local population to grow local staples and other carbohydrate food crops, such as taro and bananas as a matter of urgency. Hence the Government is targeting atoll banana growing (using disease resistant varieties) to combat the global soaring food prices and at the same time strengthen food security in Tuvalu.

3. THE PROJECT

In Tuvalu, under the agriculture sector one of the main priorities of the Government is to increase local food crop production to ensure households have available food crops to strengthen food security. This is linked to the objectives of the World Food Summit and MDGs. This project is also linked to the FAO, 'Regional Programme for Food Security' project and collaborates with projects under the European Community, 'Development of Agriculture in the Pacific' Programme which is managed by the Secretariat of the Pacific Community.

Because of the interest shown by the general public and supported by the Agriculture Department of the Ministry of Natural Resources, banana production project throughout the populated islands was borne.

Therefore, to increase production on the island good and proper agronomic practices have to be adopted. The project intends to teach and show Tuvalu banana farmers about two planting technique firstly "Narrow Pit Systems" (NPS) that involves organic bulking leading to sustainable production without any chemical fertilizer inputs. The second is the "Hill" or "Raised Bed Systems" (RBS), (up to 1.5 m in height and 2.0 m wide). Bananas are then planted at the top of the hill mulched with organic matter (i.e. organic bulking). This is normally important in sites where the water-table is closer to the surface (e.g. less than 70 cm depth) where the water lens is often disturbed due to salt water intrusions during seasons when tidal surge are often common (effects

of climate change). The techniques mentioned have been adopted as a method for planting bananas on atoll islands which is now adopted in Kiribati, the Marshall Islands, and Nauru

4. OBJECTIVES

Aside from agronomic practices, shortage of planting materials was realized and this has to be sourced to meet the island requirement. To best fill this void micro propagation using tissue culture technology is the way to increase the amount of planting materials. What is good about this technique is, plants resistant to Sigatoka leaf diseases can be micro-propagated and plantlets carried into the country without risk of introducing any pest.

1. To propagate and mass-produce disease-free banana planting materials using Tissue Culture.
2. Meet the household food requirements and to enhance quality so that farmers can sell their produce on the local market to earn revenues to improve living standards.
3. To train rural farmers in sustainable management of atoll banana production through adopting the narrow pit-system of planting bananas.

5. JUSTIFICATION

Growing ones own crop has recently become more important in terms of overcoming import substitution as a result of higher costs of imported food products such as rice, flour, potato and other food crops imported from overseas. As a result, Government aims to increase food production and strengthen food security in the village communities on the nine small islands that made up Tuvalu. The islands are endowed with climatic conditions that are conducive to the growing of a number of food crops, among which is the banana. However, banana production can be greatly increased if proper agronomic and organic practices are adopted. The NPS of growing bananas on atolls proved to be very popular and productive in three of the FAO project sites in the following countries: Kiribati, Marshall Islands and Nauru. The Agriculture Division of the Ministry of Environment, Lands and Agriculture Development has learned of the success of atoll banana growing in these nearby atoll islands and in response the Government is encouraging and giving priority to atoll banana growing as one of its main programmes in agriculture food production, aimed at reducing the imports and becoming more self-sufficient.

6. BENEFICIARIES

In Tuvalu, the target beneficiaries are the households in the villages in Tuvalu. The project also targets schools, church communities, women and seamen groups and village elders in order to train them all in sustainable atoll agriculture and to appreciate the use of organic bulking as part of the sustainable food crop growing. All propagation of Banana Mother Blocks in each community would be managed by respectable elders as the lead managers with selected able young men (from the villages) to manage the village blocks. The Agriculture officers will provide technical guidance to the manager and will ensure that the banana blocks will be managed according to the atoll banana management guidelines.

7. TERM OF REFERENCE

This is the second mission for a Retired Expert to travel to Tuvalu to undertake this TCP project. This mission covered the period of 21 March to 2 May 2012.

- assist and supervise the planting of bananas on farmers sites;
- collaborate with the Division of Agriculture in carrying out a field training session on field planting (pit and non-pit systems) of bananas (nutritional requirements, organic matter bulking, etc);
- prepare a banana management programme for the Field Bananas Listing Stepwise activities, required by the farmers to ensure good growth of the plants. In addition, lay down guidelines for de-suckering activities as required to sustain good quality banana bunches;
- travel to outer islands to follow-up banana planting at selected sites and contribute to training of farmers when required;
- prepare a mission report.

8. ACTIVITIES

The fifth batch of tissue cultured banana plantlets was picked up from SPC in Fiji on the way to Tuvalu. Upon arrival I was met by Mr Itaia Lausaveve and Mr Fialua Monise, National Project Coordinator in charge of the TCP/TUV/3201 project.

8.1 Varieties

The fifth batch consist of eight varieties and total of 152 plant Table 1. Most plants were healthy upon arrival except for two of the plantlet from the MS/BG/43 which were already dead in the pouch. The last count of the healthy plants was on the 20th April.

Table 1 Fifth Batch of Banana plantlets for FAO Project

Name	Code #	Origin	# Recieved	# Alive
FHIA 17	MS/BG/13	Honduras	20	19
PA 03.22	MS/BG/23	Brasil	24	24
Yawa 2	MS/BG/43	Papua New Guinea	20	17
Pisang Mas Sucrier	MS/BG/44	Belgium	4	4
FHIA 02	MS/BG/47	Honduras	14	13
FHIA 21 (#68)	MS/BG/48	Honduras	21	20
Grande Naine	MS/BG/49	Burundi	10	10
Lakatan	MS/BG/50	Australia	39	35
Total			152	142

9. FARMERS VISIT

Growers that were given banana plant in three areas, Funafuti, Funafala islet and Falefeke islet were visited to assess the growth and health of their plants (Annex 2, 3 and 4). During the survey some characteristics were measured and some were visually observed and recorded. Plants height was measured from ground level to the base of the last emerging leaf and the diameter of the pseudostem is measured at half the height. The overall health of a plant was based on leaf colour (green, pale green and yellow) and whether the plant is mulched or not. The amount of shoots and if the plant has fruited were also recorded. Aside from checking the plants, growers were interviewed of their past and present practises. Some more plants were handed to the Kaupule (chief) to distribute to the residence on the two islets visited (Table 2).

9.1 Health and Growth of Banana plants given to Growers

Based on the data and visual observation, differences in growth and health of plants can be seen between the varieties and within varieties. The answer given by the growers is therefore used to draw some conclusion to as the reasons the plants were at the state they are in at present. In some instances growers do not have the answer, and then we have to lead him or her before they can give an answer. The following are then the reasons that contribute to the unhealthy condition of the plants;

1. The first point to mention is concerning agriculture extension officers. There is very little and in some case has not visited the growers that the plants were handed to grow. As a result of this many of the plants were planted in places that can hinder their development and growth which will be mentioned following this. Regular visit to growers and talking to them can greatly advance this project which can improve food security.
2. The plants were planted too deep and the root system were affected by salt water during king tide and the growth is stunted and the entire leaf is yellow even the midrib. Even in some area salt can be tasted in the underground water. In this case growers were advised to uproot the plant and replant higher up the hole to avoid contacting with salt water.
3. The seedling was planted without compost in the hole. In this case the plant is starved of essential element for healthy growth and in these cases the leaf is pale green showing element deficiency. The growers concerned were advised to obtain decomposed organic materials or pig dung, spread and incorporate into the soil around the plant to give the plant some food.
4. Many have mulched their plants and also the same numbers have not done so. In many cases the mulch applied were thin and not adequate to prevent soil moisture evaporating and add nutrient back to the soil. The growers that have adequate mulch applied to their plant have better plant growth because it prevent evaporation and the decayed materials is adding nutrient for the plant. For those that have added compost at planting and did not or thinly mulch, the growth of the plants is stunted due to water stress and nutrient deficiency unless they attend to solve this now the plant will deteriorate further. The growers were advised of the importance of mulching that is to prevent evaporation and it adds nutrient into the soil

after it rots. To improve the health of their plants they must add compost or animal manure to give the plant nutrient necessary for good growth.

5. Some households planted their plants in depressions, area where sand has been mined, or in areas where swamp taro are planted. During high tide salt water rises higher and slowly affecting the development of the plant. In both these cases they used the pit system instead of the hill planting. The growers were advised to mount soil up to half a metre high and plant on it to save their plants or transfer their plant to an area that is not inundated with sea water. The growth of the plant is like that described in 2.
6. Some growers planted their seedling amongst established banana plants that is shading the plant. The growth of some is stunted due to competition for nutrient and water, and some have elongated growth reaching for sunlight. When they were advised to remove some of the established plants they were reluctant to do so and some are willing to relocate their plants.
7. Water is a limiting factor especially on the two islets visited. On Funafuti people can get replenishment from the desalinization plant. On the two islets refill is not available and therefore water is conserved mainly for human and some for animal use. Growers were reminded that water is necessary for plant growth and health. Pouring used water, after washing the dishes and clothes, under the plants is a good practice and soapy water will not harm the development of the plant.

Table 2 Banana Plants Delivered to the Islets

Islet	Variety	Number	Islet	Variety	number
Funafala	BG50	3	Falefeke	BG13	2
	BG56	3		BG50	4
	BG23	3		BG23	1

9.2 Characteristics of the three bearing Varieties

BG 29

Growth Habit: The pseudostem extends 4 metres and the leaves are erect. The brownish stem is 18 centimetres in diameter which is uniform from bottom to top. **Foliage:** The leaf is deeply grooved and petiole measuring 40centimeters and is entirely green. **Fruits:** There are 8 hands with 16 to 18 fingers measuring 15 to 16 centimetres and each fruit have four ridges.

BG 50

Growth habit: The whitish green pseudostem extends 4 metres and the leaves are erect. Like BG29 the stem is uniform from bottom to top. **Foliage:** The petiole is grooved measuring 40 centimetres and entirely green. **Fruits:** There are seven hands containing 15 to 16 fingers measuring 15 centimetres and each fruit has five ridges.

AU 29

Growth Habit: The whitish green pseudostem stands two metres and the leaves spreading. The stem is thick at the bottom and slowly tapering as it extends up. **Foliage:** The petiole is grooved

with reddish tint on the edge of the canal which measure 30 centimetres and entirely green. **Fruits:** There are nine hands containing 12 to 14 fingers measuring 15 centimetres and each fruit has five ridges. The male fruits remain on the stalk.

10. WORKSHOP

Workshops were only held on the two islets visited Funafala and Falefeke,. On Funafuti five to six individual growers were visited daily not only to check on their plants but also to talk and deliver the necessary message to improve the growth of their plants. The topics discussed were that described in 10.1, 10.2, 10.3 and 10.4. Beside banana other crops swamp taro, sweet potato, taro vegetables and cassava were also discussed. Modifying the planting method, in containers, raised beds or hilling, is to save the plant from salt water intruding not only in low lying area but into ground water too. The one on one approach did open the growers up to voice his/her feeling about horticultural process.

10.1 Banana Leaflet

After consulting with the public as to how they want to see their leaflet, this how they want it to be. Not to describe each activity in detail because these have been demonstrated many times. The information is only to remind them what to do from planting to harvest. Some pictures would be good as these convey many words. The leaflet be a single page, one side Tuvaluan and the opposite English. Many people tend not to read it if it has too many words hence the following is produced (Annex 5).

10.2. Planting Methods

The two planting methods, Pit and Hilling, were emphasized again to growers. Even though the pit system is preferred it was pointed out that sea water is seeping through the sand and this is obvious on the island. This has affected the growth of their plants because they have planted it too deep in the hole. To avoid the intrusion of salt water the plants be planted shallower than what they have been practicing. In some areas the land is lower than other area the hill system is better as this will raise their plant higher from salt water. The application of organic matter is a must to feed the plant because sand does not hold enough nutrients to give the plant good growth. For other crops, containers or raised beds with plenty of organic matter will improve the growth.

10.3. Mulching

Because atoll soil is calcareous and deficient in many elements they were reminded to continuously supply organic matter into the pit and mound throughout the life of the crop. The thicker the better as this prevents soil moisture evaporating. This supply ensures a constant supply of nutrient for good healthy growth. Recharging at regular intervals with leaves, animal manure, coconut husks, washed seaweed, fish bones, ash and tins is good. As these materials decay and rot, the nutrients are released which aid in the development and retention of water giving the plant healthy growth.

10.4. Desuckering

They do not desucker because they want as much bunches from the mat as they can have and end result is the tree makes small bunches. The only time they desucker is, to give away planting material or to plant some more trees on their property.

It was explained that thinning is important as this will give bigger bunches because most nutrient uptake will be directed to the development of the bunch. Aside from fruit development leaving three to four follow-up plants of varying sizes is good because this will allow sunlight to penetrate into the mat which is necessary for photosynthesis. During selection, the first follow-up is about three quarter size of the original plant. The second one is half the size of the first follow-up and the third follow-up is half the size of the second one and so on. The selection of the follow-up must be of the healthy sword leaf shape plants.

11. REMINDER

From what have been observed in the field and the feedback from the growers the following reminders are important to accomplish not only by the officer but also by the growers that will lead to successful banana growing ultimately securing greater food security.

11.1 Extension Service

Frequent farmers visit is important. Regular visit can help progress agriculture production and shows growers that you care for the welfare of their plants. Through these visits the growth of the plants can be observed and can also be modified to further improve the growth and health. Talking frequently to growers, the officer can judge the good practices performed by one or two growers which can be used as an example to improve the production of others. In the course of your visit food security in the home can be improved.

11.2 Mulching

This is very important because this will help sustain the growth of any living plant. Mulching is a way of composting directly on the land. The main difference between mulching and composting is that the organic materials used in mulching are not exposed to the high temperatures characteristic of compost heaps. Mulch is a layer of material (coconut, breadfruit leaves) which covers the soil surface. Mulching benefits the garden soil and plants in the following ways:

- a.** Conserves soil moisture: Layer of mulch helps to conserve soil moisture by reducing evaporation. Soil underneath an area which has been mulched is kept moist and loose.
- b.** Insulates the soil: The soil is insulated from extreme temperature fluctuations, keeping the plant roots warm in cold weather and cool in hot weather.
- c.** Reduces erosion due to rainfall: Mulch protects the soil from pounding raindrops, thus reduce soil erosion caused by rainfall and running water.
- d.** Keeps the plant clean and dry: protecting the fruits of melons, squashes, strawberries, tomatoes, etc. from diseases.

- e. Controls weeds: Mulch controls the growth of weeds by depriving them of sunlight.
- f. Contributes organic matter and nutrients to the soil: As mulch decomposes, it contributes organic matter and nutrients to the soil. Earthworms feed on the underside of the mulch, mixing it with earth in their castings. This helps to condition the soil.

11.3. Food Security

Banana is one of the crops that can provide a household with food whether eating when ripe or cooked when green mature. When given the nutrient it needs and looked after properly, sucker will take about nine to ten month to bear fruit. Banana has lots of energy which comes from the sugar and starch in the fruit. The starch is from the green banana after cooking and the sugar comes from the ripe fruit. It also has vitamin C which aids the chemical action in the body. Vitamin A is also present for good healthy eyes and protection from disease.

Growing banana using organic matter, ash, and seaweed as means of supplying the plant with nutrient can be classified as "Organic Crop" because no agro-chemical is being used. If and when the quantity of the crop increases this can be labelled under Organic Food and will be viewed favourably by outside buyer. This could bring into the country foreign exchange and could benefit both growers and Government. The extra income earned by the people can buy other necessities required for the household.

11.4 Distribution of the Cultivars

Records are important reference which many things can be learnt from past information. Armed with this reference material one can read the story from it and can also predict the future. The main office should keep record of the plants by variety, they send to the outer-islands and those given to the growers in Funafuti. These are, the variety by access number sent or given to growers and where these plants are planted plus the growers names. Also, Officers in the islands must be asked to keep record too. To whom they give the plants to and sent to the main office a duplicate of that record. If and when an officer from the head office travels to one of the islands the record can serve as a reference for the person to locate the plant. This is important if the officer responsible for the island is not present on the island and this can be a road map for the officer travelling. The officer can check the growth and health of the plant and can make recommendation to rectify any problems encountered. This will give a developmental record for each island situation. One can also predict which of the cultivars is doing the best in each situation.

Pictorial



Batch 5 Transplants



Vaisua next to BG49 spreading leaf formation



Bearing AU 29



AU 29 male flower remaining on stalk



Erect leaf of BG50, BG29 BG13



Foreground banana planted too deep showing yellowing coursed by salinity compared to the trees behind

ANNEX. 1

People Met During the Mission

Itaia Lausaveve	Director of Agriculture
Fialua Ioane Monise	NPC TCP/TUV/3201
Mr Vaisua Leupena	Banana Counterpart
Mr Sakaria Ianuali	Kaupule on Funfala Islet
Mr Matia Toafa	Kaupule on Amatuku Islet

Annex 2. Health and Growth of Banana plants on Funafuti

Household Name	Varieties	Plant height in metre	Colour of leaves	Mulched	Stem size cm	Plant health	# of shoots	Fruiting
Paul Iosefa	BG 13	1	1	yes	3	8	nil	no
	BG48	1	1	yes	4	8	nil	no
	BG56	1	1	yes	4	8	nil	no
	BG50	1	1	yes	4	8	nil	no
	BG49	1	1	yes	4.5	8	nil	no
Mataio	BG49	1	1	no	3	8	nil	no
	BG13	1	2	no	2	5	nil	no
	BG50	1	2	no	2	5	nil	no
Logo	Given 3	plants all	died					
Sadaraka	AU11	1.5	1	no	5	8	nil	no
	BG50	1.5	1	no	4	8	nil	no
	BG49	1.5	1	no	5	8	nil	no
Tenamo	BG13	0.25	3	no	2.5	5	nil	no
	BG50	0.25	3	no	2.5	5	nil	no
	BG49	1	2	no	2.5	6	nil	no
Malosi	BG49	2	1	no	6	8	nil	no
	BG50	1.5	1	no	4	7	nil	no
	Bg13	1.5	2	no	4	7	nil	no
Otinielu	AU07	1.5	2	no	5	6	nil	no
	AU39	1	3	no	4	4	nil	no
	BG49	3	1	no	12	8	nil	no
	BG50	0.25	3	no	3	5	nil	no
Talini	BG49	1.5	1	yes	10	8	nil	no
	BG29	4	1	yes	18	8	4	yes 8 hands
	BG50	3	1	yes	18	8	5	Yes 7 hands
	BG03	2	1	yes	17	8	1	no
	BG07	To be planted						
	BG50	To be planted						
Faiatea	Bg47	To be planted						
	BG47	2	1	yes	10	8	nil	no
	BG13	3	1	yes	10	8	nil	no
	BG48	3	1	yes	8	8	nil	no
	BG11	3	1	yes	8	8	nil	no
	BG49	2	1	yes	8	8	nil	no
	BG50	3	1	yes	8	8	nil	no
Saufatu	BG13	1	1	no	5	7	nil	no
	BG49	3	1	no	10	8	1	no
	BG50	2	2	no	10	7	nil	no
	AU39							
	BG17	3	1	no	8	8	1	no
	BG48							
Sosea	BG56							
	AU06	1	1	no	6	7	4	no
Given 4,1 more								
Evolini	BG13	0.5	3	no	3	4	nil	no
	BG49	1	1	no	4	6	nil	no
	BG50	0.5	3	no	3	4	nil	no
Prison	BG17	0.5	3	no	3	5	nil	no
	BG50	1.5	1	no	3	7	3	no
	BG54	1.5	1	no	2	7	3	no
	BG7	1	1	no	2	7	nil	no
	BG50	1	1	yes	2	7	nil	no
	BG49	1	1	yes	2	7	nil	no

Name	Variety	Height	Leaf colour	Mulch	Stem size	Plant health	# of shoot	Fruiting
Vete	BG49	2	1	yes	8	8	nil	no
	BG13	1	2	yes	3	5	nil	no
	BG49	1	1	yes	6	7	nil	no
	AU07	1	1	yes	6	7	nil	no
	AU39	1	1	yes	6	7	nil	no
	BG50	0.5	2	yes	5	6	nil	no
	No #	0.5	2	yes	5	6	nil	no
Teulu	BG13	1.5	1	yes	6	8	3	no
	BG49	2	1	yes	8	8	1	no
	BG50	1.5	1	yes	6	7	2	no
	AU11	2	1	yes	6	8	3	no
	BG11	1	1	yes	5	7	2	no
	AU39	2	1	yes	7	8	1	no
	BG43	0.75	2	yes	4	6	nil	no
	BG47	1	1	yes	5	7	nil	no
	BG17	2	1	yes	8	8	nil	no
	AU07	0.5	1	yes	5	8	nil	no
	BG29	0.75	2	yes	6	8	1	no
	BG47	0.5	1	yes	5	7	nil	no
	BG48	0.75	1	yes	5	7	nil	no
	Vavao	BG49	1.5	1	yes	6	7	nil
BG50		1	2	yes	4	7	nil	no
BG13		1	2	yes	4	7	nil	no
Talapa	A39U	2	1	yes	8	8	4	no
	BG50	1.5	2	no	6	7	3	no
Afelee	BG50	1.5	1	yes	3	7	1	no
	BG13	1.5	1	yes	3	6	1	no
	BG49	2	1	yes	6	7	2	no
Taomia	BG49	Yet to be planted						
	BG13	As above						
	BG50	As above						
Eliu	BG 49	1	3	no	5	4	nil	no
	BG50	0.25	3	no	2	4	nil	no
	BG13	0.75	3	no	2	4	nil	no
Mareko Sam	BG50	0.5	1	no	2	6	nil	no
	BG49	1	1	no	3	6	nil	no
	BG50	1	1	no	3	6	nil	no
Mahafu	BG49	2	1	yes	7	7	nil	no
	BG50	2	1	yes	5	7	1	no
	BG13	1.5	1	yes	4	7	nil	no
Semese	9 plants to be planted	AU39, AU11, AU07, BG47	BG17, BG13, BG49, BG49	BG50				
Tumema	To plant BG47 AU07							
Tina Paul	BG40	0.5	1	yes	3	6	nil	no
	BG13	0.25	2	yes	2	6	nil	no
	BG50	0.25	2	yes	2	6	nil	no
Kavapoe	BG49	0.5	1	yes	5	7	nil	no
	AU07	0.25	3	yes	3	4	nil	no
	AU39	0.25	1	yes	3	7	nil	no
Nielu	BG49	1.5	1	yes	6	8	nil	no
	BG50	1.5	1	yes	4	8	nil	no
	AU07	0.25	3	yes	2	4	nil	no

Name	Variety	Height	Leaf colour	Mulch	Stem size	Plant health	# of shoot	Fruiting
Afele Pita	BG13	0.5	1	yes	2	7	nil	no
	BG50	0.5	1	yes	2	7	nil	no
	BG49	1	1	yes	4	7	ni	no
Niua	BG11	2	1	yes	3	8	nil	no
Given 4,1 die	BG44	1	1	yes	3	7	nil	no
	BG56	1	2	yes	3	7	nil	no
Malia	BG49	1.5	1	yes	4	8	nil	no
	BG13	1	1	yes	2	6	3	no
Tiwere	BG13	0.5	3	no	2	4	nil	no
	BG50	0.75	3	no	2	4	nil	no
	BG 49	1	2	no	3	6	nil	no
Sitela	BG49	0.75	2	no	3	7	nil	no
Given 4,2 die	BG50	0.25	3	no	2	5	nil	no
Ekueta	BG13	0.25	2	no	2	4	nil	no
	BG49	0.5	1	no	3	6	nil	no
	BG50	0.5	1	no	2	6	nil	no
Apisoloma	BG13	1	3	no	2	5	nil	no
	BG49	1	3	no	3	5	nil	no
	BG50	0.5	3	no	2	5	nil	no
Tualo	BG49	1	3	no	3	4	nil	no
	BG50	0.25	3	no	2	4	nil	no
	BG13	0.25	3	no	2	4	nil	no
Laviti	AU50	0.75	1	yes	2	7	nil	no
Paulson	BG44	2	3	no	5	6	nil	no
	BG29	1	3	no	3	6	nil	no
Tekiali	BG56	3	1	yes	10	7	2	no
	BG03	1	1	yes	3	6	nil	no
Siosi	BG29	0.25	3	no	2	5	nil	no
	BG12	2	2	yes	4	6	1	no
	BG03	2	1	yes	3	6	3	no
	Bg03	2	1	yes	3	6	nil	no
	BG44	1	1	yes	3	7	1	no
Semele	BG50	2	1	Yes	9	8	3	no
Given 2,1 die								
Tuie	BG49	1.5	1	no	5	7	nil	no
	BG50	1	1	no	3	7	1	no
Kaleti	BG49	2	1	yes	7	7	nil	no
	BG50	1	1	yes	4	7	1	no
	BG13	1	1	yes	3	7	1	no
	AU39	1	1	yes	4	7	nil	no
Neata	BG50	0.75	1	no	3	6	nil	no
	BG49	1	1	no	5	6	nil	no
Ropati	Given 1 die							
Peniata	BG49	0.75	2	no	2	6	nil	no
	BG50	1	2	no	4	6	nil	no
	No #	0.75	2	no	3	6	nil	no
	No #	0.75	2	no	3	6	nil	no
Silaume	BG13	0.25	2	no	3	6	nil	no
	BG49	0.5	3	no	4	5	nil	no
	BG49	0.5	2	no	4	5	nil	no
	BG50	0.5	2	no	3	5	nil	no

Name	Variety	Height	Leaf colour	Mulch	Stem size	Plant health	# of shoot	Fruiting	
loasa	BG49	1.5	1	no	8	8	nil	no	
	BG50	1	1	no	5	7	nil	no	
	BG13	0.75	3	no	4	6	nil	no	
	BG17	0.75	2	no	7	7	nil	no	
	AU39	0.5	3	no	5	6	nil	no	
Siliga	BG49	1	3	no	8	6	nil	no	
	BG50	0.5	3	no	6	6	nil	no	
	BG13	1	3	no	5	6	2	no	
	BG11	0.5	2	no	4	6	nil	no	
	BG13	1	2	no	5	6	nil	no	
	BG11	0.75	2	no	6	6	nil	no	
	BG11	0.75	2	no	6	6	nil	no	
Mavaega	AU11	1	2	no	5	6	1	no	
	BG49	0.75	2	yes	4	6	nil	no	
	1 died BG13	BG50	1	2	yes	4	6	nil	no
	BG13	0.75	1	yes	4	7	nil	no	
	BG49	1.5	1	yes	10	7	nil	no	
	BG13	0.75	1	yes	5	7	nil	no	
Eti	AU39	2	1	no	12	8	2	no	
	BG47	1	2	no	7	8	nil	no	
	BG49	1	2	no	9	7	nil	no	
	BG56	1	1	no	7	8	nil	no	
	BG56	0.75	1	no	5	8	nil	no	
	BG13	0.5	2	no	4	7	nil	no	
	BG17	0.5	1	no	4	8	nil	no	
	BG50	1	1	no	5	8	2	no	
	Kamuta	AU29	2.5	2	no	10	7	5	Yes 9hands
BG17		1.5	2	no	6	7	nil	no	
AU11		1	3	no	5	6	nil	no	
BG47		1	2	no	5	6	nil	no	
BG56		1.5	2	no	4	6	2	no	
BG49		1.5	3	no	6	5	nil	no	
Feli	BG49	0.5	2	no	4	7	nil	no	
	BG13	0.5	2	no	3	7	1	no	
Tapuli	BG13	0.75	2	yes	4	7	1	no	
	BG49	0.75	3	yes	5	7	nil	no	
	BG50	1	2	yes	5	7	1	no	
Malia	BG49	1	1	yes	6	8	nil	no	
	BG49	1	1	yes	6	8	nil	no	
	BG50	1	1	yes	5	8	nil	no	
	BG50	0.75	1	yes	4	7	nil	no	
	BG13	0.75	1	yes	3	7	nil	no	
	BG13	0.75	1	yes	3	7	nil	no	
Vaisua	BG50	0.75	2	yes	3	7	1	no	
	BG17	0.75	2	yes	4	7	nil	no	
	BG50	1	2	yes	4	7	nil	no	
	BG49	1	1	yes	5	8	nil	no	
	BG48	1	1	yes	4	8	nil	no	
	BG13	1.5	1	yes	4	8	nil	no	
	BG13	0.75	1	yes	3	7	nil	no	
Naetene	BG13	1.5	3	yes	5	6	nil	no	
	BG29	0.5	3	yes	4	6	nil	no	

Name	Variety	Height	Leaf colour	Mulch	Stem size	Plant health	# of shoot	Fruiting
Kausea N	BG49	1	1	no	3	6	nil	no
	BG50	0.5	2	no	2	6	nil	no
	BG17	0.5	2	no	2	6	nil	no
	BG47	0.25	2	no	2	6	nil	no
	AU07	0.25	2	no	2	6	nil	no
Luka	BG13	0.75	1	no	2	7	nil	no
	BG50	0.75	1	no	3	7	nil	no
	BG49	1	1	no	4	7	nil	no
Kapua	BG13	0.75	1	yes	3	8	2	no
	BG49	1	1	yes	4	8	nil	no
	BG49	1.5	1	yes	5	8	2	no
	BG50	1	1	yes	4	8	2	no

Annex 3. Health and Growth of Banana plants on Funafala Islet

Name	Variety	Height	Leaf colour	Mulch	Stem size	Plant health	# of shoot	Fruiting
Sakaria	BG13	0.75	3	no	2	4	nil	no
	BG13	0.75	3	no	2	4	nil	no
	BG13	1	3	no	3	4	nil	no
	BG13	0.75	3	no	2	4	1	no
Brother	BG50	1	3	no	3	4	1	no
	BG50	0.75	3	no	2	4	nil	no
	BG50	0.75	3	no	2	4	nil	no
	BG50	0.75	3	no	2	4	nil	no
Sekau	BG13	0.75	3	no	2	4	1	no
	BG49	0.75	3	no	3	4	nil	no
Jay	BG50	0.75	1	no	2	5	nil	no
	BG50	1	1	no	3	5	nil	no
	BG13	0.75	2	no	2	5	nil	no
Panapa	BG13	0.50	3	no	2	5	1	no
	BG50	0.50	3	no	2	5	nil	no
	BG50	0.50	3	no	2	5	nil	no
Eliakimo	BG13	0.50	pale	yes	2	5	nil	no
	BG50	1	pale	yes	3	5	1	no
	BG50	0.5	pale	yes	2	5	nil	no
	BG13	0.50	pale	yes	2	5	1	no

Annex 4 . Health and Growth of Community Banana plants on Falefeke Islet

Name	Variety	Height	Leaf colour	Mulch	Stem size	Plant health	# of shoot	Fruiting
	BG13	0.75	3	no	2	4	1	no
	BG44	0.5	3	no	2	4	1	no
	BG47	0.5	3	no	2	4	1	no
	BG49	0.5	3	no	2	4	nil	no
	BG17	0.5	3	no	2	4	1	no
	BG50	0.5	3	no	2	4	nil	no
	BG07	0.5	3	no	2	4	nil	no
	BG56	0.5	3	no	2	4	nil	no

	AU07	0.5	3	no	2	4	nil	no
	AU11	0.5	3	no	2	4	nil	no
	AU39	0.5	3	no	2	4	nil	no
	No #	0.5	3	no	2	4	nil	no
	No #	0.5	3	no	2	4	nil	no
	No #	0.5	3	no	2	4	nil	no
	No #	0.5	3	no	2	4	nil	no

- Plant height in metres measured from the ground to the growing point
- Colour of leaves; 1. Green (satisfactory health) 2. Pale green (some element lacking) 3. Yellow growth deteriorating.
- Mulching is critical it is a source of plant nutrient when it decays and prevents water evaporating.
- The stem size refers to the diameter in centimetre of the stem about the middle
- Overall health of the plant rated from 1 to 10. (1 poor and will die and 10 very good health)
- Is the plant fruiting or not

Annex 5

Planting and caring banana tree

You cannot grow bananas from seeds because banana plants don't produce seeds.

The best way is to start with the suckers. Every banana plant produces lot more suckers than you need. Only take suckers from vigorous banana plants. The suckers should have small, spear shaped leaves and ideally be about one meter high. Smaller suckers will take longer to fruit.



Cut the sucker from the main banana plant with a sharp shovel. Cut downwards between the mature plant and the sucker. You have to cut through the corm. It's not easy. Make sure you get a good chunk of corm and many roots with it.

Chop the top off the sucker to reduce evaporation while you move it and while it settles into its new hole. Remember, the growing point is at the bottom of a banana plant. You can decapitate the sucker and will grow back.

Plant your suckers in your well prepared hole or hill with plenty of compost and rusted tins to feed the sucker as it grows.

The spacing depends on you. You plant at 1.5 to 2.0 metres apart or can put them closer together. Keep your banana plants moist but not too wet in the early days, or they may rot. They don't have leaves yet to evaporate water, so they don't need much.

Maintaining your banana plant is important. The most common cause of death for bananas is lack of **water**. The most common cause for not getting fruit is **starvation**. Banana plants blow over in strong winds. **Protect** them and **feed** them and **water** them and all will be well. Other than that bananas don't need much maintenance.

Remove any dead leaves and cut down the dead plants every now and then. You get bigger fruit if you remove all **unwanted suckers**, only keeping the best three for **very healthy, vigorous plants**. These are original, mother, daughter, granddaughter and the smallest great granddaughter.

The **best** suckers are the ones with the small, spear shaped leaves, **NOT the big round leaves**. Spear leaves sucker is still fed by the mother plant and does not need to do much photosynthesis, so it doesn't need to produce big leaves. A sucker that is well looked after by the mother plant will produce better fruit and be stronger than one that had to struggle on its own.

Mulching is very important for coral atolls because soil do not retain water and very poor in nutrient. Just throw all the leaves and old trunks etc. back under the plants as this prevent moisture evaporating

from the soil and in time will give the plant some nutrient. Decayed organic matter, washed seaweed, ash, and animal manure can also be added to growing tree.

Banana fruit may first emerge at about nine months or ten months, depending on how well you look after your plant.



As the flower petals curl back and drop off they reveal a "hand" of bananas and each banana is a "finger". You can get many hands on a bunch and then, under the next petal, you'll see a hand of very teeny small flowers and these are the male fingers. The male fingers just dry and drop off and only the stalk remains. If you let it grow it will eventually reach the ground.

It's better to break off the "bell" below the last female hand. That way the banana plant puts its energy



and reserves into growing big bananas, and not into growing a long stalk.

While waiting for the bunch to mature for another three months you may have to prop your banana bunch, because it becomes very heavy, and they can snap off or pull the whole plant over. A long stick or pole can do the job. Bananas are ready to be picked when they **look well rounded and the little flowers** at the end are dry and rub off easily.

You can **preserve bananas** for use in cooking and baking by peeling and freezing them or to preserve them for eating, peel, split in half lengthwise and dry them.

Once the bunch is picked the rest of the plant will **die quickly**. Cut it to the ground and put it back under the tree and let the next sucker grow while you process all the bananas.

ANNEX 6

Anau Manarangi's Travel Itinerary

Tuesday March 20 2012	Rarotonga - Auckland
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Flight:	NZ0749	AIR NEW ZEALAND LTD
Depart:	Rarotonga	01:30
Arrive:	Auckland	05:00 Wednesday March 21 2012
Cabin:	Economy Class	Stops: 0
Status:	Reservation Confirmed	Aircraft: AIRBUS INDUSTRIE A320
Duration:	4hrs 30mins	Meal:

Wednesday March 21 2012	Auckland – Nadi
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Flight:	NZ0752	AIR NEW ZEALAND LTD
Depart:	Auckland	06:50 Terminal – International
Arrive:	Nadi	08:55
Cabin:	Economy Class	Stops: 0
Status:	Reservation Confirmed	Aircraft: AIRBUS INDUSTRIE A320
Duration:	3hrs 5mins	Meal:

Wednesday March 21 2012	Nadi - Suva
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Flight:	FJ0015	AIR PACIFIC LTD
Depart:	Nadi	14:10
Arrive:	Suva	14:40
Cabin:	Economy Class	Stops: 0
Status:	Reservation Confirmed	Aircraft: CV5
Duration:	30mins	Meal:

Thursday March 22 2012	Suva - Funafuti Atol
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Flight:	FJ0281	AIR PACIFIC LTD
Depart:	Suva	09:20
Arrive:	Funafuti Atol	11:40
Cabin:	Economy Class	Stops: 0
Status:	Reservation Confirmed	Aircraft: AEROSPATIALE
Duration:	2hrs 20mins	Meal:

Tuesday May 01 2012	Funafuti Atol - Suva
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Flight: FJ0280 **AIR PACIFIC LTD**
Depart: Funafuti Atol **12:25**
Arrive: Suva **14:45**
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** AEROSPATIALE
Duration: 2hrs 20mins **Meal:**

Wednesday May 02 2012	Suva - Nadi
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Flight: FJ0010 **AIR PACIFIC LTD**
Depart: Suva **10:00**
Arrive: Nadi **10:30**
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** AEROSPATIALE
Duration: 30mins **Meal:**

Wednesday May 02 2012	Nadi - Auckland
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Flight: NZ0755 **AIR NEW ZEALAND LTD**
Depart: Nadi **19:50**
Arrive: Auckland **23:00**
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** AIRBUS INDUSTRIE A320
Duration: 3hrs 10mins

Wednesday May 09 2012	Auckland - Rarotonga
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Flight: NZ0746 **AIR NEW ZEALAND LTD**
Depart: Auckland **08:45** Terminal - International
Arrive: Rarotonga **14:40** Tuesday May 08 2012
Cabin: Economy Class **Stops:** 0
Status: Reservation Confirmed **Aircraft:** AIRBUS INDUSTRIE A320
Duration: 3hrs 55mins **Meal:**

View your itinerary online at www.checkmytrip.com	Your Amadeus Reference Number is: 4QKMKE
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