



Growing Vegetable Seedlings in Fiji

A PRACTICAL GUIDE FOR
Farmers & Nursery Owners

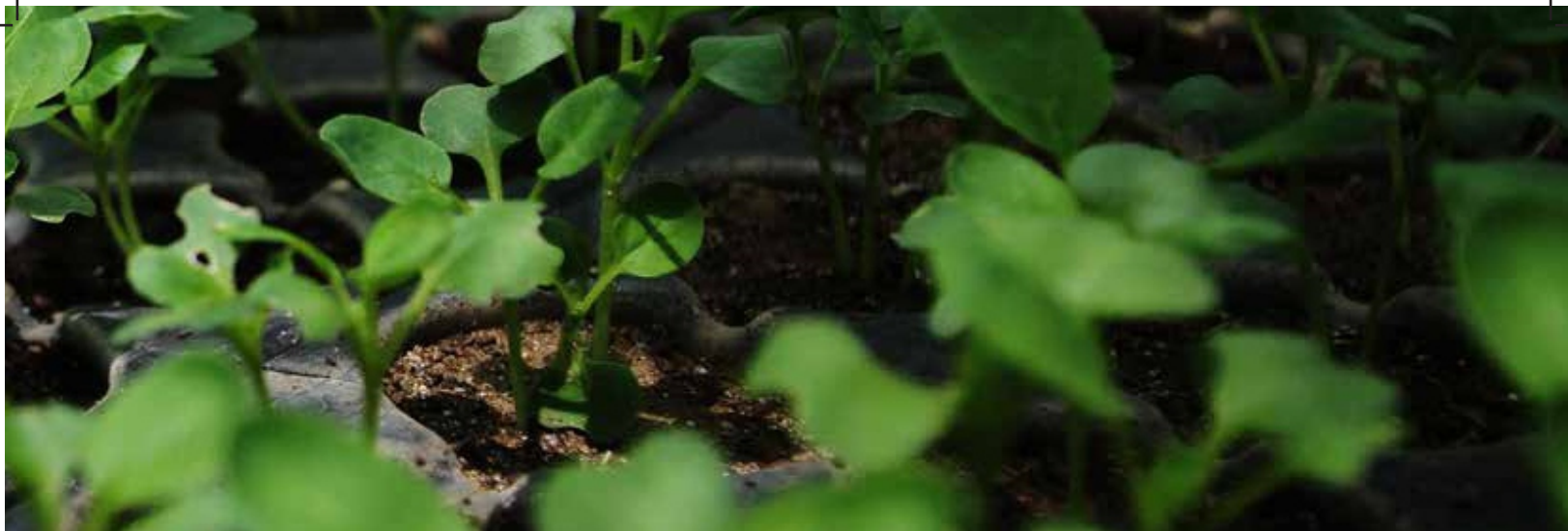




There are nine countries in the Pacific participating in the project 'Farmer Organisations for Africa, Caribbean and Pacific' (FO4ACP). With a total of 18 national Farmer Organisations (FOs) directly engaged in implementation and engaging in activities that are working in three components, namely: Component 1 – Linking Farmers to Markets; Component 2 – Farmers Have Their Say; Component 3 – Farmers Helping Farmers.

Farmer Organisations are a relatively new trend in the Pacific where farmers are organised into formal organisations and provide key services to their members. In this project, the FOs are directly involved in implementing activities, amplifying the role of extension and research officers and providing critical agricultural services to their members.

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Photography by Faith Naivaluwaqa



PREFACE

I have a vision that Fiji's fresh produce industry will continue to grow as a major contributor to the income of our farmers and to the nation of Fiji. I believe that in order to realise this vision we need to support our private nursery so that they can be better businesses and more adaptable to various natural disasters.

This manual is intended to assist our farmers and nursery owners on how to grow high quality vegetable seedlings and also how to run a vegetable seedling nursery as a business. Through some of the tips in this manual it is expected that nurseries will be better equipped to handle natural disasters so that farmers can have quick and ready access to seedlings to rehabilitate after a natural disaster. It is also hoped that our farmers and nursery owners with greater knowledge and skill will increase their income by producing more quality vegetables.

Kyle Stice and Sant Kumar coordinated the production of this manual, with technical assistance from BP Syna, Saten Reddy, Roger Goebel, Timote Waqainabete and Atu Fereti.

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Sant Kumar
Nurseryman



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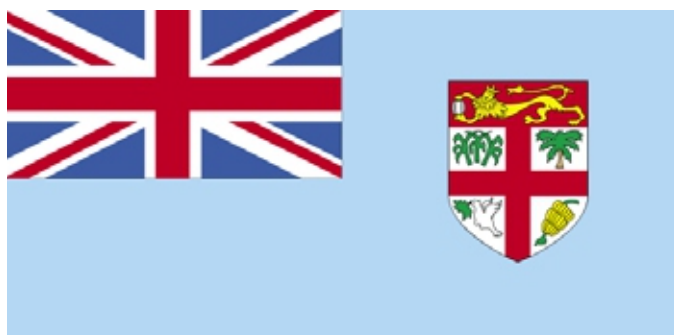


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VEGETABLE FARMING IN FIJI

Fiji has a proud farming history. Of the 196 countries in the world, the Fiji flag has the most references to farming than any other country.

Farming in Fiji is very important for supplying food to our citizens as well as for earning money. The food that we eat should contain a wide range of fruits and vegetables, so that we can be healthy and avoid non-communicable diseases, diabetes, hyper tension and heart disease.



There are many different ways of growing vegetables in Fiji. **Some are very simple...**



While others are more complex...



Whichever way you are growing vegetables, it is very important that you start with healthy plants (seedlings). There are three main ways of getting your vegetable seedlings started:

Using seedlings from the nursery

Direct sowing of seeds into the field

Using plants grown in a seed bed



There are good things and problems about each of these different methods.

Advantages of seedlings over other methods

The main advantages of using seedlings from a nursery over other methods include:

- Gives a faster crop which means quicker to sell
- Uses less water in the field
- Healthier plants
- Less time weeding in the field
- Head start on insects, disease and weeds
- Uniform growth in the field

High quality seedlings = Healthy plants = More crops and more money

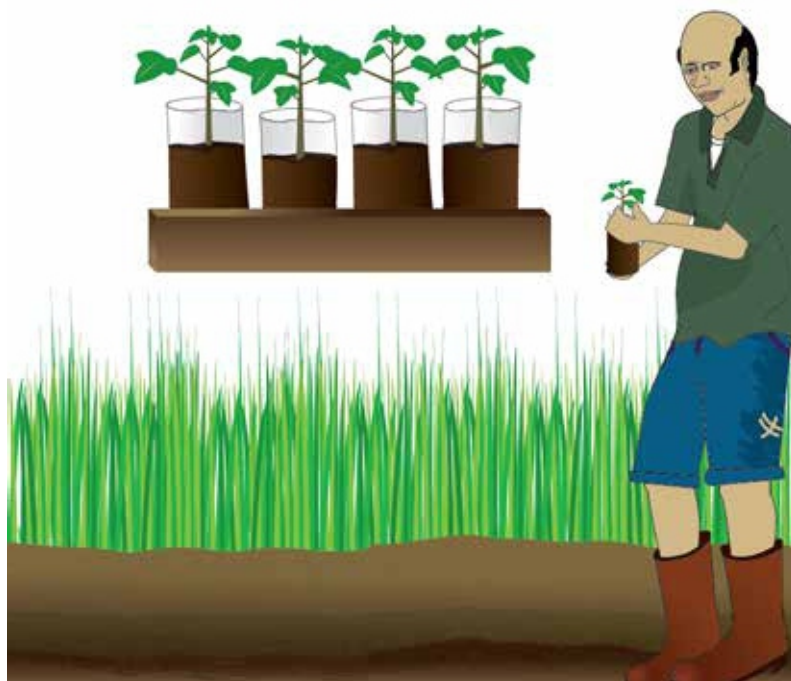
THE NURSERY

Why do we need a nursery?

A seedling nursery protects young seedlings from things that can harm them until they are strong enough to go into the field.

A nursery for growing vegetable seedlings should provide a few basic things:

1. **Separate the plants from the ground (the soil contains many diseases that can be harmful to young vegetable seedlings)**
2. **Protection from heavy rain (heavy rain can wash away newly sown seeds and damage young seedlings – too much rain will encourage disease and kill young seedlings)**
3. **Protection from heat and intense sun by providing shade (this is not necessary for all vegetable seedlings and may vary throughout the year).**



The nursery is a valuable 'tool' for the vegetable farmer

Different types of nurseries to suit different needs

It is important that you choose the type of nursery that just suits your needs. If you are a village or backyard vegetable farmer then you do not need to spend much money to build a nursery that can produce small numbers of seedlings.



If you have a semi-commercial or commercial farm and would like to grow your own seedlings, then you may need to invest in a nursery that can produce enough seedlings for your farm all year round.



Finally, if you want to supply large amounts of seedlings to a big farm or want to set up a commercial nursery to sell your seedlings then you may need to build a much more sophisticated nursery.



A smart farmer builds a nursery that is adaptable and meets his current needs but also has room to expand.

Different types of nurseries – how much will it cost?

This section will show you three different types of nurseries and provide an idea of how much they may cost to build. These are just examples and the costs will vary depending on the materials you use and where you buy them.

Backyard nursery house



This nursery is designed to utilise local materials that can be collected at little or no cost. This nursery is approximately 4 m x 2 m and can hold around 20 seedling trays.

Cost of production:

Material	How many	Cost (FJD)
Wooden bush posts	12 posts	0
Bamboo	8 posts	0
Nails	½ kg 4 inch ½ kg 2 inch	\$10.90
Plastic	4 m x 3 m	\$36
Total materials		\$46.90
Labour		
Cutting/collecting materials	1 man day	\$18
Building nursery house	2 man days	\$36
Total Labour		\$54
Grand total		\$100.90

Small farm nursery



This nursery is made with materials that will last longer than the backyard nursery but it does not require the construction of a shade house. This nursery is 2.5 m x 1.2 m and can hold around 20 trays of seedlings.

Cost of production:

Material	How many	Cost
6 inch blocks	8	\$9.60
Mesh wire (2" x 2")	1 sheet (8 ft x 4 ft)	\$42
Angle Iron (3 mm x 2" x 2")	1 length (6 m)	\$34.50
Polythene pipe (1/2")	5 m	\$12
Clear plastic cover (140 micron)	2 m x 4 m	\$12
Sarlon cloth (50% shade)	2 m x 4 m	\$10
Metal rod	¼ length (6 m)	\$6
Total materials		\$126.10
Labour		
Collecting materials	1/2 man day	\$8
Transport materials to farm	1 trip	\$15
Machine man (welding)	½ man day	\$25
Building nursery	2 hours	\$4
Total Labour		\$52
Grand total		\$178.10

Large farm or commercial nursery



This nursery design is a more typical shade house which is 6 m x 6 m and holds 12 benches, each bench holds 20 trays. The nursery has a total capacity of 240 trays at any given time.

Cost of production:

Material	How many	Cost
<u>Nursery</u>		
Pine poles (6" x 3.5 m)	9	\$540
Pine poles for strainer posts (6" x 3.5 m)	4	\$240
Cement for pine pole (50 kg bag)	4	\$60
Sarlion cloth 30% shade (2.6 x 50 m roll)	1	\$500
#8 wire (25 kg coil)	1	\$95
UV rope (100 m coil)	1	\$35
<u>Benches</u>		
6" blocks	96	\$115.20
Mesh wire (2" x 2")	12 sheets (8 ft x 4 ft)	\$504
Angle Iron (3 mm x 2" x 2")	12 lengths (6 m)	\$34.50
Polythene pipe (1/2")	60 m	\$144
Clear plastic cover (140 micron)	2 m x 50 m	\$90
Metal rod	1 length (6 m)	\$24
Total Materials		\$2381.70
<u>Labour</u>		
Collecting materials	2 man days	\$32
Transport materials to farm	1 trip	\$15
Building nursery (foreman)	7 man days	\$210
Building nursery (labourer)	14 man days	\$252
Total Labour		\$509.00
Grand Total		\$2890.70

BUILDING YOUR NURSERY

Selecting a site

Whether you are building a backyard nursery or a large commercial nursery, the site that you select is the first and most important step. Some things to consider when you choose your site:

1. Does this site get enough sunlight? – if it is near a house or big trees then you might not be able to get enough light to grow high quality seedlings.
2. Does this site allow for good airflow? – airflow is important to help control disease in your nursery.
3. Is the site close to water? – you will likely need to water your seedlings everyday so it is important that your nursery is close to a good water source.
4. Does this site flood? – you must make sure the site is in a flood free area.
5. Is the site secure? – you must make sure that your seedlings are safe from thieves and animals (usually it is best to put the nursery close to the house so the owner can keep a close watch on the seedlings).
6. Are there many pest 'host' plants near your site? – there are some plants such as guava and banana which will attract bad insects and if these plants are near your nursery then you will have problems with these insects.



This nursery is located in a wide open space with good sunlight and airflow.

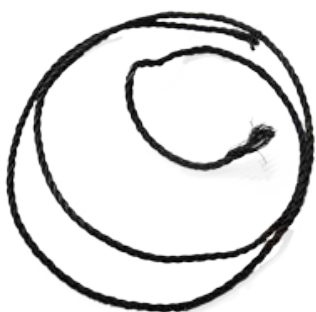


This nursery is located too close to houses and big trees which allows for too much shade and poor airflow.

Tips and tricks for building nurseries

Materials

Shade cloth Shade cloth is used to filter the sunlight for young plants. Generally 50% shade is used for growing vegetable seedlings in the Western Division of Viti Levu and the Macuata and Bua provinces of Vanua Levu, where there is an abundance of sunshine. In areas such as the Central Division of Viti Levu, Savusavu and Taveuni of Vanua Levu, where there is less sunlight than 30% shade is preferred. Either green or black shade cloth may be used. There are many stores in Fiji that sell shade cloth but be careful of the very cheap ones as they may not have good protection from the sun and will not last long. Hop Tiy and Marco Polo Holdings in Suva sell the best quality shade cloth.



Ultra violet protected rope (UV Rope) The best material for sewing your shade cloth is UV rope. This rope has good protection from the sun and will last a very long time. UV rope is available from some hardware stores in Fiji.

Clear plastic Clear plastic is used to keep the rain off of your seedlings. This is a very important material in the rainy season. It is important that you get a thick, high quality plastic so that it can withstand the sun, wind and rain. Flexible Packaging (Ba Industries Ltd) located in Lautoka has a very good product. The thickness of plastic is measured in microns – it is recommended that plastic greater than 100 microns be used for the nursery.



Seedling benches One good way to make benches for your nursery is to use sheets of mesh wire. These sheets of mesh wire are 8 ft long by 4 ft wide and the square holes are 2" x 2". These mesh wire sheets are available from most hardware stores and will last a long time in the nursery. These mesh wire sheets can also be modified to be stronger and hold up hoops (like the small farm nursery) if an angle line frame is welded onto the mesh wire.



Small pieces of iron rod welded to the mesh wire allow you to put on a hoop to hold up shade cloth or clear plastic



PVC or polythene pipe is a good way to make hoops. This system allows the nurseryman to easily control the amount of shade or plastic for the seedlings.

Sewing shade cloth It is important that your shade cloth be sewn together properly in order to withstand strong wind and rain. Sewing shade cloth is much like sewing clothes; a 'needle' can be made by using a piece of #8 wire. One end should be sharpened and the other end flattened with a hole to attach the UV rope.



Nursery frame The frame of a nursery is needed only to support the shade cloth or plastic. The most effective and cheapest way to build a nursery frame in Fiji is to use pine poles and wires. A wooden frame design like that used in building a house is much more expensive and requires more maintenance than the wire design. Other support ideas include steel posts, cement filled PVC pipe and bush timber. Painting wood can help and look better but may not be worth the cost.



This pine pole and wire nursery frame is the most economical construction method.

The wooden frame nursery design is very expensive and also requires additional maintenance as the timber rots.

THE SEEDLING TRAY

Different types of seedling trays for different uses

The most common way to grow vegetable seedlings is to use plastic seedling trays. There are many different shapes and sizes available to fit your needs.



32 Cell Tray



45 Cell Tray (Split)



144 Cell Tray



50 Cell Tray (Square)

Buying seedling trays in Fiji

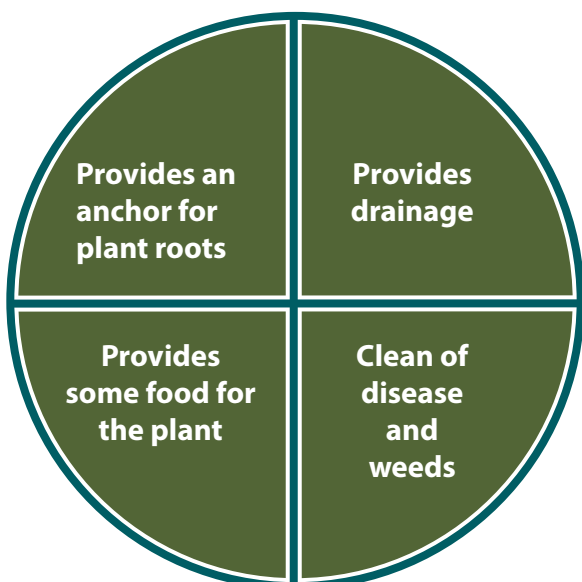
Plastic seedling trays were previously very expensive in Fiji (around \$5-\$7 for a 50 cell tray), but very recently new trays have become available that are much cheaper (around \$1-\$2 for a 50 cell tray) and still of relatively good quality. This is very good news for farmers and nursery owners in Fiji. Hop Tiy and Marco Polo in Suva have the biggest range of plastic seedling trays.

Vegetable seedlings can also be grown in low cost containers such as recycled tins, plastic cups, small rice bags and the flaps from egg containers etc. These containers may be better suited for village or backyard farmers who do not need large amounts of seedlings.



SEED RAISING MIX

What makes a good seed raising mix?



- Broken down coconut husks (grated) - provides water holding capacity and anchor for plant roots.
- Top soil under trees (free of debris) - provides fertilizer and water holding capacity.
- Seed raising mix from the shop - provides good drainage, enough water holding capacity and may provide some fertilizer.

Many a time you may need to mix these materials to make a good seed raising mix. Sant Kumar of Bula Agro Nursery in Votualevu, Nadi uses the following materials for his vegetable seed raising mix:

Using materials available around the farm

Some good materials for a seed raising mix include:

- Good river bank soil - supplies drainage, some water holding capacity and some fertilizer.
- Well composted animal manure - supplies some fertilizer, particularly nitrogen and some water holding capacity.
- Well composted vegetable or garden waste - provides fertilizer like nitrogen and water holding capacity.



- 1 part composted animal manure (sterilized)
- 1 part river bank soil (treated)
- ½ part Yates potting mix
- 1 tuna can of NPK fertiliser 13.13.21

Here are some examples of what other good nursery owners in Fiji use as their seed raising mix:

Good ingredients = Good seed raising mix = Strong and healthy plants

John Kemp – Nadi Bay Herbs, Nasoso, Nadi

- 1 part river bank soil (treated)
- 1 part Yates potting mix

Tutu Rural Training Centre, Taveuni

- 3 parts – rich top soil
- 1 part – composted and grated coconut husk

Sterilizing your seed raising mix – free from disease and weed seeds

- A clean seed raising mix means that your plants will be free of disease and weed seeds.
- Seed raising mix that you buy from the store is already clean.
- One way to clean your seed raising mix that you make on the farm is to use a drum steam sterilizer. Sterilize the made up mix or just the components that are not already clean.



Using the drum method to make seed raising mix clean is quick and effective



1. Place two blocks in bottom of drum.



2. Set steel mesh on blocks

In the middle of the mesh place a steel pipe (with holes to allow for steam to escape)



3



4



5

3. Fill with water halfway up the block.

4. Spread unsterilized seed raising mix over steel mesh to the top of drum. Mix should not be in contact with water. Cover with leaves or sacks to trap steam as in lovo preparation.

5. Build -re under the drum to heat water, allowing steam to pass through the seed raising mix killing all weeds and soil diseases. At a temperature of 80 deg C all of the diseases and weed seeds will be killed. A good way of knowing if you have reached the right temperature is to place a piece of cassava in the drum, when the cassava is cooked then you have reached the right temperature.

GOOD SEED

There are two main types of vegetable seeds available in Fiji – open pollinated and hybrid

Open pollinated seed is collected from the best vegetables in a farmers block – the seed collected from the vegetable should produce vegetables the same as the parent plants.

Some examples of open pollinated vegetable varieties grown in Fiji are:

- Eggplant – long purple, chahat, round purple, Sigatoka beauty
- Okra – dark green and light green
- Tomato – Alafua large, Alton
- Chillies – red fire, hot rod, bongo, birds eye
- Cow peas – mana, rachna
- Pigeon pea – bharpoor, kamica
- Corn – nirila, Hawaiian super sweet, local yellow (sila)

Hybrid seed comes from crossing pollen from two different vegetable varieties. Seed collected from hybrid varieties will not produce vegetables the same as the parent material. Hybrid seeds need to be bought from the shop.

Some examples of hybrid vegetable varieties grown in Fiji are:

- Eggplant – black beauty, black bell, also known as 'long purple'
- Okra – Clemson, Hybrid okra
- Tomato – Rising sun #1 and #2, beef steak
- Chillies – know you seed
- Watermelon – emperor #2, field master
- Capsicum – blue star
- Head cabbages – kk cross, ffcross, autumn summer
- Leafy cabbages – pok choy, bok choy, petsi
- Cucumber – telegraphic, money maker
- Long Beans – long bean
- French bean - contender



Sourcing seed in Fiji

Open pollinated seed can be sourced from MPI research stations or private farmers. There are two main MPI research stations that provide open pollinated seeds:

Sigatoka Research Station – papaya, eggplant, chillies, tomatoes, corn

Legalega Research Station – cow pea, pigeon pea, mung, peanut

Hybrid seed is generally available in hardware or agriculture stores. Some stores such as Hop Tiy specialize in good tropical vegetable seeds. Some seed companies such as Yates sell vegetable varieties that have been selected for different climates to Fiji and may not perform as well as 'tropical' varieties.

**Open Pollinated – Yes, you can collect your own seed.
Hybrid – No, you cannot collect your own seed.**

Proper seed storage – germination rate

After you buy seed it is important that you store it properly to keep away insects, rats and disease. Good seed storage also helps to maintain a good germination rate.

Germination rate is the number of good seeds from a total batch of seeds – if you buy a packet that says the germination rate is 80-90% then you can only expect 80-90 out of 100 seeds to be good.

If you buy a packet of capsicum seeds that have 5000 seeds and only 4000 germinate then the germination rate is 80%.

If seeds are not stored properly then the germination rate may decrease – you lose time and money. When you buy seeds from the shop, usually the packet will have some instructions for storage. Some tips for good seed storage are:

- Keep seed in a cool, dry place away from direct sunlight.
- Keep seed in closed bag or container to keep out water and insects.
- Some seeds will store longer if placed in the warmest area of a refrigerator.



Hybrid Seeds



Open Pollinated Seeds



Sometimes the cheapest seed is not necessarily the best seed.

GETTING STARTED IN THE NURSERY

Filling Trays



Trays should be filled to a certain compaction so that you can still see the plastic between the squares.



This tray is not evenly filled



This tray is too full

Sowing seeds



Using a stick, make holes 10 mm deep.



Using a stick and paper cone, drop seeds one at a time into the squares.



After sowing, cover seeds lightly with fine seed raising mix.



Cover plastic trays with black plastic to help germination. Check daily for moisture and germination – water as needed. Once seeds have germinated, remove plastic.

After germination care



Seedlings need to be watered regularly but you do not want to avoid damage from rain by keeping seedlings covered with too much water – always use a watering implement with a fine mist so you do not disturb the plants. plastic during bad weather.

FEEDING YOUR SEEDLINGS

Are your seedlings hungry?

You must watch your seedlings carefully to determine if they are hungry, thirsty or sick. You should observe leaf colour, growth rate and root activity. There could be other factors at play such as the quality of the seed raising mix, pests or diseases. However, susceptibility to pests and diseases can be related to poor nutrition.

Hungry plants can have the following symptoms:

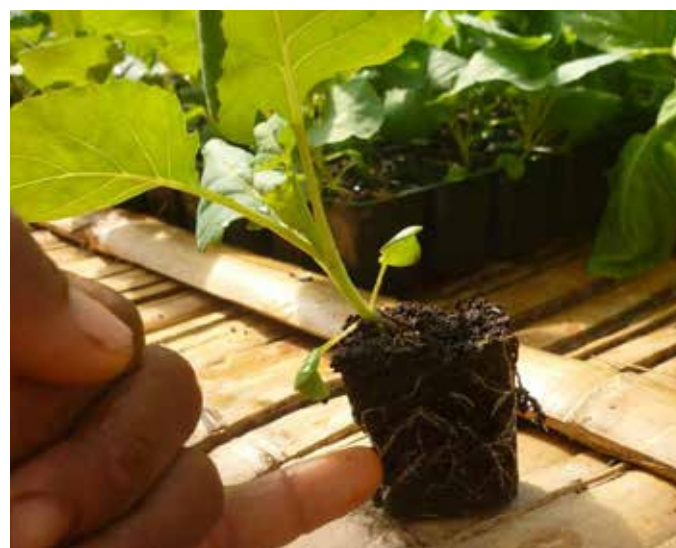
- Yellowing of leaves
- Thin and unhealthy looking plants
- Poor root development



The yellow leaves and poor growth of these eggplant seedlings is a result of poor feeding.

Soil mix pH is important and can be changed by adding various ingredients. There are some basic methods to test your mixes and once you settle on a suitable mix you will not have to test as often.

The pH that suits most plants is 6.5. Lower than that is acid and may need lime. Readings above 7.5 and below 6 can mean that the fertilizer in the mix is not available to the plant even though the fertilizer is there hence the plant can show deficiency symptoms.



This round cabbage seedling shows poor root development for its age – this is the result of poor feeding.

Hungry seedlings = Poor crop
Healthy seedlings = Good crop

Types of fertilizer and ways to apply it



Feeding your seedlings

Like humans, plants need food, light, air and water to grow. When you are growing seedlings, you must remember that these are baby plants and the amount of food and timing of feeding is very important, like a human baby.

Adding food to the seed raising mix

A seed raising mix with a high level of nutrients is the best way to provide food for your seedlings at an early stage of growth. Using well composted treated animal waste in your seed raising mix is a good way to add food. Never use fresh manure in your seed raising mix. Well composted animal manure will not have a strong smell.

If you know your seed raising mix is low in nutrients, add an NPK fertiliser and trace elements like boron, zinc and magnesium. NPK fertiliser is incorporated directly into the seed raising mix at a rate of around 100 grams (one small tuna can) per wheelbarrow of seed raising mix.

The plant food phosphate, needs to be in the potting mix and available to the plant as soon as the seed germinates. Other foods like nitrogen, potassium and most of the trace elements can be applied as the plant grows.

Feeding growing plants

Once your seedlings are growing they may show signs that they are hungry (see section on 'Are your seedlings hungry?').

The best way to feed growing plants, is with a foliar (mixed with water) fertiliser. Many hardware stores sell Thrive® foliar fertilizer (N=27: P=5.5: K=9) which is good for seedling production.

Foliar fertiliser such as Thrive should be mixed in water according to the label and sprayed onto plants using a knapsack sprayer. A watering can may also be used – but this tends to waste fertiliser. A general application rate for vegetable seedlings would be 10 ml (2 teaspoon) fertiliser for 1 L water.



PESTS AND DISEASES IN THE NURSERY

Keeping pests and diseases out

The best way to control pests and disease in your vegetable seedlings is to keep them out.

Keep pests and diseases out of your seedlings by:

1. Using a clean seed raising mix – this keeps the soil diseases out of your nursery (see section on 'Clean Seed Raising Mix').
2. Use a plastic cover to control the amount of water on your seedlings – this prevents diseases from developing.
3. Remove plants that host insects, from around your nursery house – this will help keep insects away (trees like glyricidia, guava and banana attract bad insects to your nursery).
4. Only use clean water, free of diseases, salt and bad chemicals in your nursery.
5. Use sterilized tools and clean hands when handling seeds/seedlings

Keeping pests and diseases out of your nursery makes you and your plants happy.



This drum sterilizer will kill bad pests and diseases in your seed raising mix.



The plastic roof on this backyard nursery house will keep unwanted rain off the seedlings which will help control disease.

Knowing your pests and diseases

If you want to try and control a pest or disease, it is important that you have an idea of what it is. Below are a few examples of common pests and diseases that affect vegetable seedlings in Fiji.



These tomato plants are suffering from a fungal disease.

FROM THE NURSERY TO THE FIELD

Getting your seedlings ready for the field

Seedlings grow well in the nursery because all of the conditions are just right – lots of water, the right shade, protection from pests and diseases etc. This is very good to give young plants a head start, however there is an important step between the nursery and the field and this is known as 'hardening'. Hardening is basically: getting your plants ready for the field. Some steps in 'hardening' your plants are:

1. Putting them into full sunlight - your plants will be in full sunlight when they are in the field so you can start to gradually introduce them to full sunlight to avoid field burn. When moving your seedlings into direct sunlight for hardening it is best to do this in the late afternoon to minimize shock.
2. Water your plants less in the 1-2 weeks before planting them in the field.



These eggplant seedlings are placed in direct sunlight for 1-2 weeks before planting, for 'hardening'.

When is a seedling ready for the farm?

The nursery is a place to just help plants get a head start; plants need to grow in the field.

Some vegetables take longer in the nursery than others. The amount of time a plant spends in the nursery also depends on how big the space in the tray is – if you are growing in a 50 cell tray you have more potting mix than if you are growing in a 144 cell tray.



These eggplant seedlings are ready for the farm, they are healthy, vigorous and have been hardened in direct sunlight.



These eggplant seedlings are not suitable for transplanting because they have been left too long in the nursery and are hungry.

How do you hold seedlings in the nursery?

There may be some cases when you need to 'hold' seedlings in the nursery for a week or two longer than usual, This can happen during times of bad weather and the farmer cannot complete land preparation or when a customer is delayed in picking up his seedlings.

Some tricks to 'hold' seedlings longer than usual include:

- Stop fertilizing seedlings and water heavily to leach out fertilizer from cells.
- Put seedlings into direct sunlight
- Supply less water than usual in order to slow down the growth of the seedlings.

Transplanting to the field with good success

Planting your seedlings into the field is known as 'transplanting'. Some nursery owners apply a dose of fertilizer and fungicide to all their seedlings just before they are planted into the field.

During transplanting it is important that the roots of the seedling are not disturbed. The farmer should carefully remove the seedling from the tray whilst trying to keep all of the seed raising mix and roots intact.



During transplanting carefully remove seedlings from the tray and try not to disturb the root system.



Seedlings should be carefully planted in the field and watered straight away.



PROTECTION AGAINST NATURAL DISASTERS

Natural disasters, including cyclones, drought and flooding, can be a farmer and nursery owner's worst nightmare. For a farmer or nursery owner who has been affected by a natural disaster, the best thing he/she can do is to go back to the farm and plant more crops. Often after a natural disaster, there is a big demand for vegetable seedlings as farmers work towards restoring their farms.

For these reasons it is very important that you try to protect your nursery and seedlings from the damaging effects of natural disasters.



The March 2012 floods caused widespread damage to farms and nurseries in the Western Division – the question now remains, 'Are we prepared for the next natural disaster?'

Below are a few tips to help protect your nursery against natural disasters:

1. Choose a good site for your nursery – Make sure that your nursery is in a flood free area and is also close to water, in case of drought.
2. Build your nursery 'cyclone ready' – A 'cyclone ready' nursery is built to go through cyclones with only minimal damage. Some tips for building a 'cyclone ready' nursery are: use nursery clips to fasten your shade cloth or plastic, do not cement the poles of your nursery so that in a cyclone they fall over but do not break.
3. Have a safe place to store your seedlings when a cyclone or flood is approaching – In some cases you may not be able to save your nursery but you may be able to save the seedlings in it, these seedlings may be very valuable to you or your customers immediately after a natural disaster. Have a designated area where you store your seedlings in the event of a natural disaster, this could be a shed or room in your house. If you are a bigger nursery you may choose to invest in a shipping container that can be modified to store large amounts of seedlings.

GROWING SEEDLINGS AS A BUSINESS

The market – who will buy your seedlings?

The person, company, or group that will buy your seedlings is known as your **market**. For example, if you are living in a community of farmers who all grow vegetables than these farmers are your market. Your market can also be an actual place where you go to sell your seedlings directly to buyers. **Assessing your market** gives you a good idea, if enough people will buy enough of your seedlings at prices which will give you a profit (you earn more than it costs you in terms of money and your time).

It is important to know what your market will be before you begin investing time and money in your nursery business.

Available labour and value of labour

It is important to know the time that is required to meet your goals in a small nursery business. You must consider very carefully who is going to do this work and whether there will be money to pay them. Many people starting a business already have a job; it is a good idea to make sure that your new business is going to work before quitting your job. It is always good to have one steady income coming into a household when starting a new business.

Even if you do not have a job you must assign a dollar value to your time and use this in your business plan because one day you may have to pay someone to do your job. It is also important to know the value of your time in trying to determine how much you are going to sell your product for. If you have worked as a cook or in a shop and made \$80 a week, this can be used as the value of your time.

Culture and Business

One reason that many small businesses fail is the conflict between cultural demands and business efficiency. To be sensitive to the local culture, it often seems to be necessary to do things like:

- give away money or products from the business to meet cultural and church obligations, and
- give credit to people who will never pay you back!

Below is a list of suggestions to help your nursery business be profitable and culturally sensitive:

- I. Train your family to see the business as something separate from you.
- II. Be aware of what you are giving away. Keep records of everything you give away on credit or otherwise and to whom.
- III. Do not live out of the cash box. Pay yourself a wage. Do everything you can to help yourself see the business as a separate entity. Think of it as **the** business, not **my** business.
- IV. Avoid being elected or appointed to too many committees. This often happens to business people and can be a drain on time, energy and resources. You are expected to be a big donor to every local project.
- V. Take your culture into account in all your planning. Budget your donations and plant some extra – include them in your personal financial plans and do not exceed your budget. Avoid giving away very poor plants as this can cause trouble and is poor advertising.
- VI. Find alternatives to giving credit to non-creditworthy people. Use barter. Instead of giving credit, exchange your products for goods or for work.
- VII. Consult successful local business people and learn from their ways of overcoming cultural barriers to ensure business success.

Setting prices

There are two main ways to set prices.

- I. Calculate how much your product costs to produce your product.

These costs must include:

- Estimate how much time it takes to produce your product
- Calculate the cost of the raw materials needed to make one product.

	How many	Cost/tray
Materials		
Plastic tray	1 x 50 cell	\$2.60
Seeds	1 packet Known You seeds var. Blue Star contains seed for approximately 24 trays of seedlings @ a cost of \$26/packet	\$1.08
Seed raising mix	1 kg Yates potting mix 1 kg composted pig manure	\$1.25 \$0.07
Total materials		\$5.00
Labour		
Mixing and sterilizing potting mix	½ man day for 50 trays @ \$18/man day	\$0.18
Filling and sowing trays	1 man day for 50 trays @ \$18/man day	\$0.36
Maintenance (watering, feeding)	6 weeks @ 30 mins per day for 50 trays x \$18/man day	\$0.95
Total Labour		\$1.49
Grand total		\$6.49

Pro-t margin

After you calculate your cost of production you need to add in a profit margin. This is the money you will earn for your effort. A reasonable profit margin can range from 25-100%.

Material + Labour + Profit Margin = Selling Price

350 + 80 + 194 = 624

You must make sure that your seedlings are not so expensive that no one will buy them. We will use 75% as our profit margin.

Selling price can be calculated using the following formula:

You must add on a profit to the end of this cost, which is what you will be getting after you have allowed for all your costs.

- II. Check how much other people are selling similar seedlings for. Your prices need to be similar to other businesses and lower if possible. If you do decide to charge more than other businesses, you will need to be sure that you are going to do a better job at meeting your customers' needs. Remember the lower your price, the more you will be able to sell.

It is very important to estimate how much time and money you will spend on selling your product. This helps to determine the selling price and understand other businesses' selling prices. For example, a nursery owner who sells seedlings from his own home might sell a 50 cell tray for \$14. This nursery owner spends very little time and money in trying to sell these seedlings. However, a nursery owner who sells his seedlings at a local market place may sell the same tray for \$18. This nursery owner has to pay for transport to the market, as well as stall space and may spend the whole day waiting for a customer to buy his product.

Taking orders, planning your work

In the nursery business it is best to have your customers place orders for their vegetable seedlings. Orders are a sort of agreement with your customers stating:

- Number and variety of seedlings to be grown
- Date seedlings are to be supplied
- Agreed price for seedlings
- Details of payment (deposit required) etc.

SEEDLING ORDER

Bula Agro Enterprises
Votualevu
Nadi

Order Number: 0100
Order Date: 22/11/2012

Deliver To:			
Mahen Kumar			
Bilalevu, Sigatoka			
Mob: 987-6542			
Delivery Method	Payment Terms	Required By Date	
Pick up from nursery	50% deposit on order	31/05/13	
	50% on collection		
Seedling Variety	Quantity	Unit Price	Amount
Eggplant var. long purple (50 cell tray)	25	\$10.00	\$250.00
Eggplant var. chahat (50 cell tray)	25	\$10.00	\$250.00
Approved By:		Subtotal	\$ 500.00
X _____	Farmer	Delivery Charges	5.00
		VAT (15%)	75.75
		Order Total	\$ 580.75
X _____			
Nursery Owner			

Once you have a confirmed order then you need to start planning out your work in the nursery. It is always better to plant more seedlings than the order says, just in case you have some problems such as poor germination. If you have an order for 20 trays of eggplant, you should plant 25 trays.

Dealing with customers

You can only succeed in your business if your products and services satisfy your customers. Looking after your existing customers is just as important as getting new customers. In the running of your business you must apply the "boomerang principle" to bring your existing customers back.

There are certain steps that you must take in order to make your business professional and keep your customers happy.

If you get an order you must take down the customer's phone number. If you realize that you will not be able to fill this order you need to call the customer and inform them of the situation and perhaps recommend someone else who can help. In this way you are still keeping the customer happy and they will return for more business.

It is important that you deal with your customers in the most business-like manner possible. Some golden rules that should be applied are:

- Always return phone calls;
- Be honest with your customers - once you get a bad name in this business it is very hard to recover;
- Take the time to explain any problems with your seedlings; and,
- Work with the customer to develop a relationship based on trust and good communication.

If your services or products are poor, no amount of smiling will make your business successful. You must plan to give a high quality product with excellent service and a smile every time.



Keeping Records

Good records will help you plan better. Recording orders, plantings, sales and conditions like problems and production times are all important. It is necessary to keep track of all the money spent related to the business i.e. fertilizer, seeds, trays, labour wages etc. Not only should these expenses be written down in an exercise book but all receipts related to these expenses should be kept in a folder. Proper records are necessary if you wish to apply for a loan from a bank. For a larger business, records are essential for making your tax returns and in paying no more tax than is required. Keeping good records is essential to avoid sleepless nights.

It is important to manage money related to your business separate from personal money. For this reason it is important to pay yourself out of the money you earn from sales. Wages you pay yourself need to be calculated as a business expense. The wages your business can pay you will depend on how much money the business is bringing in compared with other costs. The following tables provide an example of the way you might record your monthly expenses and sales records in a simple exercise book.

Expenses

Date	Particular	Cost \$
01/05/12	Return taxi fare to town to buy fertilizer and seeds	7.00
01/05/12	1 box foliar fertilizer	14.46
01/05/12	2 packets of tomato seed	16.50
02/05/12	Taxi to Ba market to sell seedlings	9.00
02/05/12	Stall fee at Ba market	4.50
06/05/12	1 load of river bank soil	50.00
09/05/12	50 seedling trays @ \$1.10/tray	55.00
16/05/12	Taxi to Ba market to sell seedlings	9.00
16/05/12	Stall fee at Ba market	4.50
31/05/12	Phone bill	33.00
31/05/12	Owners wages	200.00
Total expenses for May		402.96

Sales

Date	Particular	Sale amount	Receipt No.	Paid Y/N
02/05/12	40 large eggplant seedlings sold at Ba market	12.00	cash	Y
02/05/12	32 papaya seedlings sold at Ba market	16.00	cash	Y
08/05/12	4 trays tomato seedlings (50 cell) vr. Rising Sun #2	60.00	05	Y
10/05/12	350 papaya seedlings	175.00		N
16/05/12	25 large tomato seedlings and 40 large cabbage seedlings	19.50	cash	Y
16/05/12	4 x half tray eggplant seedlings (50 cell)	40.00	08	Y
Total sales for May		322.50		
Total amount received		147.50		

Invoices and Receipts

Invoices

Invoices are forms that are used to bill your customers and track what you have sold. As your nursery business grows it will become very important to know who has made payments and what payments are outstanding. Hopefully, you will have very few outstanding payments. If you are dealing with government or large businesses, the only way that they can pay you is if you provide a correct invoice.

CASH/INVOICE				05
Date <u>14/05/12</u>				
M <u>Avinesh Singh of Nukuloa, Ba</u>				
Bought of <u>Ram's Nursery</u>				
Qty	Description	Rate	Amount	
4	50 cell trays of tomato seedlings vr. Rising Sun #2	15	60	00
Total			60	00
Plus VAT				
Total Including VAT			60	00

Receipts

Receipts are used when cash enters the business for any reason. It is like making a deposit in your current account. Signed and dated receipts should also be received when money leaves the business for any reason, providing a record of payments. Receipts are a written record of money paid or received. All receipts should be signed and dated. The main reasons for receipts are:

- Cash sales
- Collection of accounts receivable
- Written record of payments made

Providing receipts to your customer after a sale is a very professional practice. It also provides another form of recording sales other than your exercise book. You will need all receipts and invoices if you are collecting VAT on sales and claiming back VAT on business expenses (See section on VAT).

A suitable receipt book with 100 duplicate receipts that allows you to keep records of your sales is available at most bookshops for a cost of around \$3.50. A receipt number can usually be found in the right hand corner of your receipts. This number is very useful in tracking sales and should be included in your records.

RECEIPT		03
	Date <u>14/05/12</u>	
Received from <u>Avinesh Singh of Nukuloa, Ba</u>		
The sum of <u>Sixty dollars only</u>		
Being for <u>4 trays of tomato seedlings (50 cell) vr. Rising Sun #2</u>		
\$ <u>60 -00</u>		
	Signature _____	

Do I need to register for VAT and Income Tax?

VAT

Value Added Tax (VAT) is a tax on spending, borne and paid by the final consumer of goods and services.

Any person conducting a 'taxable activity' needs to register for VAT. A taxable activity includes any activity conducted as a business, trade, profession, manufacture, vocation, association or club. If you want to know if a particular activity you are about to undertake will be VAT-able seek the Fiji Inland Revenue and Customs Authority's (FIRCA) free advice.

You must register if your total sales from the taxable activity will be more than \$100,000 in any 12-month period. Registration is only voluntary, if your total sales are expected to be below \$100,000.

Once a person is registered, he/she will be required to collect tax on behalf of the Fiji Government. This means that he/she must charge VAT at the rate of 15% on taxable supplies he makes by including it in the price of goods and services he provides and also account for the tax collected, in monthly or annual returns (VAT return). In doing so, he/she will be able to deduct from the tax to be paid to FIRCA (tax payable), the amount of tax he/she paid on purchases for the running of his/her business.

Registering for VAT is simple, -ll out the "Application for TIN Registration of Salary / Wage Earners / Sole Trader Businesses / LTA and Bank Account" form (IRS001) and submit it to the FIRCA office with your business license and a valid ID.

Income Tax

Any person providing goods or services for a fee regularly is required to register for income tax purposes. Registration is compulsory because it is required by law that business income be reported in income tax returns annually (section 44 Income Tax Act).

If your net business income is above \$15,600 you will be required to pay Income Tax. There are various tax rates for different levels of income – that is, tax payable is higher as income increases.

Tax tables are used to calculate the tax payable. The rates are: 7% for the (\$15,601 – \$22,000) bracket, 18% for the (\$22,001 – \$50,000) bracket and 20% for \$50,001 and above.

Registering for income tax is easy, just -ll out the form "Application for TIN Registration of Salary/Wage Earners/Sole Trader Businesses/LTA and Bank Account" form (IRS001) and submit it to the FIRCA office with your business license and a valid ID.

Is your business profitable?

Net Profit is the amount of money that is actually leftover after you deduct **all** of your expenses including your own wages. There is a simple formula that can be used to determine what your net profit is:

$$\text{Net profit} = \text{Total sales} \text{ less } \text{Expenses} \text{ less } \text{Labour}$$

(transport, seeds, trays etc.) (Owners wages or other labour)

To check the progress of your business, this math should be done every month using the numbers recorded in your exercise book. If the profit figure comes up negative then you did not make any money that month.

Remember: Your net profit is what you want to deposit in your business savings account.

May 2012 Monthly Income Statement		
	Sales	\$585.00
	Less Cost of Goods	\$103.85
	Gross Profit	\$481.15
	Expenses	
	Transport	\$20.00
	Telephone	\$33.00
	Owners wages	\$300.00
	Total Expenses	\$353.00
	Net Profit (Gross Profit – Total Expenses)	\$128.15

AUSAID/SPC SEEDLING ENTERPRISE DEVELOPMENT PROJECT -2010-2012)

Introduction

The initial project proposal for the 2010 Small and Micro Nursery Enterprise Development Project was prepared in conjunction with an assessment of rehabilitation activities following the January 2009 flood. This assessment and subsequent project proposal was undertaken by Koko Siga Fiji (KSF) on behalf of SPC and AusAID in August 2009.

The devastating floods that occurred in January 2009 and subsequent rehabilitation activities brought to light the vulnerability of Fijian farmers to this type of natural disaster and the limited capability of Government entities to respond quickly with appropriate assistance. The post-flood support offered by AusAID to supply seed and seedlings to affected farmers was a critical step to helping farmers rehabilitate their farms and begin to generate income relatively quickly. The distribution of locally available dry seed enabled farmers to plant new crops as soon as the land had dried out sufficiently for it to be prepared for planting. However, the time lag in having fresh vegetables available to households could have been significantly reduced if healthy seeds were available for distribution to farm households affected by the natural disaster. Furthermore, the ability to distribute seedlings to farmers in a timely fashion was severely undermined by a combination of three factors:

- The limited number of commercial nurseries producing high quality vegetable seedlings
- The damage caused to these nurseries and their seedling by the disaster
- Coordination difficulties faced by the Ministry of Agriculture.

A clear finding from KSF's post-disaster rehabilitation assessment (August 2009) was the need to develop the capacity of local fruit and vegetable seedling nurseries to better respond to similar natural disasters in the future.

Project Background

The '2010 Small and Micro Nursery Enterprise Development Project' had two primary objectives. Specifically:

- To increase the number and capacity of local seedling nurseries in Fiji to assist with crop recovery and rehabilitation following natural disasters; and
- To promote the use of seedlings for crop diversification by farmers in Fiji.

The Project had three principal outcomes:

- Establishment of new commercial small & micro seedling nursery enterprises throughout Fiji to supplement and eventually take over from government and donor operated nurseries;
- Building the local capacity to setup, manage and operate demand-driven, area-specific seedling nurseries in Fiji; and
- Introduction and supply of new high quality, high value fruit and vegetable seedlings to local farming communities in Fiji.

The AusAID funded project was managed by SPC utilising technical expertise from KSF and Bula Agro Enterprises.

Activities completed

Activity 1: Technical analysis of fruit and vegetable seedling production in Fiji and preparation of training materials

Activity 2: Training of Trainers

Activity 3: Promotion and awareness of advantages and disadvantages of seedlings vs. direct sowing

Activity 4: Technical training on seedling production (for farmers and prospective nursery enterprises)

Activity 5: An in-depth training for prospective nursery enterprises – Production and business/marketing skills training

Activity 6: Study tour for selected nurserymen

Activity 7: Disaster Mitigation

Activity 8: The co-financing of infrastructure capital for selected nurseries identified through training program

Activity 9: Follow-up with interested participants and ongoing mentoring of selected nurserymen

Project performance against objectives

Objective 1: To increase the number and capacity of local seedling nurseries in Fiji to assist with crop recovery and rehabilitation following natural disasters.

Objective 2: To promote the use of seedlings for crop diversification by rural farmers in Fiji.

Result 1: Project provided direct support to existing nursery enterprises and facilitated the establishment of new nursery enterprises in key geographic locations

A total of 450 farmers, nursery owners and prospective nursery owners participated in awareness workshops that highlighted the advantages and disadvantages of using seedlings raised in a nursery over other planting systems. A total of 30 nurseries around the country were supported through in-depth technical training and follow up mentoring. The provision of capital was targeted to 14 leading nursery enterprises and new nurseries in key geographic areas (Table 1).

Table 1: Nurseries receiving direct capital support under the project

Nursery owner	Location
Mr. Mun Sami	Tavua
Mr. Jai Ram Khelawan (FRIEND)	Rarawai flats, Ba Tuvu Hill, Lautoka
Mr. Prakash Chandra	Johnson Rd, Lautoka
Mr. Sant Kumar	Votualevu, Nadi
Mrs. Asha Devi	Carreras Rd, Nadi
Mr. Yashwant Kumar	Lawai, Sigatoka
Mr. Shakil Kumar	Vakabalea, Navua
Ms. Sesenieli Raturageci	Wailoku, Suva
Mr. Rajeshwer Kumar	Lakena, Nausori
Mrs. Saini Maram	Dawasamu, Tailevu North
Mrs. Shakunta Devi	Nabekavu, Labasa
Mrs. Nirmala Shama	Vunicuicui, Labasa
Tutu Rural Training Centre	Taveuni

The improved geographical distribution coupled with technical training resulted in an improved ability to provide seedlings for rehabilitation efforts in a timely and efficient manner.

Measurable outcome: Following the March 2012 floods, Nature's Way Cooperative (NWC) contracted nine (9) private nursery enterprises to supply papaya and eggplant seedlings to support farm rehabilitation for its members under the NWC Disaster Rehabilitation and Preparedness Program. The contracted nurseries all participated in the 2010 Small and Micro Nursery Enterprise Development project and were located in the Western Division of Viti Levu near the target farmers. A total of 14,300 papaya seedlings and 16,000 eggplant seedlings were provided by the contracted nurseries.



Participants of a technical training on vegetable seedling production.



A model 'mini' nursery site established in Votualevu, Nadi.

Result 2: 'Disaster resilient' nursery design and construction methods

Employing 'build back better' principles, the project worked with experienced nursery owners to develop construction methods, better equipped to deal with strong winds and flooding (associated with natural disasters).

Key design approaches were:

- **Design for disassembly:** nursery structures were designed to allow for easy disassembly, in the event of a severe storm event
- **Structural design to minimise wind loading:** nurseries were designed to undergo 'controlled collapse' in extreme wind events to allow easy and low-cost reconstruction; structural form of the nurseries is designed to minimise wind loading in extreme events

Measurable outcome: Immediately prior to Tropical Cyclone Evan (2012), five of the supported nurseries in the heavily impacted Sigatoka-Rakiraki corridor and the one (1) nursery in Taveuni were disassembled and all seedlings were relocated inside the nursery owners house or to disaster mitigation containers. Following the cyclone the nurseries were quickly reconstructed at little to no financial cost and saved seedlings returned to the nursery structures.

Result 3: Use of Disaster Mitigation Containers to Protect Seedlings in a Disaster



Bula Agro Nursery owner Sant Kumar stands in front of his disassembled nursery post-cyclone Evan. This Nadi nursery was reconstructed within two days after the cyclone.



Sigatoka nursery owner Yeshwant Kumar points to his disassembled nursery which has already been refilled with the 4,100 fruit trees that were saved from TC Evan.



Papaya seedlings rest safely inside this nursery owners house after the nursery was disassembled in anticipation of TC Evan.



British American Tobacco nursery in Nadi suffered significant damage to the plastic covering and steel frames as a result of TC Evan. Clearly, 'disaster resilient' nursery design practices need to be incorporated into any agribusiness operating in cyclone prone countries such as Fiji.

A pilot concept was introduced in the 2010 Small and Micro Nursery Enterprise Development project which involved the distribution of six (6) custom 20 ft. shipping containers to selected nursery enterprises around the country. The disaster mitigation containers were out-fitted with special steel racks which allows the nurseryman to stack seedlings inside the container prior to a natural disaster. The theory was that the seedlings stored inside the disaster mitigation container could withstand the effects of a cyclone or flooding and could be quickly distributed to reduce recovery time post-natural disasters. The six (6) nurseries that received the pilot disaster mitigation containers were chosen based on the following criteria: the nurseries were strategically placed in target fruit and vegetable production areas and the nurseries were active in producing and supplying fruit and vegetable seedlings.

Measurable outcome: Four (4) of the distributed containers were utilised in Tropical Cyclone Evan (2012), as per Table 2 below. The use of these disaster mitigation containers led to 49,150 seedlings being saved. These saved seedlings were sold to farmers or used on the nursery owners' own farms.

Table 2: Disaster mitigation Container-ipients under the Micro-Nurseries Project

Nursery owner	Location	Summary of seedlings saved	Total seedlings saved
Sant Kumar	Nadi	10,000 eggplant seedlings 8,000 tomato seedlings 7,000 chili seedlings 2,000 zucchini seedlings 2,000 spring onion seedlings	29,000 seedlings
Yeshwant	Sigatoka	600 grafted citrus trees 3000 citrus rootstock 500 assorted fruit trees	4,100 fruit trees
Tutu	Taveuni	1000 English Cabbage seedlings 1000 Chinese Cabbage seedlings 750 Tomato seedlings 500 papaya seedlings 2000 yaqona plants 100 Yasi plants	5,350 seedlings
Mun Sami	Tavua	4,000 tomato seedlings 4,000 eggplant seedlings 2,500 chili seedlings 200 papaya seedlings	10,700 seedlings
TOTAL			49,150 seedlings



Staff of Bula Agro nursery in Nadi unload the nearly 29,000 vegetable seedlings that were saved because of disaster mitigation strategies put in place.



Over 4,100 citrus seedlings were saved by the use of a disaster mitigation container at the fruit tree nursery of Yeshwant Kumar in Sigatoka.