

Atoll Food Futures

# Atoll Climate-Resilient Home Gardening Guide



Exploring climate-resilient home gardening  
technologies for atoll communities

*June 2025 – Prepared by Live & Learn Environmental Education*

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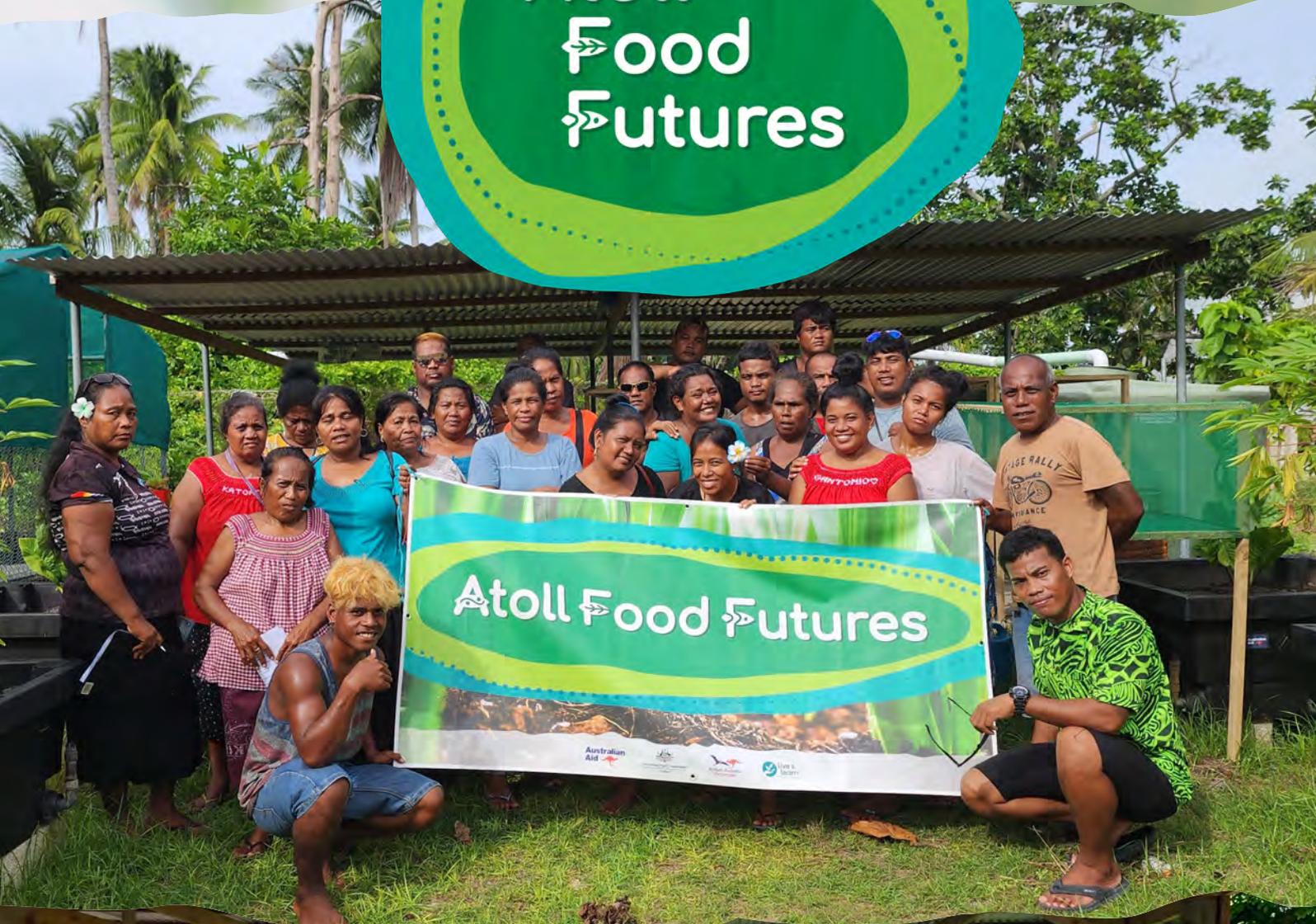
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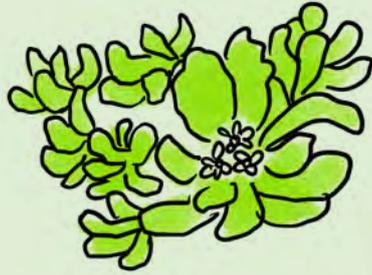


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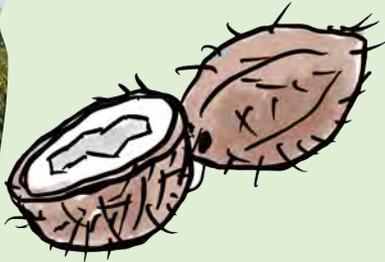
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# Atoll Food Futures

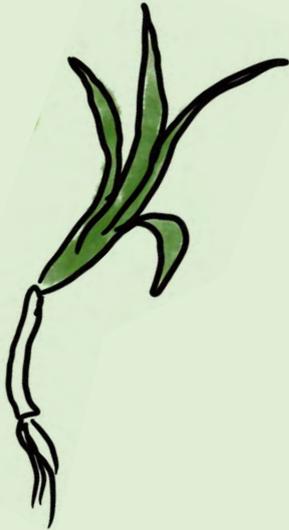




# Introduction



The *Atoll Climate-Resilient Home Gardening Guide* has been developed to complement face-to-face training on the use of climate resilient home gardening technologies. The information within the *Atoll Climate-Resilient Home Gardening Guide* has been taken from the Kiribati and Tuvalu Atoll Food Futures program. It was written for community members familiar with gardening, who will also be receiving instruction by a trainer who can provide additional information and demonstrations.



The climate-resilient agriculture principles outlined in this guide are developed for atoll environments by strengthening soil health and water conservation practices. These technologies are different to regular gardens because you can plant vegetables closer together and grow a lot more with a small amount of space.



Using the technologies in this guide will help you produce as much fresh healthy food as possible, helping to improve your household food security and increase your resilience to climate change. By using the information in this guide, watching carefully, and sharing your experience with other families who are also growing produce, you will build the knowledge and experience to grow an abundance of fresh, delicious and nutritious vegetables.



*Consult your local agriculture extension worker or Live & Learn staff for more information on home gardening.*



# PART 1



This chapter discusses different types of garden beds that you can use in your home or community, including:



## foodcubes



## wicking gardens



## raised garden beds



## dig-in garden beds



## container beds

Most of the technologies featured in this chapter can be made using simple materials that you already have access to.

Climate resilient gardens can help you grow crops in any conditions, so that you can eat fresh and nutritious food all year long.



# Technology benefits

## Foodcubes

Foodcubes are an advanced wicking-bed design made from 80% recycled food-grade plastic by Biofilta International. This makes them light-weight to transport and movable once in use. They are water efficient by enabling plants to draw water from an adjustable reservoir under the soil via the soil cones.

Foodcubes are ideal for growing a variety of vegetables, especially leafy vegetables or vegetables that don't require a lot of space to grow. If utilised well, Foodcubes can grow up to 30kg of produce per year. Foodcubes can also be connected to one another to maximise on space in a community garden and can be raised for disability access.



# Wicking gardens

A wicking garden bed is a self-water garden bed made from a large container (or watertight tarpaulin) with no holes. This means that the water is retained within the garden bed unit. They are great for conserving water because water is stored underneath a layer of soil. This is known as a 'water reservoir' and when the reservoir is full water is drawn up from the bottom to the roots of the plants. Wicking beds work well in combination with Foodcubes because they provide more space for crops, including root vegetables, that need a lot of nutrients and more space than a Foodcube can provide.



# Raised garden beds

Raised garden beds can be made using a variety of materials. There are several options for raised garden bed design. Raised garden beds have twice the production rate of regular dig-in gardens, which improves food production. This is especially true in the wet season because water can drain through them and away, preventing overwatering. Raised garden beds also distance plant roots from saltwater intrusion. A raised garden bed is an ideal choice for anyone with mobility issues since they aren't low to the ground.



# Dig-in garden beds

A dig-in garden bed is constructed by digging a hole and filling the hole with compost (or organic material if following the layer recipe – see Part 2). This can either be round, square or rectangular shape, depending on the type of plants being grown in the bed. The depth of the bed also differs, based on the root systems of the plants that will be planted. The recommended depths of the dig-in bed are outlined in the table below:

PLANTS	DEPTH
<b>Cabbage, sweet potato</b>	½ ft / 15cm
<b>Capsicum, cucumber, eggplant, tomato, radish, long bean, boom, chaya, bele</b>	1 ft / 30cm
<b>Papaya</b>	2-3 ft / 60-90cm

Once the hole has been dug to its intended depth, spread a layer of coconut husk at the bottom of the hole. This will act as a sponge and soak up any water that travels past the plant roots. The coconut husk ‘stores’ water, allowing the roots to access this in times of drought. In Tuvalu, fill the hole using the Tuvalu quick composting method. In Kiribati, fill the hole using either the ACIAR compost recipe or the layer method. If using the Kiribati layer method, be sure to apply a thick layer of dark soil around the planting hole, especially the bottom of the hole where the roots will travel. This will separate the plant roots from the layer compost to protect them from burning while the compost is in the early stages of decomposing.



# Container beds

A container, bowl, plant pot or polybag can be used to grow plants with small root systems, such as lettuce, spinach and bok choy (cabbage). When selecting the container bed, it is important to ensure there is enough space for black soil, compost and mulch. If planting into an old tyre or a drum that has been cut in half, capsicums, tomatoes and eggplants are suitable for this size of bed.





# Materials, construction and use

Think about location before building your garden. While many of these designs don't need much space, they should be placed in a sheltered area to reduce direct sunlight, excessive heat (especially between 9am and 3pm), strong winds and heavy rain.

You can provide shade from the afternoon sun by placing your garden by the side of a building and/or under trees. If the materials are available, you can construct a canopy over your garden using shade cloth.

## Foodcube

### Materials

All pieces for basic Foodcube construction are provided. Remove all pieces from the inside of the tub, making sure everything is there.

# Foodcube

## Construction

### LEVEL SETTER ASSEMBLY:



- 1 Place level setter seal over level setter outlet and push against the end flange.



- 2 Push level setter into outlet with a twist, until the second O ring is no longer visible. Lubricate O rings if needed.



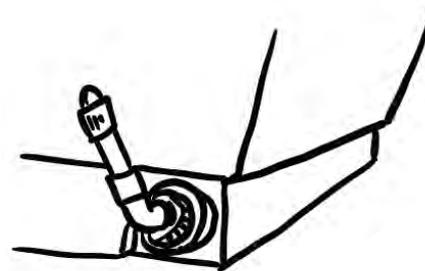
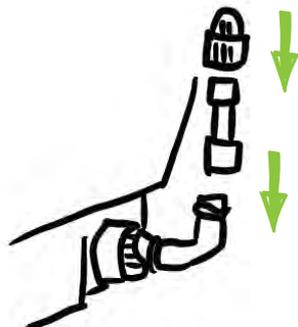
- 3 Insert level setter, outlet and seal from the inside of the tub until the thread is fully visible. Straight edges must align.



- 4 Slide circlip down groove at end of thread to stop outlet from sliding back into the tub.

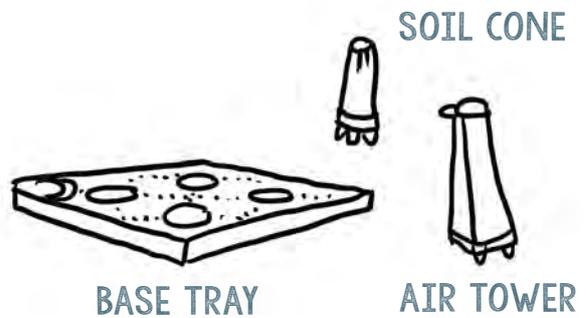
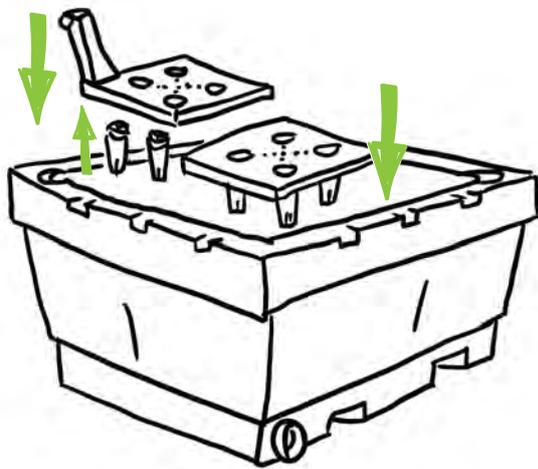
- 5 Slide backnut over level setter and tighten until it reaches the tub. This needs to be very tight.

If you are not joining multiple Foodcubes, repeat steps 1 to 5 on the other side of the Foodcube.



- 6 Screw the level setter extensions and mosquito cap into level setter to provide level height as shown.

## TRAY SET-UP:



**7** Attach each air tower to the two base trays with tower connections.

**8** Attach soil cones to bottom of the four trays. Place trays in bottom of tub.

**9** Hook tops of air towers into slots at corners of tub.

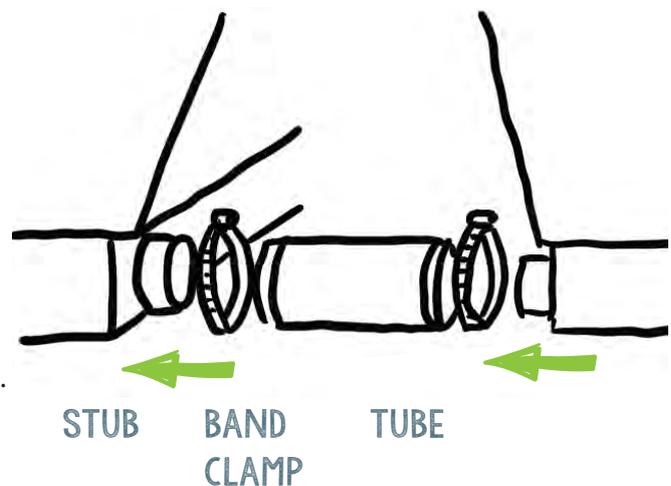
## MULTIPLE TUB CONNECTION (OPTIONAL):

**10** Place tubs close together with outlet stubs facing each other. (Level setter must remain on end tub.)

**11** Place band clamps in grooves of connecting tube (but do not tighten yet).

**12** Slide connecting tube onto stubs on tubs.

**13** Tighten band clamps.



# Foodcube

## How to use

1 Ensure the cubes are on a firm, level surface. The foodcube must be placed on a flat surface to ensure the water is evenly distributed throughout the reservoir and is equally accessible to all plant roots.

2 Test seals by filling to maximum water level before adding the soil mix.

3 When beginning to fill the tub, push the soil mix into soil cones to ensure contact with water.

4 Cover the soil surface with newspaper (if available) and thick mulch (3-5cm) to minimise water loss. This could be any leaves (e.g., taro, banana), coconut husk or broken branches from trees.

5 Add water using the air tower vents at corners of tub.



## Maintenance

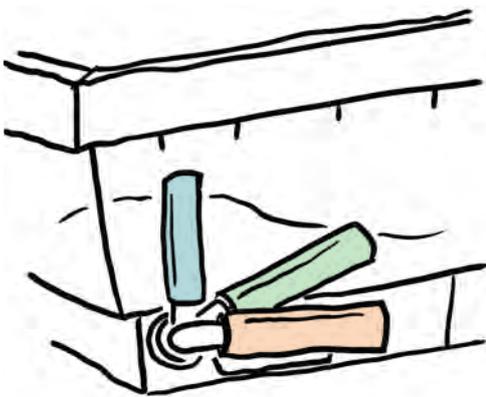
- It is recommended every 12 months to remove the soil and check for built up root mass in the cones.
- Trays and cones should be removed at this stage to remove any roots that may have found their way in the base.
- Refresh your soil by adding more nutrients from organic compost.
- We recommend shovelling and mixing fresh compost into the current compost in the foodcube. You may need to top up your soil after each harvest as volume is lost due to settlement and plant root mass.

# Watering

Foodcubes can be watered through the holes at the top corner of the foodcube known as the 'aeration cones'. This is a handy way to adjust the amount of water needed in the Foodcube.

## Level setter

- Use the level setter to control the water height.
- Use the *Saturated* setting to saturate the soil for seedlings.
- Use *Everyday* setting to create air gap between water and soil and to avoid root rot for mature plants.
- Check water level by checking level setter. Water should be visible inside the handle when set at the appropriate level.
- Tilt level setter downwards below horizontal to drain tub.



The Foodcube allows full control of the water height within the soil medium by swivelling the level setter from Saturated to Drain positions.

**Saturated:** Use this to super saturate the soil when seedlings are first planted or to safeguard against extreme heat conditions. Do not leave the in this position for extended periods of time as root rot could form. Upon planting seedlings, you may still need to water the soil surface until the roots can reach the saturated water level.

**Everyday level:** The normal setting position which allows the water reservoir to fill and create an air gap between water and soil. This is the recommended setting for everyday use. Check the water level every few days by turning the level setter downward. The point where water comes out indicates how full the reservoir is. If no water comes out, then turn the level setter back to the everyday level. Using the air vents at the corner of the foodcube, fill up the reservoir until water begins coming out of the level setter.

**Drain:** Use this setting to flush water from the reservoir or before moving the foodcube. Most of the water reservoir will be emptied in this position.

# Wicking garden

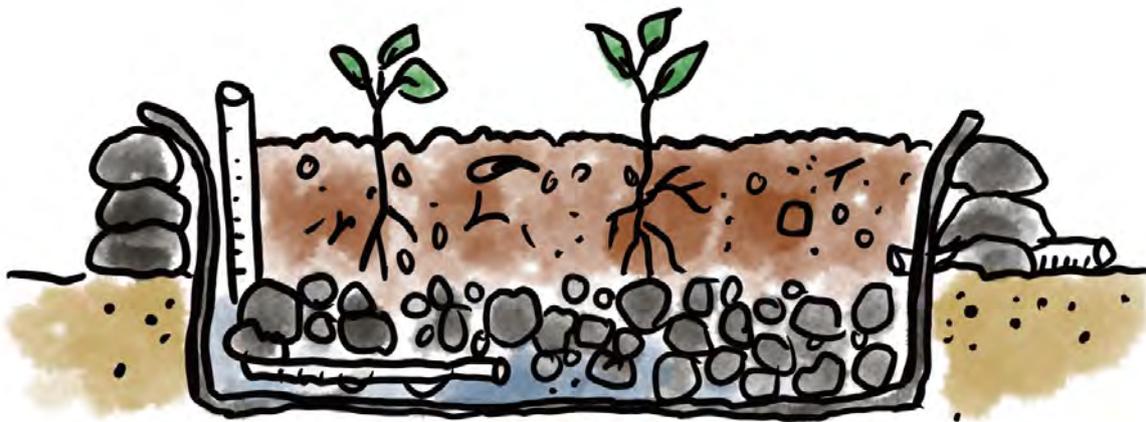
## Materials

- A large watertight tarpaulin to line the garden bed. A container could be used if this is not available e.g. a plastic tub.
- Something for the bottom of the container that will make space for water and hold the fill up on top of it, e.g. small rocks or coconut husk.
- Nursery mesh to separate the soil and the reservoir created by the rocks (needs to be close weave mesh to avoid soil coming into the reservoir).
- Plastic pipes or tubes: one the same height as the container and the other 20 to 30cm long.
- Materials for the walls of wicking system – fascia board, coconut husk or something similar.
- Soil (See Part 2: Soil).
- Mulch: You'll need enough mulch on top of the soil that reaches the depth of a hand (from the tip of your fingers to your wrist).

## Construction

- 1** Dig a hole for your wicking bed; dimensions should be 15cm deep and no wider than 1m (to allow access to the middle of the bed). Length should be around 2m for the wicking process to work best.
- 2** The first layer in your watertight container/tarpaulin will be the item you choose to make space for water and support the soil on top of it (e.g. small rocks or coconut husk). This layer should be 15cm deep. It will become the water reservoir.
- 3** Take your first plastic tube and place it in vertically so that it is almost touching the bottom and sticking out at least 40cm above the top.
- 4** Cover with a layer of nursery mesh (you will need to make a hole for the plastic tube).
- 5** Lay your second pipe horizontally on top of the mesh, fascia board, coconut husk or something similar, with part inside the bed and part sticking out.
- 6** Build up the sides of your wicking bed with coconut logs, rocks or similar.
- 7** Add your soil mix and cover with a final layer of mulch. Do not cover over the top of the plastic tube.





## Watering and use

The vertical pipe sticking out the top of the container is the watering pipe. Pour water into this pipe so that it fills the well in the bottom. You will know when it is full because water will come out of the overflow pipe. Thanks to this pipe your wicking bed can never be overwatered, even when it rains.

When you have planted your vegetables in the wicking garden bed, give them a quick water on top to help them get started. After planting, only water your garden using the top pipe. The moisture will be evenly divided at the base for the roots to accessing water as they need it.

After two years of use, remove all the contents and start again. This way you can replace any parts that have broken or rotten, as well as improve the soil quality. For continued use of your wicking garden bed replace or top up the soil after harvesting.



*Alternative wicking garden designs are available. To learn more consult Live & Learn staff or your local agriculture extension officer.*

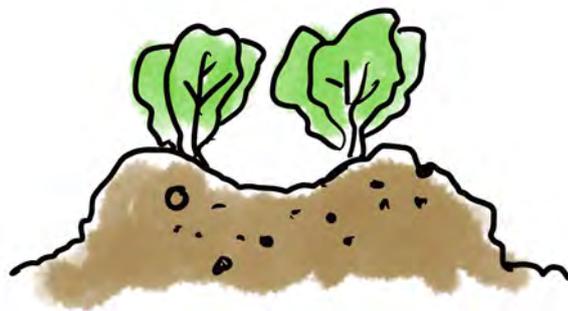
# Raised garden bed

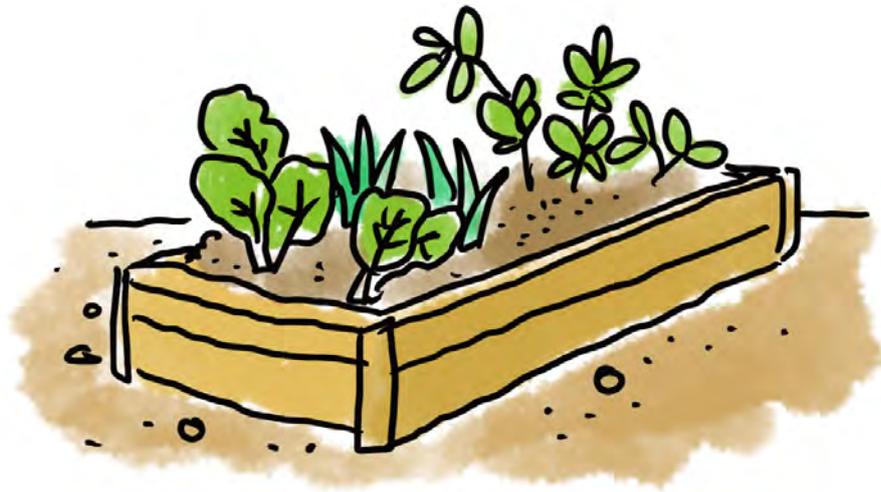
## Materials

- Edge materials: The boarder/edge of your raised garden bed can be made of whatever material you have available, e.g. rocks, wood, coconut logs. (A raised garden bed can be made without edging materials, but after a while the soil will be washed out of the bed.)
- Soil mix (See *Part 2: Soil*).

## Construction

- 1 Using the edge materials, create your raised garden bed boundary. Your raised garden beds will need to be small enough so that you can reach all your cops without stepping on them, but wide enough to be able to retain water. A good size to follow is 2m by 1m, and 40 to 50cm high.
- 2 Add soil mix.





## Watering and use

To tell if your raised garden bed needs water there is one simple test you can do. Simply stick your finger into the soil (roughly three centimetres deep). If the soil is damp and sticks to your finger after you remove it, there is no need to water. If the soil is not moist or doesn't stick to your finger, it's time to water.



# PART 2



# Soil

In atolls, a lot of the soil is too sandy or made from too much broken down coral to give the right nutrients needed for plants to grow well. Likewise, soil that has been regularly covered by waves and saltwater is not great for growing most types of crops, due to high salinity, which stunts plant growth and sometimes prevents it altogether.

Sandy soils generally have low fertility and a low water-holding capacity. Due to the sandy soil being unable to support an abundance of plant life, the compost you produce will become the soil that is used in your garden. The compost you produce is very important, as this helps you grow healthy plants with nutritious fruit. This chapter will discuss how to support soil and plant health through the production of homemade organic compost and liquid fertiliser recipes.



## HOW CAN YOU TELL SOIL IS HEALTHY?

There are a few signs of healthy soil. Good soil absorbs moisture well and is moist but also lets water drain through when there is heavy rain. Dry or sandy soil will not hold water well.

Do not use soil from the ground to fill your garden beds; instead create a nutrient-rich compost for your plants to grow in. The layer compost recipe can be used in dig-in garden beds and raised garden beds, and the ACIAR and Quick compost recipes can be used in Foodcubes and wicking beds.

## Foodcube

Each individual Foodcube container needs to be filled with 330 litres (6 wheelbarrow loads) of soil.

Your Foodcube should be filled with:

- 70% compost = 4 wheelbarrow loads.
- 30% dried coconut husk (also called coir or cocopeat) = 2 wheelbarrow loads for further water retention.

Coir is rich in carbon, and is a useful addition to compost, helping to balance nitrogen-rich materials like green leaves and manure. Coir is the combination of coconut husk fibres and finely mulched coconut husk, which has a consistency like coffee powder.

If you don't have coconut coir, you will achieve the same result by using broken up coconut husk.



## Wicking gardens

Do not use soil from the ground to fill your wicking garden bed. Fill your wicking bed with:

- 70% compost
- 30% dry coconut husks.

The amount of soil required will be based on how big you choose to make your wicking garden bed.

## Raised and dig-in garden beds

Fill your raised and dig-in garden beds with:

- 80% compost.
- 20% coconut husk (spread at the bottom of the raised bed).

## Container bed

Fill your container/pot/or polybag with:

- 100% compost.

# Recipes

A high percentage of compost is needed for your garden. If your soil is rich in compost this will create a healthy environment for your plants to thrive in.

## LAYER COMPOST

The layer compost method was developed by Willie Tabuia (Technical Officer in the Kiribati Live & Learn office). This method is commonly practiced by AFF beneficiaries across Kiribati and has proved successful in providing essential nutrients to plants without undergoing a pre-decomposition period. The layers of green and brown materials provide sufficient oxygen to microbes without needing to turn and air the compost.

**Garden beds to be used in:** raised garden bed, dig-in garden bed

## MATERIALS

- |   |   |
|---|---|
|  coconut husk      |  brown leaves                                    |
|  soil from pig pen |  soil mixed with rusty tins                      |
|  green leaves      |  seaweed (wash in freshwater to remove the salt) |



## METHOD

Fill the garden bed with the following materials, in the order below:

Top of raised garden bed

1 shovel of brown leaves

6 shovels of soil from pig pen

3 shovels of seaweed

6 shovels of soil from pig pen

1 shovel of brown leaves

6 shovels of soil from pig pen

1 shovel of green leaves

6 shovels of soil from pig pen

2 shovels of coconut husk

6 shovels of soil from pig pen

3 shovels of seaweed

6 shovels of soil from pig pen

1 shovel of brown leaves

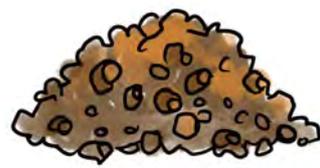
6 shovels of soil from pig pen

1 shovel of green leaves

6 shovels of soil from pig pen

2 shovels of coconut husk

Bottom of raised garden bed



It is important to ensure the bottom of the bed is lined with coconut husk for water retention, and that the top of the bed is spread with brown leaves (mulch) to retain soil moisture.

Once the layer ingredients are inside the garden bed, leave it for 2-3 weeks before planting.

When planting, it is important to line the planting hole with black soil or old compost. This will protect the seedling roots from burning while the nitrogen-rich materials are still raw.

It worth noting that the layer compost CANNOT be used in Foodcubes or wicking beds as this prevents the wicking system from working. The layer compost method is only to be used in dig-in garden beds and raised garden beds.



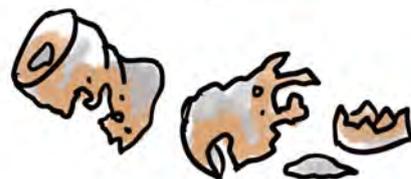
## ACIAR COMPOST RECIPE

This recipe was developed through the ACIAR Atoll Soil Health Project and is promoted by the Kiribati AFF team. This recipe can be used on all garden beds and can be used in the nursery as well.

**Garden beds to be used in:** Foodcube, wicking bed, raised garden bed, dig-in garden bed, container bed

### INGREDIENTS

- Brown material (e.g. fallen breadfruit leaves)
- Green material (e.g. green leaves, kitchen scraps, manure)
- Dark soil/old compost
- Ash
- Rusty tins



### METHOD:

- 1 Make a 25cm layer of brown material.
- 2 Add a 15cm layer of green material.
- 3 Add some dark soil and/or a sprinkle of old compost.
- 4 Lightly sprinkle some ash and rusty tins onto the pile to add micronutrients.
- 5 Water the layers so that they are damp, but do not overwater.
- 6 Repeat the layers until the pile is about 1m in height.
- 7 Put a tarpaulin or banana leaves over the pile to hold the heat and moisture within the pile. This will also protect the compost from rain or excessive heat.
- 8 The inside of the compost pile should heat up after 2-3 days. The inside temperature can be checked by inserting a knife inside the centre of the pile. The blade should feel hot to touch when it is removed.
- 9 Leave the pile to heat up for 1 week and then turn the pile every week for 8-10 weeks. The pile should then be a dark crumbly soil and should be moist when squeezed, but not wet.

*Always wash your hands with soap and water after working with compost!*

# QUICK COMPOST RECIPE

This recipe is promoted by the Tuvalu AFF team and can be used in all garden beds. The benefit of this recipe is it doesn't require time to decompose prior to planting into it and is suitable to be used in any garden bed. This compost can also be used in the nursery when propagating cuttings into polybags or containers. However, it may be too coarse to be used in seedling trays.

**Garden beds to be used in:** Foodcube, wicking bed, raised garden bed, dig-in garden bed, container bed

## MATERIALS

- 1 part pig manure
- 1 part decayed broken up coconut logs
- 1 part dark soil
- 1 part shredded organic material



## METHOD

Add all four materials into a pile and using a shovel, mix them evenly.

Once mixed, the compost can be used to fill any garden bed, which can then be immediately planted into.



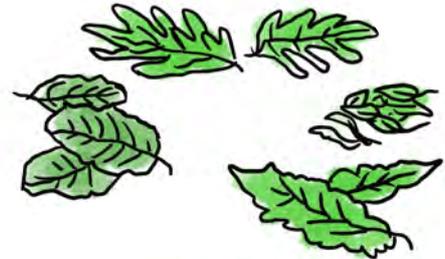
# COMPOST FOR FRUIT TREE PLANTINGS

RECIPE

Add layered materials to the planting holes of fruit trees, so that it decomposes slowly to improve soil structure over a long period of time.

## MATERIALS:

- coconut husk
- coconut log
- green leaves
- rusty can
- ash
- black soil
- brown leaves



## METHOD:

- 1 Dig a hole approximately 1m deep and 60cm wide.
- 2 Spread a thick layer of coconut husk at the bottom of the planting hole.
- 3 Mix the coconut log, green leaves, rusty cans, and ash together and add to the hole so that it fills approximately half of the hole.
- 4 Fill the rest of the hole with black soil or old compost.
- 5 Plant the fruit tree into the black soil and deeply water the planting area so that it seeps down into the organic material layers to activate decomposition.
- 6 Apply a thick layer of brown leaves to act as a mulch.



# LIQUID MANURE FERTILISER

← RECIPE

Liquid manure fertiliser can be applied to your garden if your plants aren't growing as well as you think they should be. This recipe is especially important to use if your soil mix is over three months old because it will put much needed nutrients back into your soil. You also need to add some liquid manure fertiliser if the leaves of your vegetables are yellowing. This recipe is used within the Tuvalu Atoll Food Futures program.

## MATERIALS

- Fresh poultry or pig manure
- Water
- 2 containers



## METHOD

- 1** Fill a quarter of the container with the manure and fill with water to the top of the container and cover.
- 2** Stir the mixture three times a day for two days, until the mixture turns a pale-yellow colour.
- 3** Pour the liquid into another container until it is a quarter full, then top it up with fresh water. The liquid is now diluted and ready to be applied to the soil and mulch around the plant.

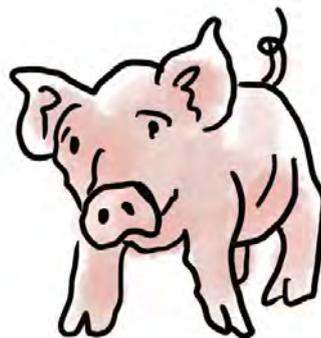
Always dilute liquid fertiliser before applying it to. You can apply it to the soil under the top layer of plants. About 1/2 litre per square metre of garden.

### Note:

You can use pig manure, but chicken manure has a lot of Nitrogen (N), phosphorous (P) and potassium (K).

Chicken Manure: N – 1.8%, P – 2.7%, K – 1.5%

Pig Manure: N – 0.3%, P – 0.4%, K – 0.2%



# KIRIBATI LIQUID FERTILISER

RECIPE

For improving yield, preventing yellow leaf wilt, and replenishing soil nutrients during the plant's key growth stages.

## Apparatus for liquid fertilizer:

- ▶ Large drum (44-gallon)
- ▶ Bucket
- ▶ Bottle (2 litre)



## INGREDIENTS:

- Green leaves
- Brown leaves
- Rusted tin
- Seaweed
- Animal manure (chicken or pig)
- Sea cucumber
- Leftover Foods (excluding meat or dairy)



## Measured materials for Liquid Fertilizer Preparation:

- ▶ If you are making the fertiliser in a drum (44 gallon): 1 rice bag (empty) filled of each ingredient
- ▶ If you are making the fertiliser in a bucket: 1 bowl of each ingredient
- ▶ If you are making the fertiliser in a 2-litre bottle: 1 coconut shell of each ingredient

## STEPS:

- 1** Pour all measured materials into bucket, kerosene drum, or 2-litre bottle. Add enough clean water to fully submerge the ingredients. Leave some space at the top to allow for fermentation gases.
- 2** Cover and stir the mixture once a week to speed up the decomposition and improve nutrient breakdown. After 4 weeks, the liquid fertilizer is ready to use.



# RAISING SEEDLINGS

## Materials to raise seedlings in:

- empty tins
- bowls
- seedling trays or plant pots



## MATERIALS:

Black soil and/or compost

## STEPS:

- 1 Combine all the pre-measured materials (coconut husk ash, old animal manure, soil from pigpen). Add enough water to moisten the materials, ensuring they are damp but not soaking wet.
- 2 Turn and mix the materials at least 3 times to ensure even moisture distribution.
- 3 Fill seedling trays, empty tins, bowls or any other available containers with the prepared growing medium.
- 4 Mark the spots where you will place the seeds to ensure proper spacing.
- 5 Place seeds inside the marked spots. Cover them lightly with a thin layer of soil.
- 6 Place the trays or containers in a shaded area, under a table, or in a location where direct sunlight cannot reach. Continue watering if the soil feels dry. The seeds should germinate within 3-5 days.
- 7 The seedlings can be transplanted into the garden once they have grown three true leaves (the mature leaves that follow the first set of leaves).



# MULCHING

Mulching is the process of covering the soil surface of a garden bed with materials like dry grass, leaves, sawdust or food peelings to protect the soil and retain moisture.

## What are the benefits of mulching?

- retains water and keeps crops cool during the dry season
- minimises weed growth
- prevents soil erosion by reducing the impact of rain on the soil surface and run-off
- improves soil fertility and structure
- increases crop yield
- saves water by reducing water lost by evaporation
- contributes to biodiversity
- makes soil healthier



## Types of mulch:

- ▶ Organic mulches: Common ingredients include dry grass, leaves, sawdust, brown cardboard and crop byproducts such as banana leaves and coconut husks.
- ▶ Artificial mulches: Examples include sand, stones, empty rice bags and gravel.

## MULCHING STEPS:

- 1 Gather your mulching materials into a pile near your crop.
- 2 Weed well before mulching.
- 3 Loosen the soil with a garden fork or rake.
- 4 Incorporate some compost/aged manure into the soil.
- 5 Water the soil so it is well-moistened before applying mulch.
- 6 Spread the mulch: Apply a 3–4-inch layer, depending on the material.
- 7 Keep away from plant stems to prevent collar rot and mould.
- 8 Water after mulching to help settle the mulch and soil.
- 9 Remove weeds periodically. Some weeds may still grow through the mulch.



# PART 3

Planting the right combination of vegetable seeds is essential to making the most out of your climate resilient food technology. Different combinations of plants have different benefits and by growing produce at the right time and in the right combination you can harvest all year long. This chapter will help guide you through different options for planting in each technology.

It is important to think about your household's food needs when choosing your vegetables. Planting a variety of vegetables from different food groups in your garden can give you the nutrients you need, for example: a bean, a dark green leafy vegetable and an orange vegetable like a sweet potato. Try unfamiliar varieties and see which grows best. If you are planning on selling your crops, you might also want to consider the market value of each item you are planting.

# Plant Lists

## Foodcubes

Although the cubes are small and they aren't very deep, you can grow a lot in them with the right combinations of plants. Here are a few things to consider when planting vegetables in your Foodcube:

- Different heights will allow better access to sunlight. Climbing plants like beans and cucumber can be trained to climb frames that you add to your Foodcube, making more space for other vegetables.
- Some plants spread out a lot under the soil (e.g. Taro Futuna), which means they have to be spaced out more and it don't make efficient use of the limited space. Other plants don't take up as much space (e.g. cabbage).
- Some plants prefer less sun – they can be shaded by others within the Foodcube.
- Some plants use more nutrients than others. We call these 'heavy feeders'. Some help make nutrients available for others. We call these 'heavy givers'. Others are somewhere in between (let's call them tweeners). We need to have a good mix of types of plants in the cube. We are trying to avoid too many heavy feeders (they also normally need more space!).
- Consider planting seedlings of the same vegetable 2 weeks apart – this will give you more produce for longer.



The following is a guide to plant types, with harvest timeframes based on raising from seed.  
If you are planting seedlings, reduce each time given by 2-3 weeks.

PLANT	TYPE/FAMILY	BELOW GROUND	HEIGHT	SPACING	TIME	SUN	WATER
<b>Spring onion</b>	Tweener/ Onion (Alliaceae)	Shallow	40cm	10 X 10cm	8 weeks	Full	Moderate
<b>Broccoli</b>	Heavy feeder/ Cabbage (Cruciferae)	15cm	40cm	40 X 30cm	8 weeks (remove head and it'll regrow)	Full	Moderate
<b>Chinese cabbage / bok choi / wong bok</b>	Tweener/ Cabbage (Cruciferae)	Shallow	30cm	15 X 20cm	8 weeks	Full	Moderate
<b>Kale</b>	Heavy feeder/ Cabbage (Cruciferae)	Moderate	40cm	40 X 30cm	8 weeks (remove some leaves and it will keep growing)	Full	Moderate
<b>Kumala (Sweet Potato)</b>	Tweener/ Morning glory (Convolvulaceae)	30cm	70cm	40 X 50cm	16 weeks	Full	Moderate
<b>Okra</b>	Tweener/ Mallow (Malvaceae)	Shallow	1m (sprawling)	20 X 30cm	12 weeks	full	Moderate
<b>Cucumber</b>	Heavy feeder/ Cucumber (Cucurbitaceae)	Shallow	70cm	30 X 30cm	8 weeks	Full	Moderate
<b>Bean / long bean / snap bean</b>	Heavy giver/ legume family	Shallow	1.0-2.0m	10 X 10cm	12 weeks	Half	Moderate



PLANT	TYPE/FAMILY	BELOW GROUND	HEIGHT	SPACING	TIME	SUN	WATER
<b>Wing bean</b>	Heavy giver/ Legume (Fabaceae)	shallow	1.0-1.2m	10 X 10cm	9 weeks	Half	Add additional water by hand
<b>Capsicum</b>	Heavy feeder/ Solanaceae (tomato)	15cm	60cm	20 X 30cm	10 weeks	Full	Add additional water by hand
<b>Eggplant</b>	Heavy feeder/ Nightshade (Solanaceae)	20cm	40cm	30 X 30cm	10 weeks	Full	Moderate
<b>Tomato</b>	Heavy feeder/ Nightshade (Solanaceae)	15cm	1.0m	40 X 40cm	10 weeks	Full	Moderate
<b>Ginger</b>	Light feeder/ Ginger (Zingiberaceae)	30-40cm	1.5+m	30X30cm	30 weeks	Shade	Avoid too much water
<b>Herbs (coriander, amaranth, mustard)</b>	Light feeder/ various	shallow	30+cm	10 X 10cm	4-6 weeks	Full	Add additional water by hand



# Wicking gardens

The following is a guide to plant species that are best suited for wicking garden beds, when used in combination with Foodcubes. These timeframes are based on raising from seed. If you are planting seedlings, reduce each time given by 2 to 3 weeks.

PLANT	TYPE/ FAMILY	BELOW GROUND	HEIGHT	SPACING	TIME	SUN	WATER
<b>Giant Taro (Alocasia)</b>	Heavy feeder/ Arum (Araceae)	Plant 30cm deep, needs 50cm+	1m+	1m X 1m	9-12 months	Partial	Moderate
<b>Taro Futuna (Xanthosoma)</b>	Heavy feeder/ Arum (Araceae)	Plant 30cm deep, needs 50cm+	1m+	1m X 1m	8-10 months	Partial	Moderate
<b>Taro Tonga (Colocasia)</b>	Heavy feeder/ Arum (Araceae)	Plant 30cm deep, needs 50cm+	1m+	60 X 60cm	8 months	Partial	Moderate
<b>Kumala</b>	Tweener/ Morning glory (Convolvulaceae)	30cm	70cm	40 X 50cm	16 weeks	Full	Moderate
<b>Cabbage</b>	Heavy feeder/ CabbageCruciferae)	Plant shallow, needs 30cm	Low	40 X 40cm	4 months	Partial	Moderate
<b>Melon</b>	Heavy feeder/ Cucumber (Cucurbitaceae)	Plant shallow, Needs 50cm+	Low	60 X 60cm	3-4 months	Full	High
<b>Pumpkin/ squash/ gourd</b>	Heavy feeder/ Cucumber (Cucurbitaceae)	Plant shallow, Needs 30cm+	Low	60 X 60cm	3-4 months	Full/ Partial	Moderate
<b>Bean</b>	Heavy giver/ Legume (Fabaceae)	Shallow	1.0m+	10 X 10cm	12 weeks	Half	Moderate
<b>Bele/Nambere</b>	Tweener/ (Malvaceae)	Plant 10cm, needs 1m	1m+	90 X 90cm	3-4 months	Full	Moderate



PLANT	TYPE/ FAMILY	BELOW GROUND	HEIGHT	SPACING	TIME	SUN	WATER
<b>Banana</b>	Heavy feeder/ Banana (Musaceae)	Plant 50cm, needs 80cm,	1m+	1m X 1m	10-12 months	Full/ Partial	Moderate
<b>Plantain</b>	Heavy feeder/ Banana (Musaceae)	Plant 30cm, needs 80cm	1m+	1m X 1m	14-20 months	Full/ Partial	Moderate
<b>Maize / corn</b>	Heavy feeder/ Grass (Poaceae)	Plant 10cm, needs 30cm	1m+	20 X 30cm	4-5 months	Full	Add additional water by hand
<b>Cassava</b>	Super heavy feeder/ Spurge (Euphorbiaceae)	Plant 10cm, needs 50cm+	1m+	60 X 60cm	8 months	Full	Low
<b>Fruit trees*</b>	Tweener/various	varies	1m+	varies			High

*\*Some fruit trees can grow too big for the beds in this guide. Use dwarf varieties or make sure your bed is big enough. Keep topping up with compost and fertiliser if you have plants that last more than two or three years in the bed.*



# Raised garden beds

Raised garden beds are slightly different to other forms of climate resilience technology because they can rely on a mix of heavy and light feeders. The recommended ratio is:

- 30% heavy feeder.
- 30% tweener.
- 30% heavy giver.
- 10% either tweener or heavy giver.

Plants from either of the tables above can be used in your raised garden bed.





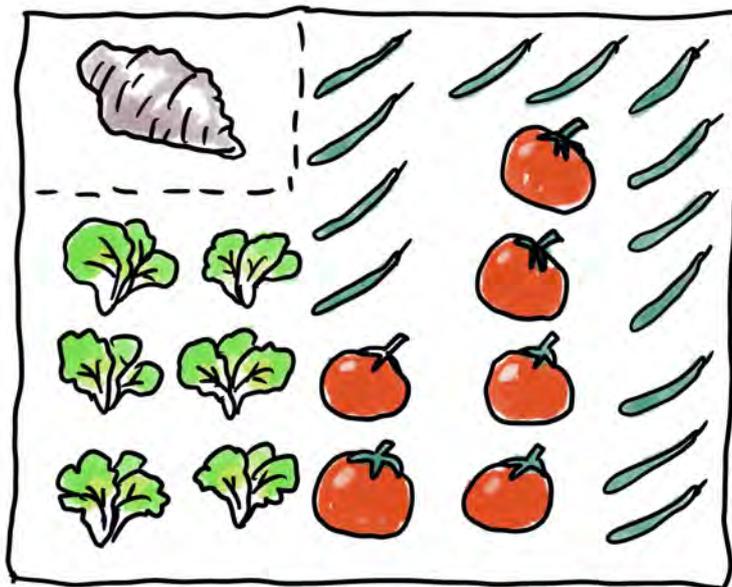
# Arranging the plants

The following arrangements were designed for Foodcubes but can be applied to other climate resilience technologies. Use them as inspiration for your own gardening style!

It is recommended to have a good mix of plant families in your garden so that you can grow and eat a diverse range of vegetables. Planting a variety of crop species which are compatible next to one another is referred to as companion planting. Companion planting allows you to grow more food out of the nutrients available in the soil and is a great method to prevent pest and disease pressure. These can be arranged in a few ways, according to the space each vegetable needs, to maximise the amount of vegetables a cube can produce. Planting a variety of crop species which are compatible growing next to one another is referred to as companion planting! Companion planting allows you to grow more food out of the nutrients available in the soil and is a great method to prevent pest and disease pressure. A few options have been developed for people new to Foodcubes or other raised garden bed planting technologies.

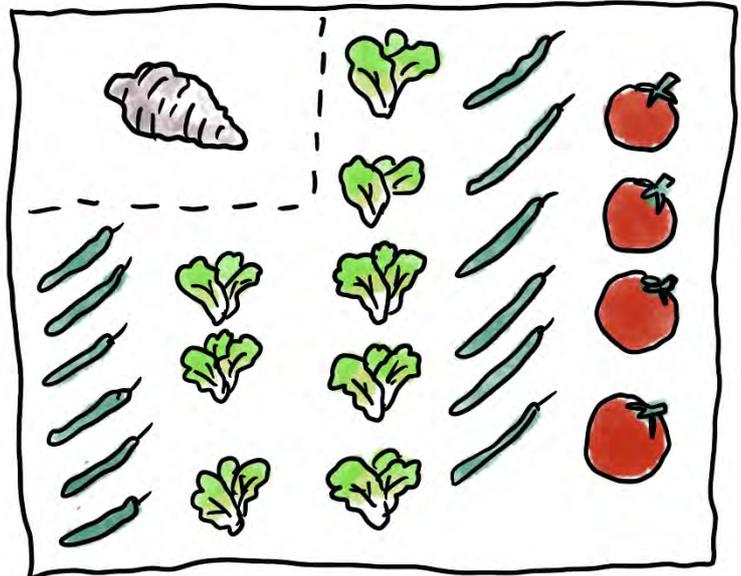
## OPTION 1: VEGGIE BOWL

- 1 kumala
- 13 beans (heavy givers)
- 6 heavy feeder (tomato, capsicum, eggplant or cucumber)
- 6 leafy tweener (e.g. Chinese cabbage)



## OPTION 2: LEAFY GREENS

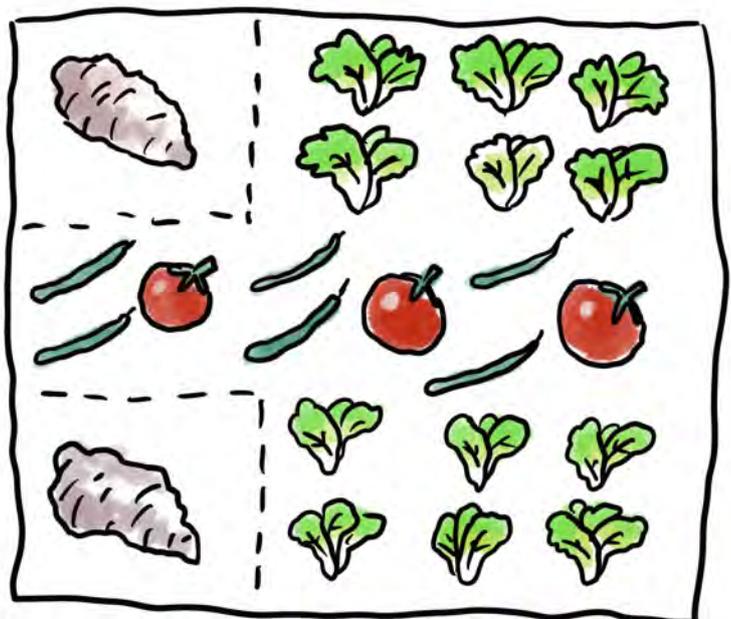
- 1 kumala
- 12 beans (heavy givers)
- 4 heavy feeders (tomato, capsicum, eggplant or cucumber)
- 8 leafy tweekers (e.g. Chinese cabbage)



## OPTION 3: ROOT RICH

This option has lots of root vegetables and 2 rows of taller vegetables that will need a climb frame.

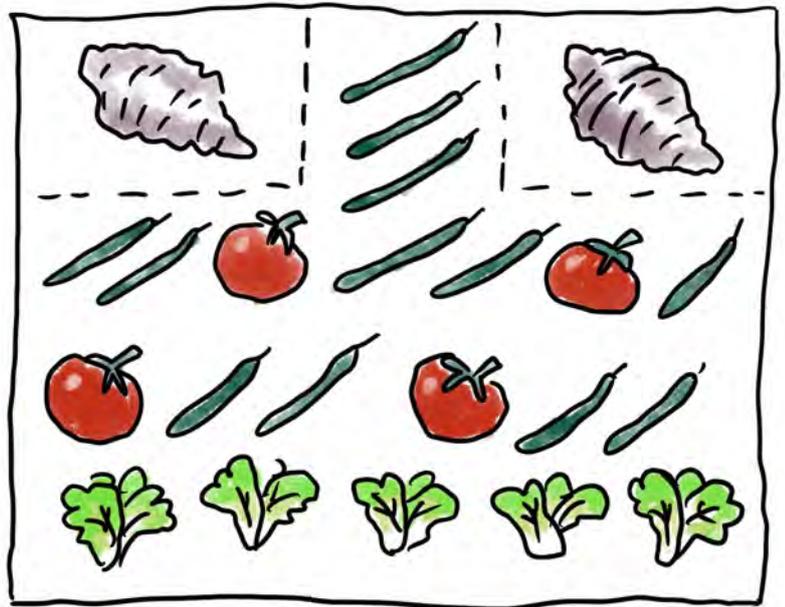
- 2 kumala
- 6 beans (heavy givers)
- 3 heavy feeders (tomato, capsicum, eggplant or cucumber)
- 12 leafy tweekers (e.g. Chinese cabbage)



## OPTION 4: ROOTS AND GREENS

This option has root veggies and 3 rows of taller veggies that will need a climb frame. It is similar to option 3, except the carrots have been replaced with more leafy greens. One of the rows of beans and heavy feeders could be replaced by an additional 5 leafy tweeners if more greens are desirable.

- 2 kumala
- 12 beans (heavy givers)
- 4 heavy feeders (tomato, capsicum, eggplant or cucumber)
- 5 leafy tweeners (e.g. Chinese cabbage)



## COMPANION PLANTING

If companion planting isn't followed, then planting one crop per foodcube is viable. However this requires following crop rotations to prevent pest and disease.



# Drip Irrigation

Drip irrigation efficiently delivers water directly to plants at slow flow rates. In atolls where rates of evaporation are high and access to clean water can be challenging, drip irrigation is an important technology to improve water efficiency and conserve water. This targeted watering approach ensures that plants are only being watered above the rootzone to avoid loss of water on unproductive soil. Bucket drip irrigation is a low-cost alternative to typical irrigation systems, requiring simple, affordable materials.

## Benefits of bucket drip irrigation:

- Conserves water through a targeted approach that only delivers water to the planting area.
- Liquid fertilizer can be applied using this system, reducing overall liquid fertilizer volumes through a targeted application approach.
- Reduces labour demands of daily watering and regular fertilizer applications. This reduces the time taken to water plants and eliminates the manual task of watering by hand.
- It is a low-cost system that is easy to install, understand, and maintain.

## Materials for one bucket irrigation system (one 2m x 1m plot):

- 1 bucket/container with a screw hole at the bottom of the vessel for a tap to screw in (this may come with a cap when purchasing)
- 1 tap with screw connector to screw into the bucket hole (measure the diameter of the bucket hole to ensure the tap fits)
- Fine mesh to use as water filter (at least 5cm<sup>2</sup>)
- 5m irrigation tubing with drip holes
- Tap adapter to connect tubing to tap (only necessary if drip tubing doesn't come with a connector)
- A platform for the bucket to sit at least 1m above ground – this could be a coconut tree stump, a stool, etc.



## INSTRUCTIONS:

- 1 If there is a cap covering the hole at the bottom of the bucket, remove the cap.
- 2 Once the cap has been removed, cut a square of fine mesh to the dimensions of 5cm x 5cm.
- 3 Using the tap, prepare to attach the tap to the bucket. First, wrap the mesh over the tap's main connection point and then tightly screw the tap onto the bucket, ensuring the mesh covers the hole between the bucket and the tap. Ensure the connection is tight to prevent leaks. The mesh will act as a filter to prevent any debris found in the water from entering the hose and blocking the dripper holes.
- 4 After installing the filter and tap to the bucket, connect the hose to the tap and ensure it is twisted tight to prevent leaks.
- 5 Locate where your bucket irrigation system will be situated. This will ideally be located in front of your garden bed so that the hose can run in a straight line along a row of plants. Once this location has been determined, perch the bucket on top of a stand that is a minimum of 1m tall to create adequate water pressure.
- 6 The tubing already has holes along the length of it, so ensure that your crops are planted next to the holes to ensure they are correctly placed to receive water. Avoid the hose exceeding 15m in length as this will reduce pressure and create an uneven distribution of water at either end of the hose. Avoid any folds or creases in the hose as this will block the flow of water to the plants. To prevent the hose from moving away from the plant during excessive wind, it is recommended to zig zag the hose between the plants.
- 7 Make a 180-degree bend in the tubing about 10 cm from the far end. Tie the tubing back to itself to hold the bend in place, this will stop water from running out of tubing.
- 8 Once the bucket irrigation is completely set up, it is time to begin trialling the volume of water required to support your plants. The correct volume of water applied can be tested by inserting your finger into the soil next to the plant to measure soil moisture. Seedlings require a soil moisture depth of 5cm, and mature plants require a soil moisture depth of 15cm. You may need to frequently adjust how much water to fill the bucket with until the plants are getting the correct amount of water. Once you've gotten this right, it may be helpful to mark the inside of the bucket with a permanent marker to identify where to fill the bucket to.

### Tips:

- Be sure to use clean water when irrigating your garden. The mesh will prevent debris from clogging the dripper holes; however, the system can clog easily if the cleanest water available is not used.
- Water plants when it is cooler in the morning and/or evening to reduce evaporation.
- To test whether you have sufficiently watered the garden, insert your finger into the soil around the plant to ensure the top 5-15cm of the soil is damp.

### Weekly Maintenance:

- Regularly inspect the filter. If the filter appears blocked, clean the mesh filter using clean water.
- Inspect dripper holes to ensure each hole is dripping water at a similar rate. This will ensure the plants are receiving equal amounts of water for uniform plant growth. If holes appear blocked, unfold the end of the drip tube and flush water through the tube to remove material.

# Pest Control

Natural pesticides are one way to manage pest problems. Natural pesticides should be a part of regular pest management but should only be used when necessary. Do not use natural pesticides if there are no pests and crops are not damaged.

Some natural pesticides are very strong and will kill all insects, both good and bad. Be careful, because most insects are not harmful to your crops and killing them can cause more problems in the future.

Hands are an excellent natural pesticide!  
Many pest problems can be controlled by  
regular observation and hand removal of pests.



# Natural pesticide recipes

## CHILLI PESTICIDE SPRAY

RECIPE

This recipe works against ants, caterpillars, aphids and mealy bugs. (This recipe was provided by Ela Vaipulu, Senior Agriculture Officer in Tonga.)

- 2 cups of chilli crushed in a bowl, mixed with 1 litre of water.
- Leave for 1 hr.
- Sieve the content and mix with another 1 litre of water and 2 tablespoons of dishwashing liquid.

This gives a diluted solution which can be sprayed generously onto infected plants. Ensure the spray is applied to both the top and underside of the leaves.

RECIPE

## TARO LEAF SPRAY

- Crush 10 taro leaves.
- Place into 3 litres of water and stir well.
- Spread onto plants using a palm broom.
- Make sure every plant is covered well with this liquid.

Taro leaves contain lissolic acid. When insects eat this it feels like eating broken glass! Most pests hate this spray, so it's good for general use.



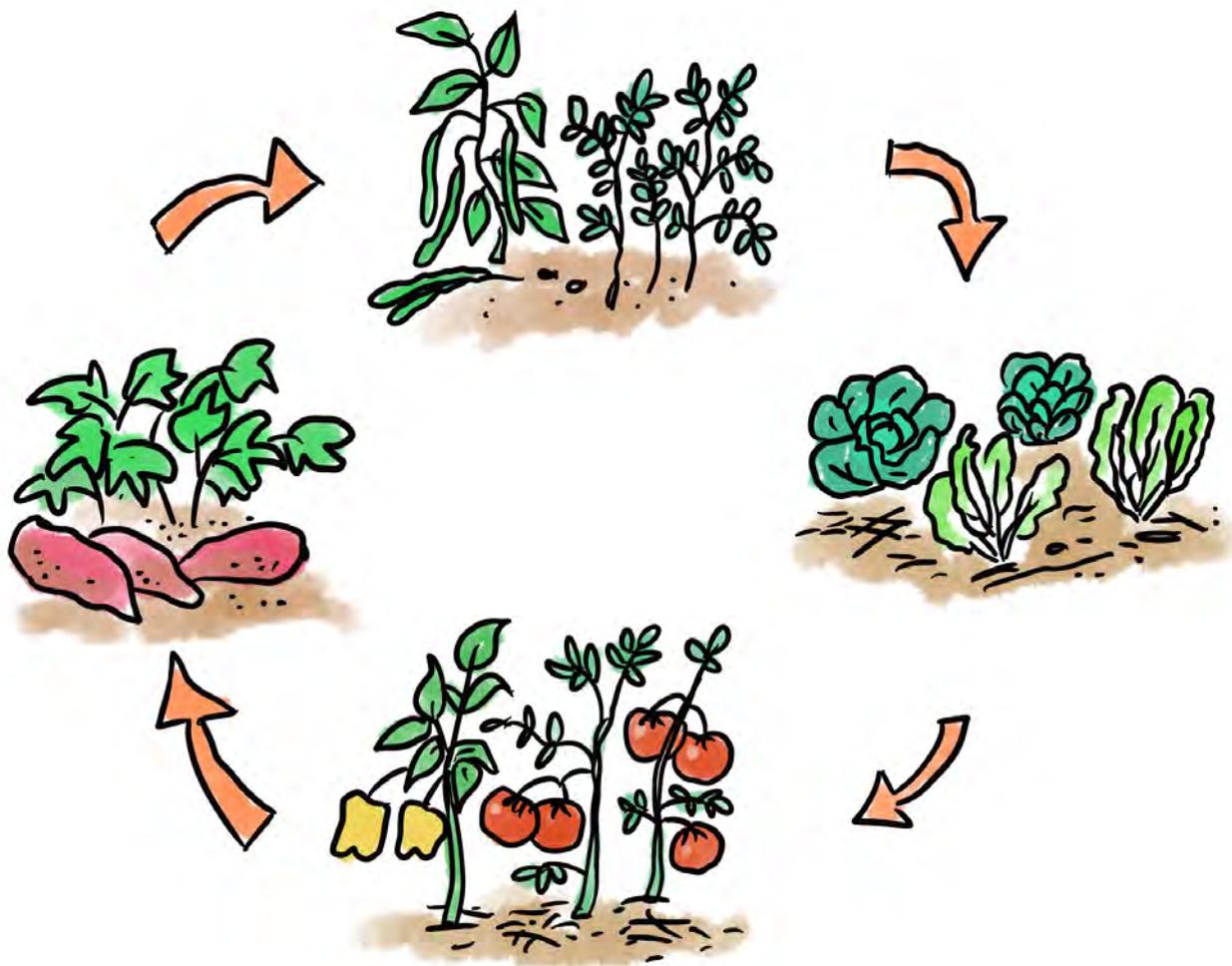
# Crop rotation

Crop rotation is an agricultural practice where different crops are planted in a specific sequence on the same land over several growing seasons.

## BENEFITS OF CROP ROTATION:

1. **Improves soil fertility:** By alternating crops with different nutrient needs, crop rotation helps maintain the overall fertility and structure of the soil.
2. **Pest and disease control:** Planting a crop from a different family in the next growing cycle disrupts the life cycle of pests and soil-borne diseases. Crops from the same family should not be planted in succession, as varieties from the same family are susceptible to the same pests and diseases. By changing crops regularly, harmful pests cannot easily establish themselves in one area.
3. **Enhances soil structure:** Prevents soil compaction and erosion by diversifying the plant roots and promoting soil aeration.
4. **Increases yield:** Long-term use of crop rotation leads to healthier soil, which in turn increases crop productivity over time.
5. **Sustainability:** It encourages ecological balance by reducing reliance on chemical inputs and promoting biodiversity.





A typical crop rotation cycle may look like this:

1. Plant a legume crop, such as snake beans.
2. Follow with a leafy crop, such as cabbage, spinach or lettuce.
3. Then plant a fruiting crop, such as tomatoes, cucumbers or eggplants.
4. Finish with a root crop, such as sweet potatoes, taro/pulaka or cassava.
5. Repeat the cycle: rotate these crops each season to maintain soil health and fertility.

#### Know your plant families:

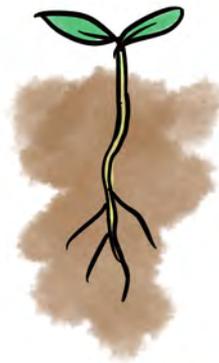
Crops from the same botanical family tend to share similar nutrient requirements and may attract similar pests. Understanding plant families can help you design a more effective crop rotation plan.

Family names are provided in the plant list tables in Part 3 of this guide.

# Plant Growth Stages:

First two leaves are **COTYLEDONS**  
– these are **not true leaves**

These are **true leaves**



## Sprout

This stage takes place in seedling trays within the nursery. Seeds are sown into compost or black topsoil.

**ACTION:** Ensure topsoil is moist but not too wet as this can cause fungal disease to spread.

## Germination

This stage occurs in the nursery – transplant into garden when 3-4 TRUE leaves have grown. Ensure layer compost has been decomposing for 1 week before transplanting. As roots develop, plants use nutrients in the soil to grow.

**ACTION:** Ensure topsoil stays moist.

## Vegetative

Nitrogen (which comes from green leaves and manure in layer compost) is important at the vegetative stage. This helps the plant when its energy is used for growing stems and leaves.

**ACTION:** Watch for yellowing of older leaves. If present, apply liquid fertilizer.



# Annual Crops



**Budding**

Flowers are beginning to develop which requires additional phosphorous (which comes from green leaves and manure in the compost) in the soil to support this.

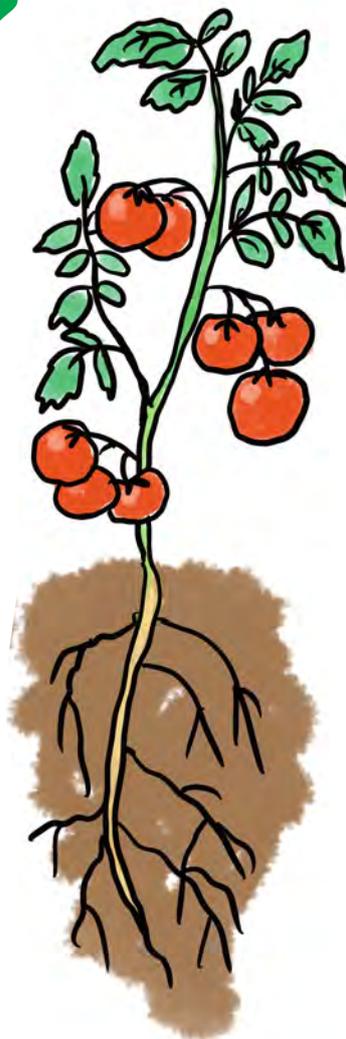
**ACTION:** Watch for purple colouration and drying of young leaves. Apply liquid fertilizer once a week from budding to fruit ripening.



**Flowering**

Potassium (which comes from seaweed and manure in layer compost) is essential for the development of healthy flowers and fruit.

**ACTION:** Watch for yellowing and drying on edges of older leaves. Continue applying liquid fertilizer once a week up until ripening.



**Vegetative**

As fruit reach full maturity and are ready for harvest, the plant no longer needs nutrients, only water.

**ACTION:** Stop weekly fertilising. Ensure plants are deep watered all the way to the roots.

# Propagation

Propagation is the reproduction of a parent plant to produce more plants. There are many methods for propagating plant material which ensure the offspring have the same characteristics as the parent plant. These methods are described below:

## VEGETATIVE PROPAGATION:

Vegetative propagation is where a stem or part of a plant is cut from the parent plant to produce a new, genetically identical plant. The following crops can be propagated through vegetative propagation: drumstick tree, ofenga, chilli, chaya, bele, spinach, tomato, cucumber, eggplant, peppers (capsicums), cabbage, sweet potato, lime, lemon and cassava.

## MATERIALS:

- Sharp knife
- Black topsoil or compost
- Water
- Bed filled with compost/empty tins/polybags/containers



### Steps to make cutting from drumstick, ofenga, chilli, chaya, bele, lime, lemon and cassava:

- Choose a semi-hardwood stem from a healthy, pest-and-disease-free plant that is actively growing.
- Remove excess leaves, keeping only a few at the top. Trim the stem to the desired length (4-6 inches/10-15 centimetres long).
- Plant the cuttings into a prepared bed filled with compost. Water lightly until new leaves appear.
- Or use an empty tin/polybag/container filled with a well-draining growing medium, keep in a shaded area until new leaves appear. Ensure the soil remains moist until new leaves appear.
- Once the cuttings have developed strong roots, carefully transplant them into a prepared bed filled with compost.

### Steps to make cutting from spinach, tomato, cucumber, eggplant, peppers (capsicums), sweet potato:

- Select a strong and healthy plant, cut a stem section with at least 3-4 nodes.
- Remove lower leaves, keeping only a few at the top. Plant the cutting directly into soil so that at least 2 nodes are buried. Regularly water the soil so that the topsoil remains moist.

### Steps to vegetatively propagate cabbages:

- Once the cabbage has been harvested, cut the base of the cabbage for propagation (the rest can be eaten).
- Use a glass of clean water or a shallow dish with water.
- Place the base of the cabbage in the water so that the cut where the head of the cabbage was, is facing up.
- Ensure the top of the cabbage stem is out of the water and only the bottom of the base is sitting in the water.
- Leave the dish in a bright location but out of direct sunlight.
- Change the water every few days to avoid root rot.
- After 1-2 weeks, rooting will have begun and can be transplanted into soil.



# Marcotting

Marcotting occurs when a plant branch is induced to grow roots while still attached to the parent plant. Breadfruit and papaya are fruit trees which can be propagated through marcotting.

## MATERIALS:

- Sharp knife
- Plastic bag or plastic wrap
- String
- Coconut stem (grated into smooth, small particles)
- Old compost
- Water

## PREPARATION OF ROOTING MEDIUM:

Combine old compost with grated coconut stem in a bowl then add enough water to the mixture so that it is moist.



### a) Steps to make breadfruit marcotting:

- Select a healthy, strong branch that has active growth from the breadfruit tree. The branch should be of a thickness where the plastic wrap can cover it comfortably.
- Use a sharp knife to remove a 3-finger-width ring of bark around the branch. The cut should be smooth and shallow.
- Place one to two handfuls of medium into the plastic, then wrap it around the cut section of the branch so that the medium covers it completely. Using the string, securely tie the plastic to the branch to hold the rooting medium in place.
- If the medium becomes dry, use a syringe to moisten it. Repeat doing that whenever the medium is dry.
- After 4-8 weeks, check the plastic wrapping for signs of root growth. You should see white or brown roots coming through the plastic.
- Once the roots have fully developed, cut the branch below the rooted section. Remove the plastic and plant the rooted branch into a prepared bed filled with compost.
- Ensure the plant is watered regularly until it establishes itself.

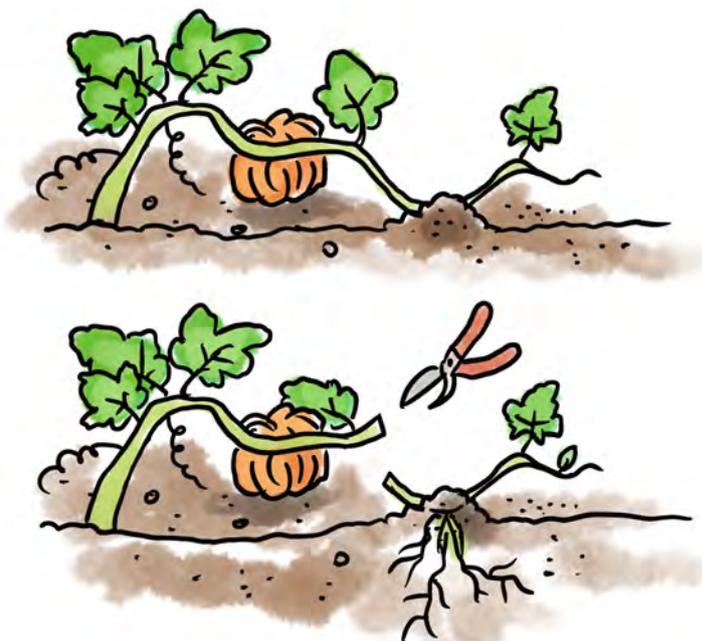
### b) Steps to make papaya marcotting:

- Choose a male papaya branch or stem with active growth; ensure the branch or stem is healthy and strong.
- Using a sharp knife, make a thin cut from the edge to the middle of the branch. (Be careful not to cut any further, to avoid breaking the branch.) To help with root formation, insert a thin object (e.g. a small stick) into the cut to prevent the wound from closing.
- Place one to two handfuls of medium into the plastic wrap or bag, then place on the cut section of the branch or stem and cover it thoroughly, Tie the plastic securely using string to hold the rooting medium in place. Ensure the medium is fully covered.
- If the medium becomes dry, use a syringe to moisten it.
- Check every 3-4 weeks for root development.
- Once you see strong roots, cut the branch or stem below the rooted area. Remove the plastic and plant the rooted papaya into a prepared bed filled with compost.
- Water the plant regularly until it establishes itself.

## Simple layering

This technique is an effective method for propagating pumpkin:

- Bend the stem to the ground.
- Cover part of it with soil, leaving the last 6-12 inches (15 to 30cm) exposed.
- Ensure the soil is kept moist for rooting to occur.
- After 3 weeks to 2 months, the soil-covered stem will grow roots.
- Cut this stem with the roots attached from the mother plant.
- Replant in desired location.



# Seed saving

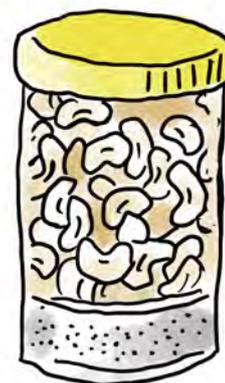
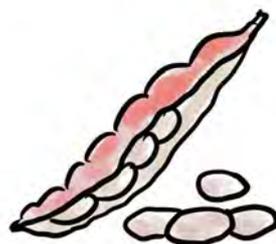
Seed saving is the practice of collecting seeds from fruits or plants, and storing them for future use. For the offspring to be the same as the parent plant, it is important that seed saving is only practiced on open pollinated plants. If the plant you wish to reproduce from is a hybrid plant, you should use the vegetative propagation method (rather than seed saving) to ensure the offspring has the same characteristics as the parent plant.

There are two main types of seeds to collect in most AFF gardens:

- Plants with dry seeds that form by letting the plant 'go to seed' e.g. cabbage, lettuce.
- Seeds within fleshy fruits e.g. tomatoes, cucumber, eggplant.

## COLLECTING DRIED SEEDS: LETTING THE PLANT GO TO SEED:

- Select a plant which is strong and healthy, and allow the plant to go to seed (when the plant produces flowers which are then replaced by pods or seeds). Wait until the pods are brown and about to die, but before they drop off the plant.
- You may wish to cover the head of the plant with a paper bag to avoid losing pods or seeds in the wind. When the pods or seeds have dried, cut the stem off and shake the bag so that the seeds or pods easily fall off within the bag.
- If you have not covered the plant with a bag, the pods may be hand harvested, or the seeds may be manually rubbed so that they fall off the plant into a container.
- Cut or squeeze the pods open to release the seeds into a container.
- Store the seeds in a jar, zip lock bag or other container that is kept in a cool, dark and dry place, away from sunlight.
- Be sure to label each of these containers with the name of the crop to avoid confusion during next season's planting period.



## COLLECTING WET SEEDS FROM FLESHY FRUITS:

- Select a healthy and strong plant. From that plant, select fruits which have the best colour and size. This will ensure the seeds collected from these fruits will carry the same high-quality characteristics for the next growing season's crop.
- Let these fruits hang on the tree until they are ripe and going soft. Picking the fruit too early can mean the seeds may not germinate.

- If tomatoes and eggplants are picked overripe, the seeds may start to germinate within the fruit.
- Pumpkin, cucumber, and melons should be left on a shelf for 2-3 weeks before removing the seed. This will increase the seeds' probability of germinating.
- Capsicum and chilli seeds are at maximum viability when the whole fruit is left to dry before removing the seeds.

- Cut the fruit open and scoop out the seeds with a spoon.
- Rinse the seeds in a sieve to separate the seeds from the flesh.

- If cleaning tomato seeds, this requires a fermentation step.
- Scoop out the fleshy seeds from the tomato and soak in a bowl of water for 3-5 days. This fermentation step will remove the flesh from the seed.
- Rinse the seeds with water and then follow the remaining steps.

- Put the seeds on a towel or plate to dry for 5-7 days. Ensure they are placed away from direct sunlight and leave them until they have dried completely.
- Store the seeds in a jar, zip lock bag or other container that is kept in a cool, dark, and dry place, away from sunlight.
- Be sure to label each of these containers with the name of the crop to avoid confusion during next season's planting period.



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