AGRICULTURE

Teacher's Book **Year 5 and 6**

LEARNING TO CULTIVATE OUR LAND

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AGRICULTURE

Years 5 and 6

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Revised Edition 1997.

This book was written by J. Chelumbrun and first published in 1990.

Layout: Raela Reuben

Contents

Introduction

This book has been specially published to help you teach agriculture to your students in Years 5 and 6. It is different from the other books for teaching agriculture in the primary school, which were developed under the HNA project funded by UNESCO, and developed together with the Vanuatu Ministries of Agriculture, Education and Health. In Years 1 to 4, children looked at agriculture in the wider context of the environment. During Years 5 and 6 the children will learn the practical aspects of agriculture by working in their own garden. In order to be able to do this, you will have to make sure that there is a piece of land available for you to use with the two classes.

You should spend a large part of the year teaching your children the best way to grow traditional local vegetables and fruits such as yams and taro, kumala and manioc, bananas and island cabbage, and how to collect and use wild nuts and fruit, and to realise their importance for our health and culture. Do not spend all your time teaching children to grow the temperate vegetables such as lettuce, round cabbage and tomatoes that have been introduced from overseas. Our local vegetables and fruit are more nutritious. Many of your students will be living in their own communities as they grow up, and need to be able to take part in the important activities of the garden. It is important that you make your agriculture lessons as enjoyable and informative as possible. Later, they will realise how important these lessons were to them.

To find enough time in your timetable to have practical lessons in the garden, plan your Health, Nutrition and Agriculture lessons together according to the farming year. You have 1½ hours each week to teach these three subjects (half an hour for each). At the times of year when you have to do a lot of work in the garden, use all the HNA lesson times grouped together for agriculture. When there is not so much to do in the garden, then use the time you would normally spend on agriculture for extra health and nutrition lessons.

Included at the beginning of this book are three stories written by Marie Léa Yoringmal, in which she talks of her experiences when she was a small girl growing up on Malakula. Make sure your children enjoy these stories and can talk about, in their own language, all the traditions connected with planting and harvesting in their community.

Good gardening!

Peanut

Common Name: **Peanut, Ground nut**
Scientific Name: **Arachis hypogaea**
Origin: **Brazil**

Nutritional value

Protein and fats

Climate and soil

The peanut is grown mostly in the subtropics. A minimal rainfall of 300 to 500 mm is necessary, with dry weather during the harvest.

A well drained, loose sandy soil is suitable.

Preparation of soil

Peanuts are planted on the flats or on ridges.

Planting information

Planting material
Seed.

Spacing
- 30 cm by 15 cm or
- 60 cm by 10 cm for erect types
- 60 cm by 30 cm for runner types.

Use of fertiliser
Calcium, phosphorus and sulphur are needed.

Pests and diseases

Leaf eating beetles and caterpillars are the main pests affecting peanuts.

Leaf spot is a fungal disease which is very common with peanuts.

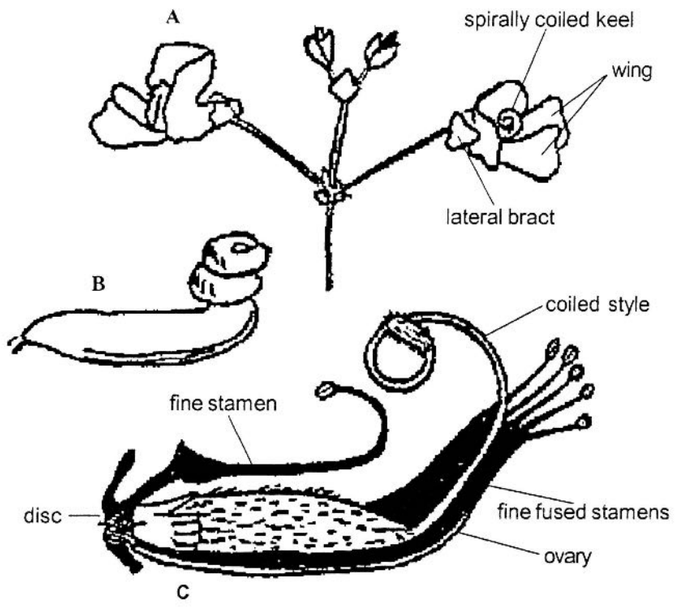
Harvesting

3.5 months for an erect type, 5 months for a runner type.

The plants are pulled up and turned over in the sun to dry before the nuts are stripped off.

Storage

It is advisable to store peanuts in the shell, as quality and viability deteriorate rapidly after shelling.



A. The inflorescence
B. The coiled keel
C. Section of a flower

October Full Moon

This morning, at Father's request, Mother looked at the calendar. "It's full moon this evening," she called from the other end of the house.

I also looked at the calendar. It certainly was full moon this evening. My mother finished tidying the house, before setting out for the garden. She took a well-dried head of corn and wrapped it in the long piece of cloth which she used for carrying vegetables back to the house in the evening. She added to it packets of cucumber, pumpkin and watermelon seeds which she had dried for the next season's sowing. She loaded everything on her back, put a spade over her left shoulder and picked up a bush knife. My father carried a head of white yam (*Waet strong yam*) whose new shoots were already searching for the ground. He hung it from a piece of wood sharpened at the end (*Néwas*) which he used for sticking into the ground and breaking up the big lumps of earth. A spade is one thing and a *néwas* another. My brother made sure that he did not forget the water and the matches. I carried a young banana shoot that Father had dug up behind our house.

We arrived at the garden and my brother raced to the foot of the mango tree. He brought back three fruit. We began eating them while our parents carefully took the young shoots of the yams and wound them very gently back round their supports. They also planted the yam and the banana plant. I lighted the fire as usual and grilled some half-ripe bananas (*Malele*). After doing the planting, Father went to dig up another white yam, the one which we were going to prepare for eating with sea worms (*Nawel*). When the bananas were cooked, I called our parents. Father was exhausted. He arrived and stopped to wash his hands in a bit of hollow wood. Mother brought some germinating coconuts (*Navara*) for the meal. We happily ate the bananas, mixing their flesh with the germ of the coconut. The food tasted delicious!

After a good meal, Mother rose to her feet again and said to us, "Get up, we're going to plant the seeds." My brother and I really enjoyed planting them. My mother sat in the shade and removed the seeds from the head of corn. Father made holes in the ground with his *néwas*. We went behind him, following his advice and burying three seeds of corn in each hole. My brother and I fought over each hole. After the corn, it was the turn of the cucumbers. This time Father advised us to put five seeds in each hole. We did the same for the pumpkin and the watermelon seeds.

Soon afterwards, the sky grew dark. Our parents busied themselves preparing to lift the yam from the hole. It was huge. My mother brought along a pole of bamboo and some bush ropes. On Father's advice, I cut some other smaller branches. First Father attached these branches along the intertwining tubers of the yam. He placed the green bamboo across the yam in such a way as to create a balanced load. Then he tied the whole thing to this central pole. Finally everyone helped to lift the burden out of the hole. The rain began falling. We carried the yam to the foot of the breadfruit tree.

We hung it from a big branch, in the shade, for it to dry before it was taken to the house. Then we went home. It rained all night.

That evening, my father said, "You must make yourselves very familiar with the moon and you must use the different phases of the moon to plant your food. At full moon, we must plant the plants and seeds that produce food above ground, but when there is no moon and it is dark, we must plant all those which have buried tubers. You must count five days after this October full moon; in this way you will know the exact date of the arrival of the great night of the worms (*Nawel*). You must weave your *Néter* with pandanus leaves, on a special bush rope of *Sékrépu*, at half moon, to be able to catch this gift of the Creator."

It is thirty-six years since my father died, and I have never stopped following his advice. I have handed it on to my children, and to all those who would like to try it today, at the dawn of this new millennium.

Marie-Léa Yoringmal

Bean

Common Name: **Common bean, French bean, haricot bean**
Scientific Name: **Phaseolus vulgaris**
Origin: **Tropical America**

Nutritional value

It contains a large amount of of protein.

Climate and soil

Beans grow best towards the end of the rainy season. Excessive rain causes flower drop. They can be grown on most soil types from light sands to heavy clays and also on peat soil.

Preparation of soil

Bean needs a well drained soil. Ridges are normally made for beans.

Planting Information

Planting material
Seed.

Spacing
15 cm between plants and 50 cm between rows.

Stalking
Some tall varieties need staking, dwarf varieties do not.

Use of fertiliser
Beans will respond well to manganese, aluminium and boron.

Pests and diseases

Aphids and leaf hoppers are pests of beans.

Fusarium root rot is a fungal disease caused by Fusarium Oxysporum. The first symptom is a red discoloration of the tap root which later turns brown and the roots become dry and papery. It can be controlled by using a suitable fungicide.

Harvesting

The pods are harvested when still immature.

Chinese cabbage

Common Name: **Chinese cabbage**
Scientific Name: **Brassica chinensis, Brassica pekinesis**
Origin: **Eastern Asia**

Nutritional value

Vitamin A and C. It also provides minerals and some protein.

Climate and soil

It grows well in a cool moist climate. The ideal soil is a rich, well drained sandy loam soil.

Preparation of soil

Chinese cabbage is best grown on a raised bed.

Planting information

Planting material
Seed

Method of planting and spacing
The seeds are sown in a nursery. The seedlings are ready to be transplanted after 20 days.

Brassica chinensis are planted at 25 cm x 25 cm apart. Brassica pekinensis are planted at 35 cm x 35 cm apart.

Use of fertiliser
Nitrate, Phosphae and Potash (NPK) in the ratio 4:7:5 is sometimes needed.

Weeding
It is done regularly.

Pests and diseases

Caterpillars, cabbage bugs and worms affect the cabbage.

Black rot, downy mildew and club rot are the main diseases of Chinese cabbage. These can be controlled by using any suitable fungicide (for example, Bravo 500).

Harvesting

It is carried out 3 months after planting.

Storage

Chinese cabbage cannot be stored for long. It should be washed and put in plastic bags, then kept in a cool place.

The White Yam and the Night of Nights

Five days passed after the October full moon.

That morning, my paternal uncle, Father's younger brother, came to our village, having been summoned by my father. All the family came to greet him. My father invited his brother into the kitchen. They ate the still warm baked bananas with thick slices of pineapple, and then left quickly for the garden. My mother knew what they had planned. After the men left, she told us, "They're going to bring back the yam for the feast of the Creator's gift and of the White Yam."

Straightaway she sent my brother running to the foot of the pandanus tree to bring back some dry leaves. I was sent to go and cut four bush ropes from the *Sékrépu* behind the pig fence. We put the bush ropes and the leaves on the mat where mother was waiting. My brother and I watched Mother's small fingers, which began by bending the bush ropes into a semicircle. Then, she fastened the two ends with some of the burao fibre which she used for plaiting the pig's rope. She began weaving the container that would be used to gather the worms (*Nawel*), a kind of basket that we call *Néter*. "Look, everything's ready for this evening," said Mother enthusiastically.

My uncle and my father arrived, carrying the enormous yam. They hung it from a branch of the mango tree opposite the house. They went to check the *Néter* and my uncle chose two of them. Mother took from the oven a little *bounia* of sweet potatoes (*Kumala*)

and island cabbage leaves. We ate under the mango tree and planned this great Night of Nights. After the meal, we went our separate ways. My uncle went back to his village with his fishing tackle. My mother forced us to take a siesta.

The evening arrived, everyone was excited, all our neighbours were busy in the village. At about six o'clock, it was already very dark, but an acrid, bitter smell, rising from the sea, blown by the evening breeze, reached the villagers. They cried out in the darkness, "They've come! They've come! Smell them! Smell them!"

They lighted big torches of bundles of dry reeds. They ran to the sea. All the coast was alight. The sea remained calm and clear. Suddenly a man cried, "Marimé!" ("They are arriving.") Everyone rushed down with their containers, bowls, buckets and cooking pots. We went down too, my brother and I carrying two big buckets while our parents each had a *Néter*. Father was the first to lift up his container. "Look! These are the *Welnmau,*" (the dancers with big feathers). They were black with white bellies. Our parents gathered a large quantity. The *Welnmau* were in the water around us and, when they bumped into our legs and feet, they tickled. My brother started to lift up his feet and father cried to him, "Be careful! You'll tip over the bucket."

The sea had become black, the worms were arriving in large numbers and some of them even became stranded on the beach. Some old women sat down on the shore and used their brooms to gather them. Little by little the numbers went down, the water began to lighten and Father said, "*Eres Welnmau.*" This means, "Thank you, the dancers with the big feathers".

A few seconds afterwards there arrived the *Welep* or *Lappai Nabus* (the big roots of the long yam). They arrived in large quantities and resembled the roots of banana plants. My father didn't want to mix up the different kinds. He tipped the contents of the other bucket into mine. When it was full, he carried it ashore. When he got back, he caught those just arriving. The fish arrived too and help themselves freely. Some of the young men positioned themselves along the reef and cast their lines into the sea. They caught some enormous fish.

My parents continued working and the second bucket was now almost full. I ran to the house and brought back two more. It was ten o'clock in the evening and a gleam of light broke through the huge black clouds; it was the moon. "Its arrival has an important meaning," sad Father. "Soon, it will make the Gift of the Creator disappear." My brother and I carried the second bucket ashore. Now the moon showed its giant, luminous face. A big black cloud separated off and rose into the sky. My father explained that it was the waste from the juice of the *Nawel* and that soon the *Del* (ropes) would arrive. The numbers of *Welep* were going down very fast and the first *Del* arrived. They were like the green leaves of the she-oak (casuarina) tree. The parents continued the worm fishing. From time to time, my mother stood up and stretched.

At 11 o'clock, the bucket of *del* overflowed and we carried it ashore. Now we saw different worms arriving. They were the white *Neveur* (the waste from grated coconut, *makas blong kokonas*). My father said, "There are the last of the *nawel.*" Everyone continued gathering them until the moon was high in the sky. It was midnight. My father stood up and said, "They are stopping. It is the end of the Night of Nights." We carried back to the house the four buckets full of each kind of worm. My mother covered them with laplap leaves. People were lighting fires on the beach and were already beginning the feast of the Gift of the Creator. We were very tired, so, following our parents' advice, we left to go to bed.

The next day the feasting was still at its height. Mother wrapped small packets of *nawel* in laplap leaves for all the members of the family and for our neighbours. Father divided the yam into three equal parts, one for our uncle, one for our aunt and the last one for us. My bother and I were kept busy distributing them. All along the coast, people were baking the worms in the young leaves of the chestnut tree and green coconuts, and were doing the same with the white yam that they were to eat that day. They were talking, they were singing, they were shouting; everyone in the village was feasting.

Island cabbage

Common Name: **Island Cabbage**
Scientific Name: **Hibiscus manihot**
Origin: **India, China, Japan, Malaysia and Pacific Islands.**

Nutritional value

Contains a large amount of iron.

Climate and soil

Tropical, well suited to lowlands. It needs fertile soil.

Planting information

Planting material

- stem cutting (2-3 nodes)
- seeds.

Method of planting and spacing

The stem cuttings are planted two in a hole, 10 to 30 cm deep and 1.2 to 2.5 m in between holes.

Planting time

It can be planted at any time during the year.

Weeding

Regular weeding is important for proper growth.

Watering

It is important in the dry season.

Pests and diseases

Beetles, moths, caterpillars, aphids, army worms, stem borers, nematodes and African snails are the main pests. Leaf spot, powdery mildew and Green mottle virus are the main diseases of island cabbage.

Harvesting

2 to 3 months after planting the growing tip and leaves may harvested. Harvesting can be done over a period of 1 to 2 years.

Storage

1/2 to 1 day. Hang it up if it is to be used on the next day.

Pests and diseases

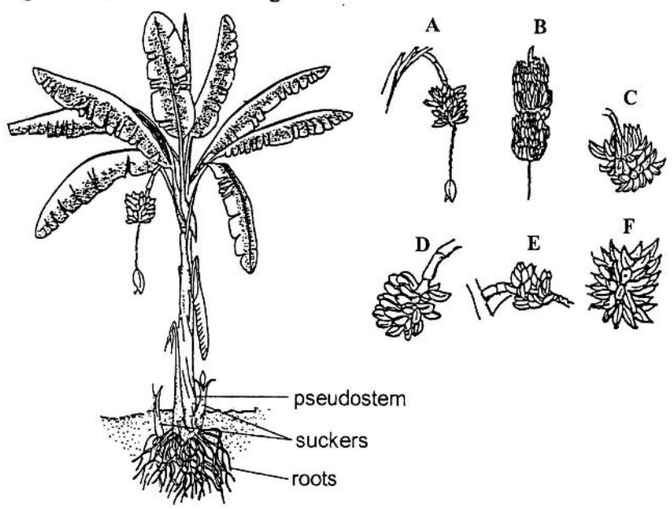
Stem borer is one of the major pests of the banana plant. It can be controlled by aldrin and dieldrin. Panama disease and leaf spot also affect the banana. A bordeaux mixture or dithane M-45 may be used as a control.

Harvesting

The inflorescence is harvested as a 'bunch' of fruit. The bunch is harvested before the fruit is fully ripe

Storage

Ripe bananas cannot be stored for more than two or three days. Bananas should never be stored in a refrigerator. They release a chemical which spoils other vegetables stored in the refrigerator.



Different types of banana

A. Gluggoe
B. Gros Michel
C. Horn Plantain
D. Klue teparod
E. Sucrier
F. Fei banana

At midday, we met again in our kitchen to smell the good smell of the *gorgness*, a kind of small *nawel* laplap, rolled up in a single laplap leaf that my mother turned and turned again on top of the embers. My father spread out the packets of baked worms and the baked coconuts on a big laplap leaf; my mother took out the *gorgness* and cut them into small pieces to cool. We stood up and Father said the words of praise which he addressed to the Creator. We sat down again and feasted on the delicious dish prepared by our parents. After the meal my mother put the rest of the packets of *nawel* to cook in the oven to keep them from going bad, and we all went to the garden. Following Father's advice, we had to touch all the yam creepers. It was in this way that the feast of the Creator and of the White Yam ended. I was proud to play a part in keeping this tradition alive.

Marie-Léa Yoringmal

When I remember, my mouth starts watering again!

One morning, just after the crowing of the roosters had woken me up, my mother sent me to look for my uncle, her youngest brother. As soon as we got back to the house, she gave us two baked yams, still hot. She said to us, "When you've finished eating, go to the garden and pick the *nakatambol* fruit. If you don't get there quickly, the flying foxes will have a feast before we do."

My uncle took a big coil of rope and I took several of the baskets that my mother had woven specially for this kind of harvesting. We arrived at the foot of the *nakatambol* tree, which was close to the *nakavika* tree and the flowering *navele* trees. My uncle exclaimed, "Look! This year we are going to be eating lots of fruit, it will be a prosperous year." I didn't really understand what he meant, but I respected the rules of conversation and replied in a Melanesian way, "Kgm, kgm, kgm, kgm."

My uncle climbed to the top of the tree, carrying the coil of rope with him. When he arrived at the highest branch, he let down the rope and asked me to fix a basket to the end. As soon as I had done so, he pulled up the basket and filled it with juicy yellow *nakatambol*. He let down the basket the full length of the rope, which just reached me, for me to empty it out. Then he pulled it up again, and so we continued until all the baskets were full.

He sat down comfortably on a big branch and contentedly ate the juicy fruit. I did the same at the foot of the tree. Then we picked up our loads and slung them on a branch over our left shoulders, two baskets in front and two behind. After that we set off home. All that day we ate fruit. My mother, as she usually did, shared some among our neighbours.

Even today, in my garden I make sure that I plant all the fruit trees endemic to Vanuatu. If you come to my village, you will see *namambe*, *naus*, *nandau*, *natavoa* and *nangai* trees. Each of these bears fruit once a year, at a particular time. This means that we have the chance to eat fruit all through the year.

Marie-Léa Yoringmal

Banana

Common Name:	**Banana**
Scientific Name:	**Musa acuminata**
	Musa sapientum
	Musa paradisiaca
Origin:	**South-East Asia**

Nutiritional value

Carbohydrate food containing Vitamin C and some minerals.

Climate and soil

The banana requires a heavy rainfall. A well drained and less acid soil will be suitable. (Ph 5.5: 6.5)

Soil preparation

Bananas are planted in holes 30cm deep and wide enough to accommodate the planting material.

Planting information

Planting materials

Corm suckers

- bits
- peepers
- suckers
- corm suckers.

Spacing

The spacing for bananas depends on the variety. Sometimes it may be 2 m or 2.5 m or even 3.3 m. Bigger plants need larger spacing.

Desuckering

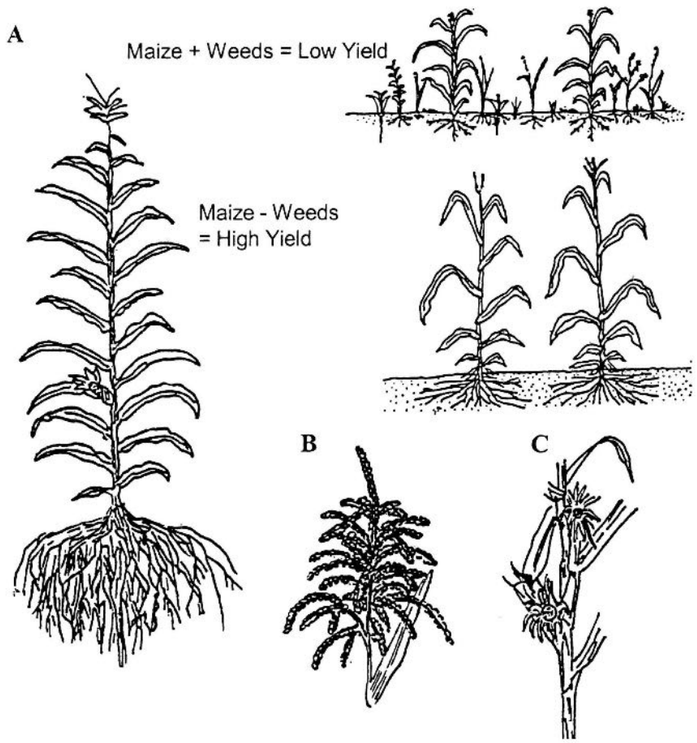
The banana has to be desuckered, that is, all the suckers except four have to be removed. Desuckering is done in such a way that one sucker is allowed to grow every 3 months. Thus only four plants will be present at any one time.

Staking

Sometimes banana plants have to be staked because they produce big bunches of fruit.

Use of fertiliser

Bananas need a large amount of nitrogen and potassium in the soil.



A. A mature maize plant
B. Tassel (male flower)
C. Young female inflorescence.

The Vegetable Garden

Planning a garden

A good garden has several necessary elements. These are: good soil, a water system, a nursery, a windbreak, fence, a tool shed and a compost shed.

Good soil

It is very important to assess the soil before starting a garden. The soil must be rich in minerals and should not be too strong or too dry.

Water system

Without water plants cannot grow. It is advisable to make a garden at a place where water is easily available.

Nursery

A small corner of the garden should be kept for a nursery where seeds are sown before transplanting.

Soil in the nursery should have good drainage to avoid growth of fungus.

For a nursery it is advisable to mix the soil with some sand in to avoid water logging.

Windbreak

A garden should be well protected against wind. In cases where there are no plants or bush around the garden a windbreak should be made. For a small garden, a good fence made of coconut leaves can be used as wind break. Sturdy plants like island cabbage or sugar cane planted around the garden can also act as windbreaks.

Fence

In order to prevent animals like pigs, dogs or cattle from coming to your garden, it is advisable for you to build a good fence around it.

Store for tools

A store for keeping tools and other materials should be made close to the garden.

Compost shed

Rubbish from the garden should not be thrown away. Some of it can be kept to make compost which can be used to enrich the soil again. A small shelter can be made for a compost heap.

Crop rotation

Crop rotation is the sequence of growing different crops on the same land for successive cultivations.

In general rotation of crops should include a legume as frequently as possible.

Advantages of crop rotation

- It helps to maintain the fertility of the soil.
- It reduces the build up of soil pests and diseases.

Examples of crop rotation

1. Kumala, beans, corn
2. Potatoes, beans, tomatoes
3. Carrots, beans, cabbages.

A general rule for rotation:

root crops ⟶ legumes ⟶ leaf crops ⟶ fruit crops

e.g. carrots ⟶ beans ⟶ cabbages ⟶ tomatoes

Corn

Common Name: **Corn or Maize**
Scientific Name: **Zea mays**
Origin: **Southern Mexico**

Nutritional value

Carbohydrate

Climate and soil

Corn grows well in a heavy soil with good drainage.

Preparation of soil

Corn may be grown on ridges, mounds, flats or furrows. Deep cultivation is needed (50 cm deep) with good drainage.

Planting information

Planting material
Seed.

Method of planting and spacing
Several seeds are sown 2 to 3 cm deep and 1 to 1.5 m apart.

Thinning
Each set of seedlings is thinned to two, when they are about 10 cm tall.

Use of fertiliser
Corn requires a good amount of nitrogen and phosphorus. Nitrate, Phosphate and Potash (NPK) is recommended.

Pests and diseases

Stem and cob borers are the main pests and can be controlled using dimechron.

Maize rust and downy mildew are two fungal diseases affecting corn.

Harvesting

It is carried out after 3 months.

Use of fertiliser

Nitrate, Phosphate and potash (NPK) in the ration 12:4:12 may be used, as pineapples do not require a lot of phosphorus. Pineapple suffers copper, zinc and molybdenum deficiencies in some soils.

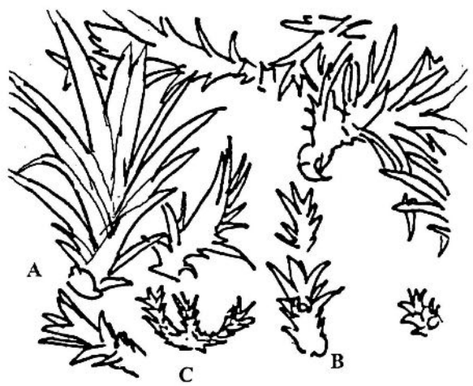
Pests and diseases

Nematode is the most serious pest affecting the pineapple. It is controlled with soil fumigation using D-D nematicide. The small farmer is advised to rotate pineapple with kumala.

Root rot is a fungal disease caused by Phytophtora cinnamoni. It can be controlled with improved drainage and a suitable fungicide.

Harvesting

15 to 24 months after planting, depending on the planting materials used. Suckers produce fruits at 15 months. Crowns develop slowly and produce fruits at about 2 years.



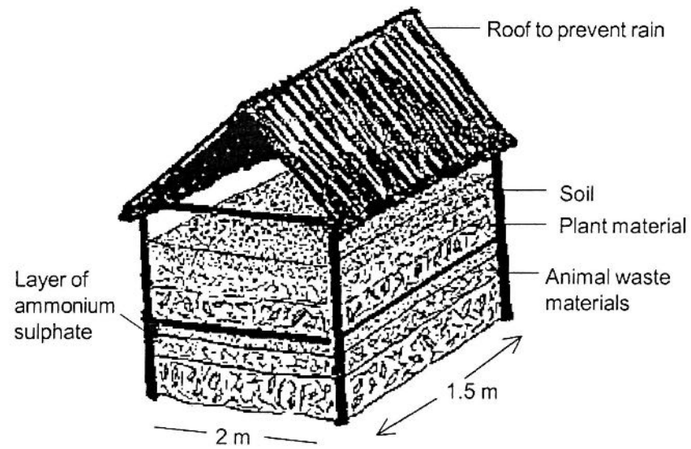
A. Large side sucker
B. Slips from beneath the fruits
C. Multiple crown.

Compost

Compost consists of decaying plant and animal materials. It is used to increase the fertility of the soil.

In a compost heap minerals from decaying dead organic matter are easily available for crops.

Making a compost heap



How to make a compost heap

1. A shelter is built (2 m x 1.5 m).
2. A layer of young soft leaves and stalks is placed at the bottom (30 cm).
3. Immediately on top of these plant materials, some animal materials are put.
4. The third layer consists of soil, which is used to cover the animal materials.

   If available a thin layer of ammonium sulphate can be added, otherwise another three layers of plant materials, animal materials and soil are again placed one on top of the other.

   The whole heap is watered and left for one month. After that period the heap is dug up and mixed. Some water is again added and the heap is left for one month, after which the compost will be ready for use.

How to use compost

Spread the compost in a layer about 5cm thick and dig in well. Compost is normally used in soil preparation prior to planting.

Importance of compost

Compost is the cheapest way of returning minerals to the soil. It also provides a mulch to the crop, for keeping the soil moist.

Mulching

Mulching consists of spreading dead plant materials around growing crops.

Functions of mulch

- Reduces soil erosion
- Conserves soil moisture
- Reduces growth of weeds around plants
- Adds to the humus content of the soil (except when polythene sheets are used for mulching).

Materials for mulching

A variety of materials can be used for mulching.

- Dead leaves
- Cut stems and grasses
- Crop prunings
- Artificial material such as polythene sheet
- Compost.

Care must be taken to avoid using plant materials containing pests and diseases.

Pineapple

Common Name: **Pineapple**
Scientific Name: **Ananas comosus**
Origin: **Eastern South America**

Nutritional value

- Vitamin C
- Sugar.

Climate and soil

It grows well in the humid tropics and organic peat soil. The soil must be acidic.

Preparation of soil

The pineapple is planted on flats.

Planting information

Planting materials

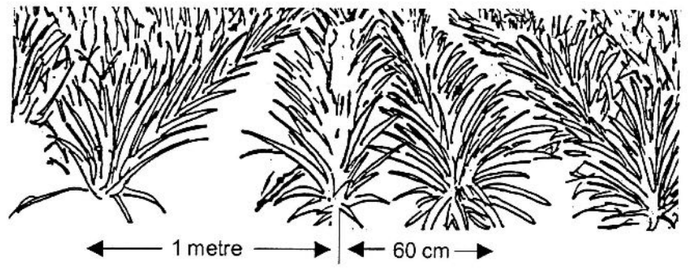
Side shoots or suckers, slips or crown shoots may be used for planting.

Method of planting and spacing

Double-row planting is recommended for pineapples.

30 cm apart between each plant in double rows 60cm apart.

Each double row is 1m apart.



Mulching

It is very important for the pineapple as it keeps the soil moist and prevents the growth of weeds. Mulching increases yield.

De-crowning and de-slipping

In some varieties of pineapple, removing the crown increases the size of the fruit. The removal of the crown and slips is carried out on the immature fruit when the shoots are about 5 cm long.

Weeding

Weeding by hand is recommended as the roots are superficial.

Pests and diseases

Root-knot nematode is the main pest affecting the pumpkin plant. Fusarium wilt and powdery mildew are the important diseases of the pumpkin.

Harvesting

Those grown for immature fruits are harvested 7 to 8 weeks after planting. Those grown for mature fruits are harvested at 3 to 4 months.

Storage

They should be kept at 25° to 30°C for two weeks to harden the shell and then store best at 10° to 15°C with low humidity.

How to use a spade

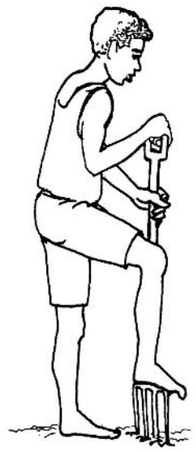
The right way

Force from the knee is used to push the spade deep into the soil.

The wrong way

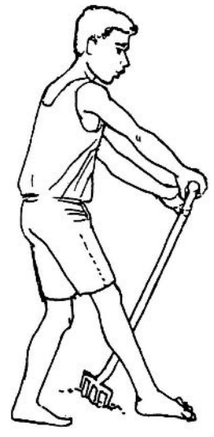
Never use the force from the arms when working with a spade.

How to use a fork

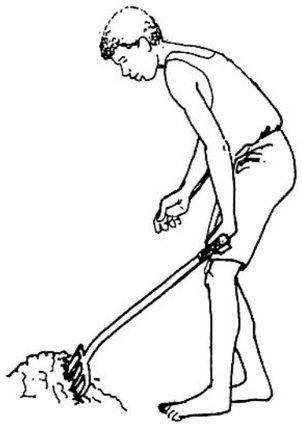


The fork is held vertically upright.

Force from the foot is used to press the fork deep into the soil.

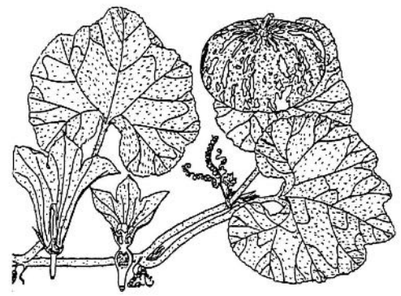


The fork is pushed forward,



then pulled backward and pressed down. Always move backwards while using a fork.

Pumpkin



Common Name: **Pumpkin**
Scientific Name: **Curcurbita maxima**
Origin: **Peru**

Nutritional value

Carbohydrate, protein and fat.

Climate and soil

Pumpkins prefer dry areas with a medium rainfall. They can be grown in most types of soil provided these are well drained.

Preparation of soil

Pumpkins are grown on mounds.

Planting information

Planting material
Seeds.

Spacing
- 120 to 150cm apart for small vines and
- 240 to 360cm apart for long runners.

Thinning
Several seeds are sown in one place and then thinned to 1or 2 plants.

Pollination
Hand pollination assists fruiting setting.

Use of Fertiliser
The pumpkin responds well to organic manure but artificial fertiliser may also be applied, such as Nitrate, Phosphate and Potash (NPK), in the ratio 5:10:10.

Pests and diseases

Insects like serpentine leaf miner, mites and various caterpillars are the main pests of the tomato. Root knot nematodes also affect tomato plants.

Diseases that affect the tomato plant are Bacterial wilt, Fusarium wilt and Sclerotium wilt.

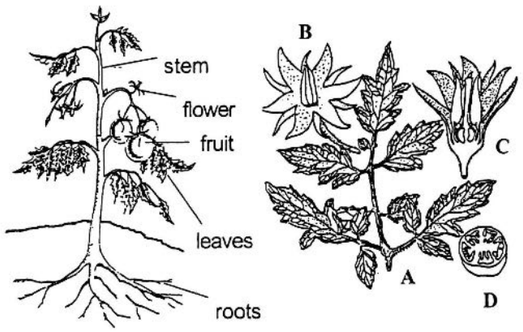
Grey leaf spot may cause complete defoliation.

Harvesting

For distant markets tomatoes are usually harvested when fully mature but still green. For the local market they are picked when firm ripe.

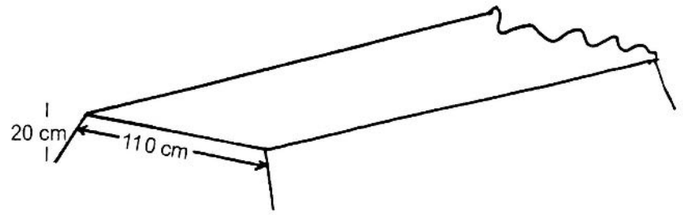
Storage

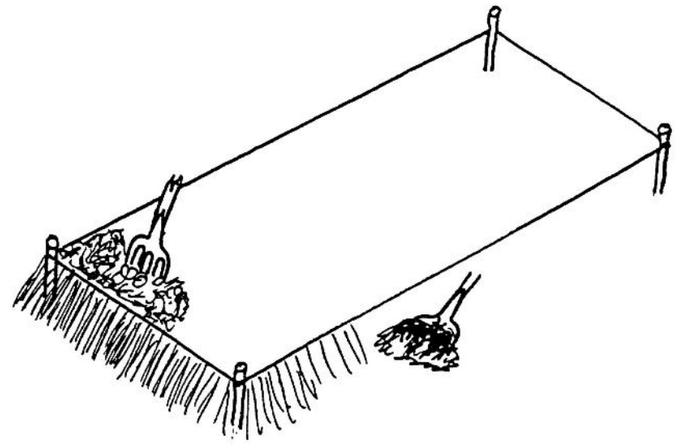
Tomatoes at the mature green stage can be cold stored at 15°C.



A. Part of a plant
B. A flower
C. Section of a flower
D. Section of a fruit

How to make a bed



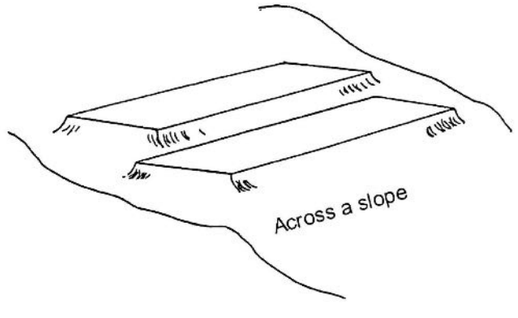


Beds are always constructed across slopes.
A bed provides good drainage for a plant. It prevents the roots from waterlogging.

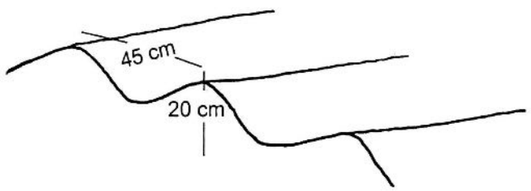
Construction of bed

1. Put in four pegs at the required distances, that is between 105 and: 150 cm wide and at the length desired, and place a rope around them.
2. Dig the soil within the roped area with a fork.
3. With a spade, dig up some soil from outside the rope and place it inside the roped area.
4. Prepare the soil well by hand, removing stones, weeds, grasses and roots to produce a good tilth.
5. Level the bed off up to the rope using a rake.
6. Firm the sides of the bed by tapping with the back of a spade.

Beds are always raised across the slope



How to make a ridge



Ridges are constructed across slopes. They provide good drainage for plants, avoiding waterlogging of the roots.

1. The soil is dug up using a fork.
2. The tilth is prepared by hand.

How to make mounds

Mounds are small hills used for planting. The soil is raised into hills.

Kumala may be planted on mounds.

Tomato

Common Name: **Tomato**
Scientific Name: **Lycopersicon esculentum**
Origin: **Peru, Ecuador**

Nutritional value

- Fats
- Good source of Vitamin C and A.

Climate and soil

Tomatoes have a wide climatic tolerance. A light free-draining fertile loam is best for them but they can be grown in a variety of soils.

Preparation of soil

It needs deep cultivation (50 cm). Ridging with good drainage is suitable for the tomato plant.

Planting information

Planting materials
Seeds

Transplanting
Seeds are sown in a nursery and later the young seedlings are transplanted into the garden.

Spacing
90 cm between rows and 4 to 5 cm between plants.

Thinning
Sometimes seeds are sown 3 in a hole and later thinned to a single plant.

Staking
Staking is done in some varieties but has no effect on yield.

Pruning
It has been found that pruning reduces yield in tomatoes.

Mulching
It has been shown to be beneficial for tomatoes.

Use of Fertiliser
Sulphate of ammonia provides nitrogen and potassium can be obtained from Muriate of potash.

Pests and diseases

Nematode is the main pest affecting yams. It causes a dry brown rot on the tuber skin.

Clean planting materials should be used to avoid rotting.

Anthracnose is a fungal disease caused by Colletotrichum gloeosporioides. Black spots appear on leaves. The tips die and finally the whole plant gets black and dies.

Harvesting

It is carried out at 6 to10 months depending on varieties. The plant dries up. This indicates the time for harvest.

Storage

Yams can be stored in a cool shady place which is protected from rats. Yams have a dormancy period of 3 to 4 months.

How to use and care for a sprayer

The first and foremost thing that one should observe when using a sprayer is **safety**.

Safety precautions

- Wear safety clothes
- Wear safety goggles
- Wear gloves
- Wear masks
- Wear protective boots.

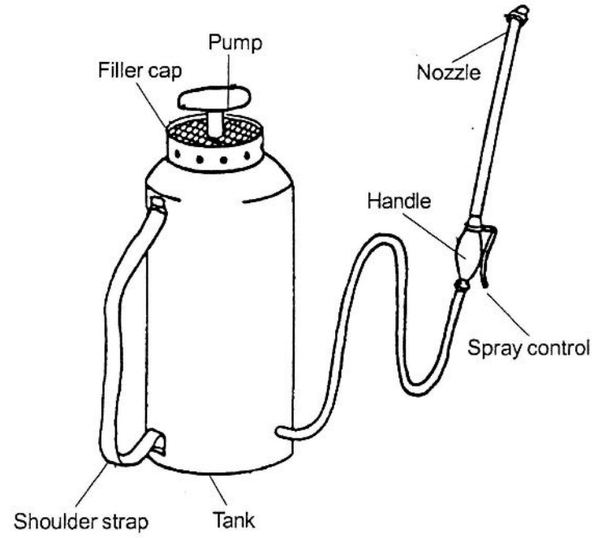
How to use a sprayer

1. Check for any damage in the sprayer.
2. Wash and fill with the required amount of water.
3. Mix the chemicals as directed on the label.
4. Shake thoroughly.
5. Adjust the spray jet as required (mist or larger droplets).
6. Spray carefully and thoroughly, avoiding contact with the body.
7. Wash and clean the sprayer immediately after use.

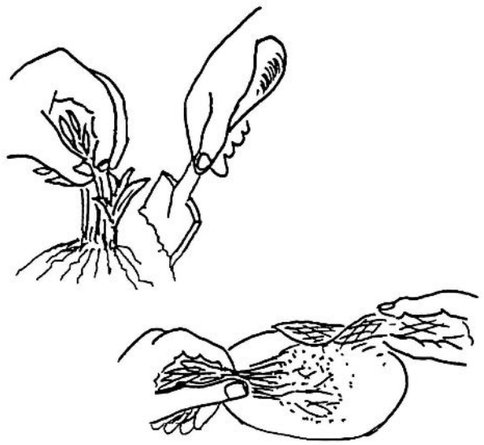
Note: Equipment that has been used for **herbicides** should never be used for fungicides and insecticides.

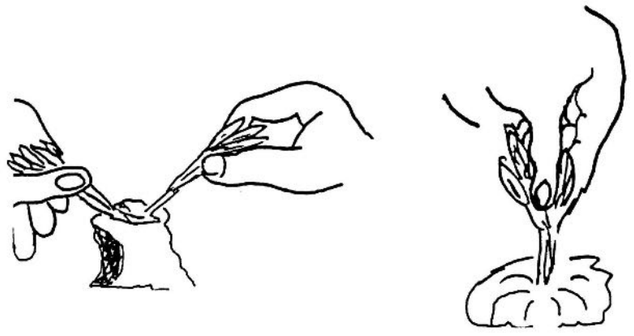
Care of sprayer

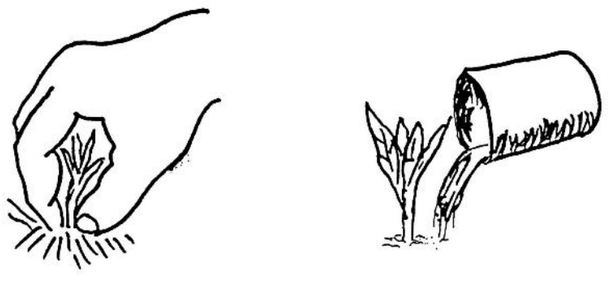
The sprayer should be cleaned every 3 months. All parts of the equipment should be taken apart and lightly oiled, and any worn washers replaced. Always keep spare washers handy.



How to transplant

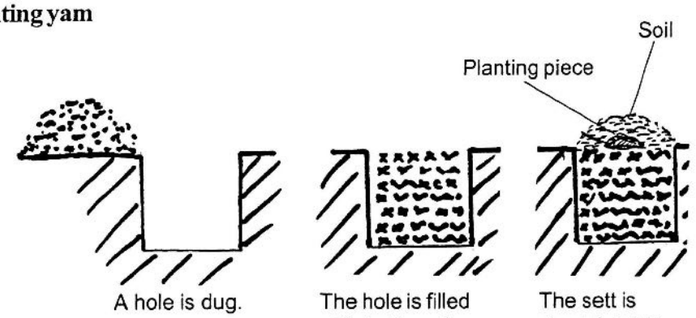


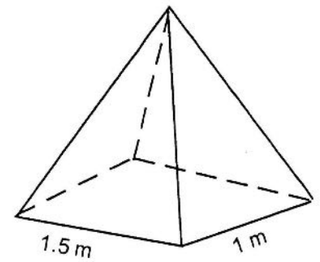




Method of Planting and Spacing
The hole is first filled with fertile soil and then a piece of the tuber, normally known as the sett, is placed on top and covered to make a mound above the planting site. The spacing depends on staking.

Planting yam





1m X 1.5 with pyramidal stake.

- Single staking is often practised in Vanuatu.
- If no staking is done the plant will need a wider spacing but this is not recommended.

Weeding
Yams should be weeded regularly. Clean weeding is essential.

Staking
Pyramidal staking is preferable. It is the best method in an area not protected from the wind. If no staking is done the leaves get burned.

Use of Fertiliser
Nitrate, Phosphate and Potash (NPK)

Yam

Common Name: **Yam**

Scientific Name: **Dioscorea alata (soft yam)**
Dioscorea esculenta (sweet yam)
Dioscorea numularia (strong yam)
Dioscorea bulbifera (bulbils)
Dioscorea trifila (African yam)

Origin: **D. alata and D. esculenta: South- East Asia**

Nutritional value

- Carbohydrate
- Calcium
- Protein 2%
- Vitamin C and A.

Climate

It is a tropical crop. Yams are quite resistant to drought but the yield is reduced, therefore there should be enough rainfall.

Soil

It needs a well drained fertile, loamy soil.

Soil preparation

A hole is dug and then filled with fertile top soil.

Planting information

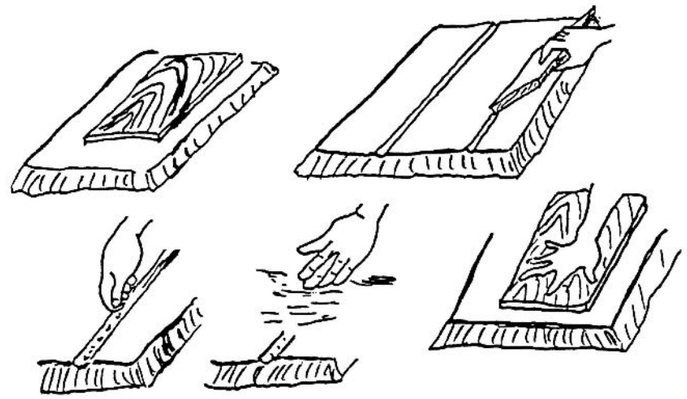
Planting Materials

Small whole tubers of sets of big tubers which are cured in ashes.

Varieties

There are about 139 varieties in Vanuatu.

How to sow seeds



1. Flatten the seed bed with a piece of wood or spade.
2. Make furrows in the bed with the edge of the wood.
3. Mix the seeds with dry sand to facilitate an even distribution.
4. Sow the seeds along the furrows.
5. Brush some soil across the grooves of the furrows.
6. Press the soil of the bed down with the piece of wood.

How to apply fertiliser

Instructions on the label should be followed carefully.

Basal dressing

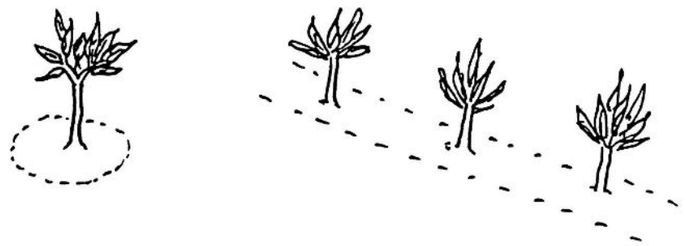
Basal dressing means applying fertiliser during the preparation of the soil prior to planting. It should be noted that the fertiliser should be well mixed with the soil to a depth of between 6 and 8 cm.

Top dressing

Application of fertiliser during the growth of the plant is known as top dressing.

Side dressing

Side dressing is the application of fertiliser, during growth, around the plants or along drills made on either sides of the plants.



Storage of fertiliser

1. Fertiliser should be kept in a cool dry place.
2. It should be kept in a safe place out of the reach of children.

Liquid manure

How to make liquid manure:

Fill a rice bag with any animal manure and suspend it from a pole in a drum containing about 200 litres of water. After the manure has been soaked for 1 week the resulting liquid can be used after mixing with three parts water.

Liquid manure can be used for foliage feeding.

Pests and diseases

The taro plant hopper is a very important pest, which causes the leaves to wilt and dry prematurely. This can be controlled by the use of Orthene.

The taro beetle also affects the plants especially in dry ground.

Dasheen mosaic virus is the most serious disease affecting taro. The leaves become yellow and feather. This disease usually appears on young plants. They normally recover as the plant grows up. Aphids cause the spread of the disease. Control of the aphids by using pest master reduces the spread of the disease.

Harvesting

It should be done at 8 to 10 months and should not be postponed.

Storage

1 to 2 weeks depending on climate.

Taro

Common Name: **Island Taro, Fiji Taro**
Scientific Name: **Colocasia esculenta (Island Taro)**
Xanthosoma sagittifolium (Fiji Taro)
Origin: **South-East Asia**

Nutritional value

- Carbohydrate
- Protein: 21% in corm and 4-5% in leaves.
- Good source of Vitamin C and A.

Climate

Wet and humid tropics.

Soil

Taro is a high moisture lowland crop. It grows best in heavy clay soil not sandy soil.

Soil preparation

Taro is planted in holes 15 - 28 cm diameter and 20 - 25 cm deep.

Planting information

Planting materials
It is planted mainly from suckers 5 to 8 cm long. Sometime the head set also is used for planting.

Spacing
l m x l m or 90 cm x 90 cm.

Planting Time
It is best to plant taro at the beginning of the wet season as it needs a good rainfall.

Growing time
8 - 10 months

Planting method
The sucker is placed in the centre of the hole. Only the corm part is covered when planting. Later the hole is filled up while weeding.

Varieties
There are about 250 varieties in Vanuatu.

Weeding
It must be done regularly.

Use of fertiliser

Nitrate, Phosphate and Potash (NPK)

Some terms for common agricultural practices in the garden

Planting

Planting means putting planting materials (parts of a plant) into the soil for growing, for example, kumala and manioc stem cuttings, pineapple crowns and suckers, taro corms and yam tubers.

Sowing

Some crops are grown from their seeds. Sowing means placing seeds into the ground for growing.

Some seeds are sown directly into the garden, for example, bean, carrot, corn, peanut and pumpkin seeds.

Other seeds like tomato and Chinese cabbage are first sown in the nursery and then transplanted.

Transplanting

Seedlings from the nursery are transplanted into the garden after a specific time, depending on the type of plant. Generally a seedling should not be less than 10cm tall with 3 leaves. When transplanting great care should be taken not to damage the roots. (see diagram)

Watering

Watering is the process of adding water to the plants. This practice is very important especially during the dry season. Watering can be done using a watering can or a hose and a sprinkler.

After transplanting, the plants must have water, but it is very important to note that at this stage only the soil and roots should be watered, not the leaves.

Shading

On a hot and sunny day plants should be shaded after transplanting, so that they do not dry up. Coconut or banana leaves can be used for this purpose. The shade can be removed after two days.

Weeding

Weeding is the removal of weeds around a plant. This is very important as weeds take a lot of minerals from the soil. Weeding can be done by hand or with a bush knife or a hand fork.

Earthing up or hilling up

Earthing up or hilling up means digging up the soil in order to allow more air to enter the soil. Earthing up also helps to prevent a root crop from being

affected by direct sunlight. This can cause the development of chlorophyll, which will give a bitter taste to a crop such as carrot (the top part of the carrot becoming green in direct sunlight).

This practice also helps to prevent pest attack. In the case of kumala, hilling up is done to cover the root so as to prevent rats from eating the roots.

Staking

Staking is the process of putting stakes to runners or climbers so as to save space, for example, climbing beans and yam are staked so that more spaces are available for planting.

Pruning

Pruning is the removal of unwanted branches from the plant. It has been found that pruning in tomatoes reduces the yield. Pruning in cocoa is not recommended except the removal of the chupons.

Thinning

Thinning is the removal of some small plants to allow enough space for the other plants to grow. For example, carrots are sown in drills but later thinned to allow a distance of 3 cm between plants, giving space for the other plants to grow properly.

Pests

Any insect or other animal which causes damage to a crop is known as a pest. Examples of pests are insects, rats, caterpillars and bugs.

Disease

Any deviation (change) from the normal life of a plant is known as a disease. Examples of dieases are blight and wilt.

Symptoms

Signs which indicate the presence of a disease are known as symptoms. Examples include

- leaves becoming yellow
- drying of leaves
- defoliation

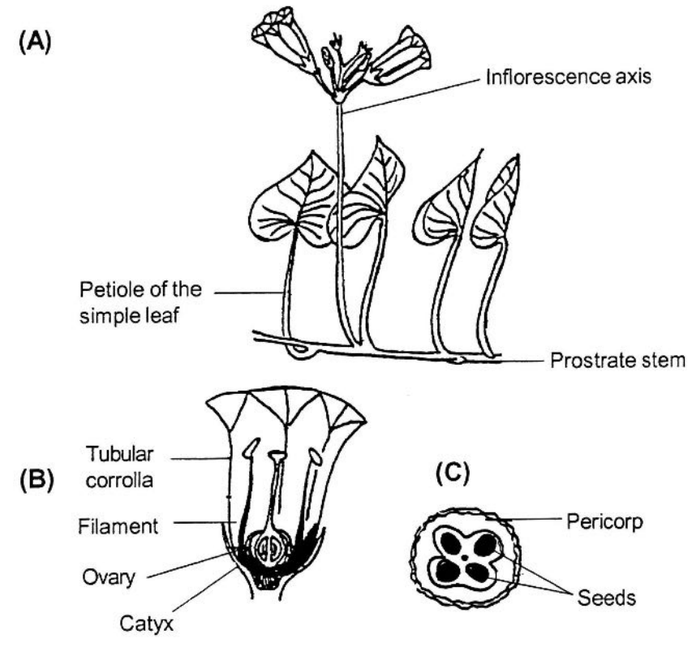
Dressing

Very often the same land is used for growing vegetables each year.

Minerals from the soil are used up and must be replaced. Adding fertiliser is the simplest way of maintaining the fertility of the soil.

The process of applying fertiliser to the garden is known as *dressing*.

Kumala



A. Portion of the stem showing arrangement of leaves.
B. Longitudinal section of a flower.
C. A section of the ovary.

Pests and diseases

Scab disease is very common in kumala. It is a fungal disease caused by Elsinoe batatas.

Little leaf or Witch's broom disease is caused by mycoplasma. If the plants are affected, they have to be pulled out.

The West Indian Weevil is the main pest affecting kumala. It is a tube borer. The tuber becomes bitter in taste.

Harvesting

Some varieties are ready after 4 months and some after 5 months. If left longer the tuber will rot.

Storage

Field storage is best. Harvesting is done when required.

Sweet Potato / Kumala

Common Name: **Sweet potato or kumala**
Scientific Name: **Ipomoea batatas**
Origin: **Central America**

Nutritional value

- Carbohydrate
- Yellow varieties provide Vitamin A.

Climate

Tropical and subtropical. It needs high rainfall for the first 2 to 3 months of growth, followed by dry conditions for tuber formation.

Soil

It needs a well drained sandy loam soil.

Preparation of soil

Traditionally kumala is planted on mounds. Commercially it is planted on ridges 30 cm high.

Planting information

Planting materials
20 to 30 cm of good terminal cuttings. These cuttings are kept in shade for 2 or 3 days for hardening.

Spacing
Cuttings are planted on mounds 2 to 3 m apart. Commercial growers plant them closer together.

Planting time
April-May.

Growing time
4 to 6 months, depending on variety and season.

Varieties
There are 38 local varieties and 8 varieties imported from Africa.

Weeding
One or two times during growth.

Earthing up
This is done to prevent rat damage.

Fertiliser
Nitrate, Phosphate and Potash (NPK)

Some Garden Crops

Carrot

Common Name: **Carrot**
Scientific Name: **Daucus carota**
Origin: **Eurasia**

Nutritional value

- Protein
- Carbohydrate
- Fat
- Lots of Vitamin A.

Climate and soil

Carrots grow well in a wet climate with a well drained, light loam soil.

Planting information

Preparation
Carrots are grown on raised beds.

Planting Materials
Seeds.

Spacing and Method of Planting
Seeds are sown in drills about 30 cm apart and one cm deep.

Thinning
The seedlings are thinned to 3 cm apart.

Harvesting
The roots should be harvested while still young.

Storage

Carrots can be stored for several months without loss of quality.

Manioc

Common Name: **Manioc or Cassava**
Scientific Name: **Manihot esculenta**
Origin: **Brazil, Guatamala and Mexico**

Nutritional value

- Carbohydrate
- Protein
- A good source of vitamin C.

Climate

Warm and moist climate. It is more drought resistant than most other root crops.

Soil and nutrient requirements

Manioc needs a light but not too fertile soil. If the soil is too fertile there will be too much top growth and no tuber formation. Because manioc exhausts the soil, it is normally planted just before the land is allowed to lie fallow.

Soil preparation

Manioc needs well prepared soil, dug with a fork or a stick. In Vanuatu manioc is usually planted on flat land.

Planting information

Planting materials
Stem cuttings, 20 to 30 cm long, from a mature stem.
2 to 3 stem cuttings are placed at an angle of 45^0 at each planting point.

Spacing: 1.5 m apart, but is better if cuttings are planted at 1 m x 1 m points.

Planting time
All the year round.

Duration of growth
12 months or more.

Varieties
There are about 25 different varieties in Vanuatu.

Weeding
It is done one or two times during growth.

Pests and diseases

Leaf spot is the main disease affecting manioc. It is a fungal disease which results in defoliation particularly in the cool, dry season. The fungus causing the disease is called Cercosporium henningsii.

Harvesting

It is usually carried out at 12 months or more, but some varieties can be harvested at 10 months. If manioc is left too long in the ground too much fibre will be formed.

Storage

Field storage is the only way of storing manioc. Fresh manioc deteriorates within 2 days of removing from the ground, so harvest only when needed.