Good Gardening and Growing Root Crops in Solomon Islands

Practical ways of growing local food plants, and doing it well

by B. Reg French

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Helping the Hungry Feed Themselves

A Project of the Rotary Club of Devonport North, District 9830, District 9600 & Food Plants International

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Good Gardening and Growing Root Crops in Solomon Islands

This is one of a series of publications produced for the Learn♦Grow™ Solomon Islands project.

Other publications in the series are:

Food Plants of Solomon Islands – A Compendium (published July 2010). A large reference text with comprehensive scientific and technical information on all food plants of Solomon Islands.

Food Crops of Solomon Islands – A Brief Introduction to the Crops (to be published). A book on the growing practices and food value of crops of potential in Solomon Islands.

Two other field guides in this series are:

Leafy Greens and Vegetables in Solomon Islands (published July 2010).

Fruit and Nuts in Solomon Islands (to be published)

All publications will be made available as pdf books on the Learn♦Grow™ website (www.learngrow.org) and the Food Plants International website (www.foodplantsinternational.com)

ISBN 978 0 9808182 1 5

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Contents

Other publications in this series

Leafy Greens and Vegetables in Solomon Islands

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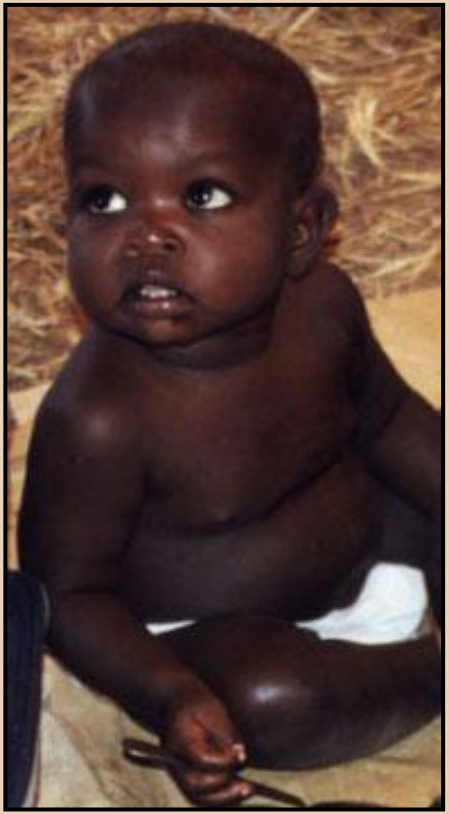
Good nutrition is simple



Grow and eat a wide range of food plants.

Then if a nutrient is missing from one plant, it will be included in other plants and produce a balanced diet.

Healthy diets

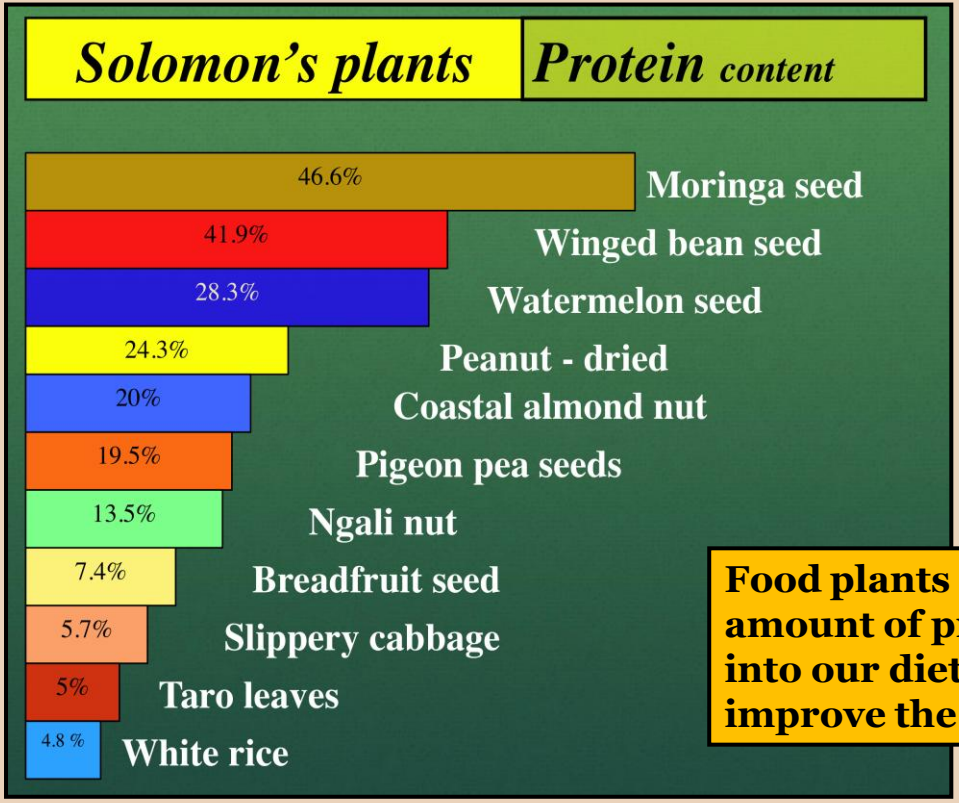
All people, and especially children, should eat a wide range of food plants to stay healthy. This should include some plants from each of the food groups – energy foods, growth foods and health foods. Then each of the nutrients required by our bodies will be met in a balanced manner.

Energy food

Health food

Growth food

Protein foods



Many seeds can be roasted and eaten as snacks

Coastal almond

Food plants add an important amount of protein (growth food) into our diets. Fish and meat can improve the quality of the protein.

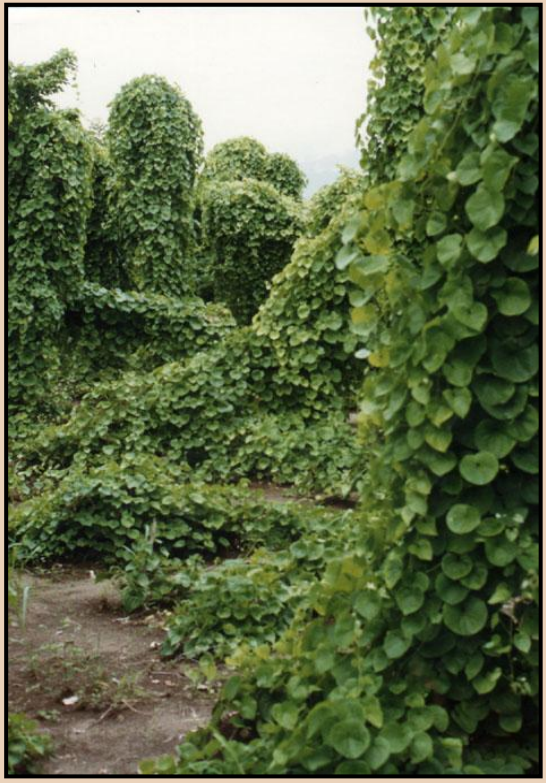
Local plants give a regular food supply

Use a range of local or well adapted plants to get a regular supply of food

Because they are local, they will have already survived local conditions and pests.

Because there is a variety, they have different ways to survive bad conditions or bad seasons.

Agro-ecology - growing plants a natural way



Growing foods in a mixed garden is a good and simple way to reduce pests and disease.

Agro-ecology - how plants grow in nature

Plants don't grow in rows in nature!

Growing only one type of plant is not used in nature!

Lots of varieties are maintained in nature!

In nature, the right plant grows in the right place!

In nature, fruit is produced in season!

Nutrients are recycled in nature!

Natural systems are sustainable!

In nature, the soil remains alive and humus rich!

Mixed cropping is good

Amaranth & corn mixed

Yams, bananas & vegetables

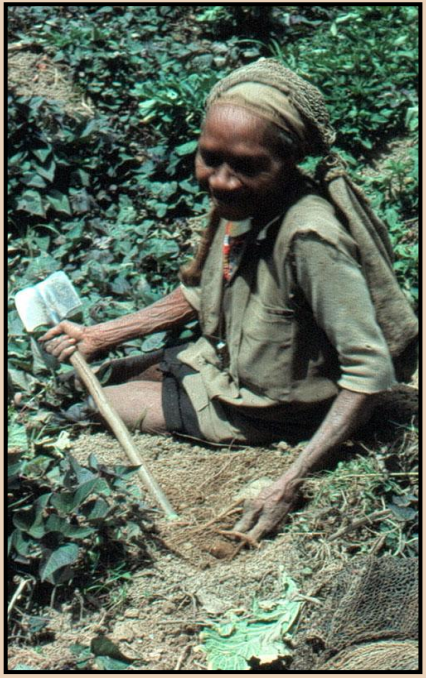
Mixed garden of taros & greens

Subsistence food gardening

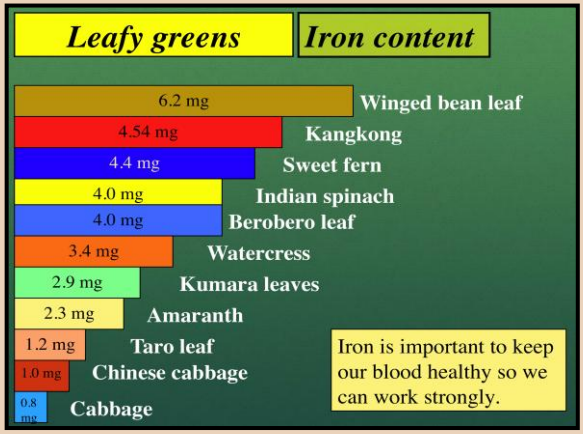
Hard, but very important work

We all need to be involved!

Everyone who cares about healthy families and caring for God's world helps produce good food gardens



Information on gardening



Food values

Seed saving

We all need to learn together and to share what we know

Deficiencies

Pests

Disease

Are your plants healthy?

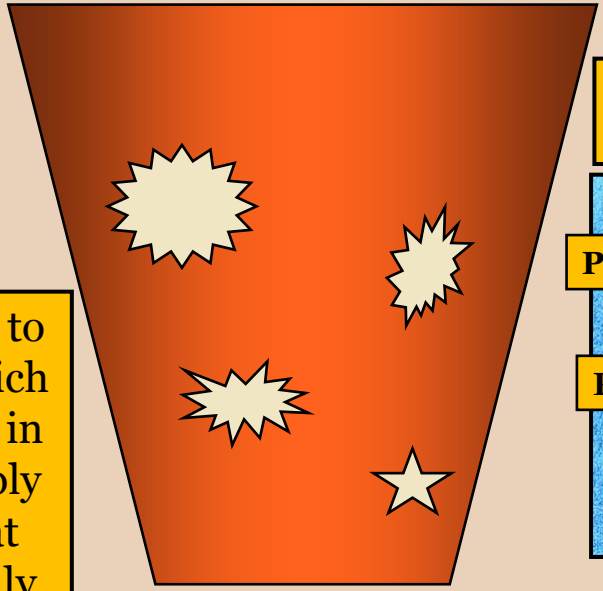
Plants show special signs when they are not growing well

This corn leaf is indicating the plant is short of a nutrient called nitrogen. It shows a dry 'V' shape down the centre of the oldest leaves. Other grass plants show similar signs.

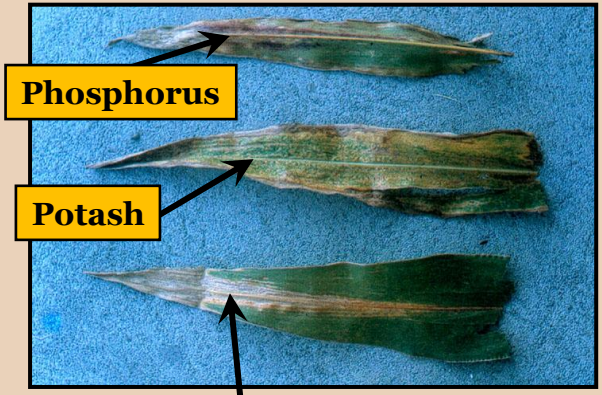
Nitrogen is in the air, but plants cannot use it unless small bacteria in the soil, and on the roots of bean family plants, change it into a form plants can use.

A bucket of nutrients!

We can learn to recognize which nutrients are in shortest supply by looking at plants carefully.



Signs of lack of nutrients shown by plants

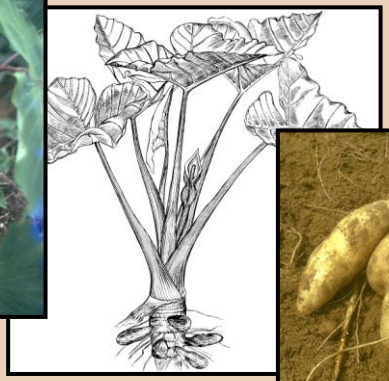


If we imagine soil as being like a bucket of nutrients, (plant food needed for the plants to grow), then we need to fix the lowest hole, (or add the nutrient which is in shortest supply), before the bucket can carry anything more!

Changing plants to grow on poorer and poorer soils is mining the ground

Yams need fertile soil

Taros need good soil



Chinese taro survives on poorer soils

Sweet potato can grow on moderate soils

Cassava will still produce on poor soils

Decreasing soil fertility

Tropical root crops

When nitrogen is short…

Pineapple plants turn red

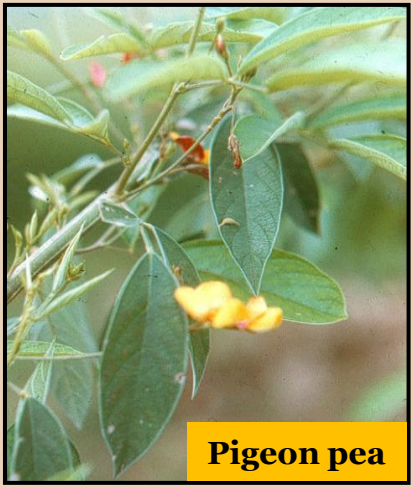
Old leaves go yellow

Grass plants have a dead 'V' shape in the old leaves

Nitrogen is important for plants to grow healthy green leaves

Sugarcane leaf

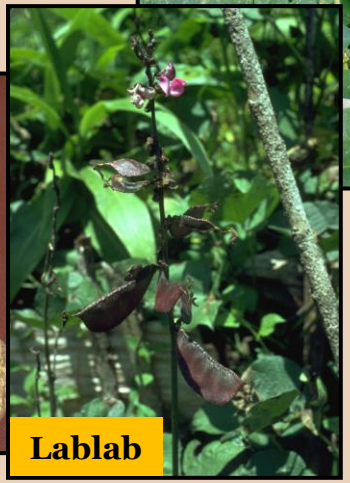
Food legumes restore soil fertility


Pigeon pea


Leucaena


Cowpea


Peanut

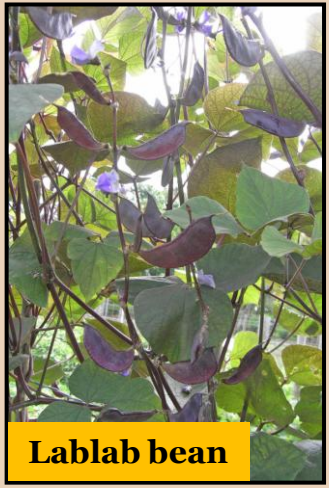

Lablab


Winged bean

Beans provide protein - and restore soils

Beans have special bacteria attached to their roots that allow them to take nitrogen from the air and put it into the soil for plants to use. It is free fertiliser!

Climbing beans can be allowed to climb up corn in gardens and still get good crops of both beans and corn.

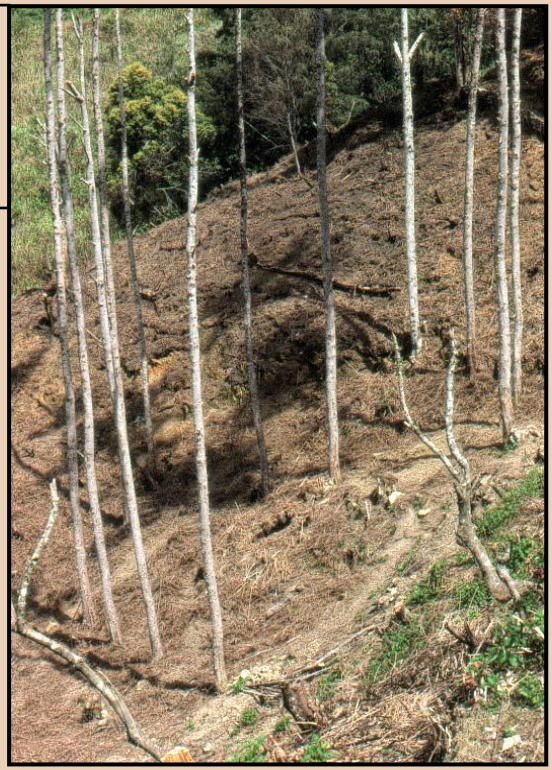


Plants to provide nitrogen

Slippery cabbage and peanuts being grown together

Casuarina trees provide nitrogen and improve soils

Peanuts provide nitrogen



Burning loses nutrients – and destroys soils

Nitrogen (and Sulphur) get lost into the air as plant material is burnt. Other plant nutrients, like potash, remain in the ashes.

Burning is a quick and easy way to clear up a garden site, but wherever possible, plant material should be left to rot back into the soil. This provides nutrients, and helps the bacteria and other living things in the soil that are so important for plant growth. A soil with humus, or rotted plant material, does not lose nutrients during heavy rain.

Making compost

Compost is a lot of hard work for large gardens

Don't burn rubbish - compost it!

Compost is perfect for small backyard gardens

How to make compost

The rules for compost making:

- Build a simple, open box to keep animals out
- Mix green leafy and dry plant material
- Allow air to get into the compost
- Keep the compost bed moist
- Add anything that has been living before
- If possible, turn the heap to allow it to heat up and break down properly
- Add some old rotting material to start the process

Compost allows things that were alive to live again!

The reasons for compost

- Small bacteria and other living things work hard to break down old plants and other living things into compost.

- Because the bacteria are living, they need continual air and water, and a balanced diet of green and dry waste, or they die!

- Living things already have plant nutrients in perfect balance for new plant growth, so it is the perfect fertiliser.

- To stay healthy, soil needs lots of compost and organic matter to do all the amazing work that goes on unseen within the soil.

Compost should become hot to kill weeds and pests

Some soils need extra help to grow plants

Many tropical soils can be very acidic, but soils on coral or limestone can be too sour. Compost is important for both.

These plants are growing poorly on very alkaline atoll soils

Pests and diseases damage plants

The first rule in managing pests and diseases is to grow the right plant in the right place, and to grow it well, so it can stay healthy.

Taro blight

Peanut rust

Winged bean false rust

Leaf spot in bananas

Some diseases tell a story

Elsinoe scab on sweet potato usually tells us 3 things:

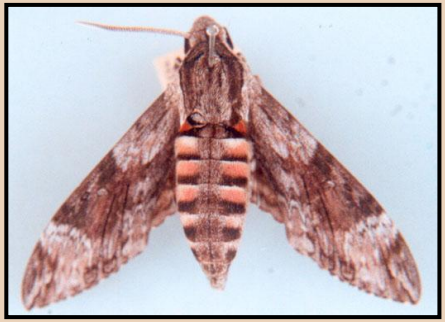
- The soil is getting poor and low in nutrients
- The sweet potato is a variety that gets the disease more easily
- The variety of sweet potato may have come from another country without the disease, so it has no resistance.

Improve the soil

Choose a resistant variety

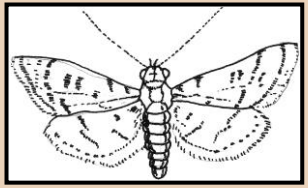
Insect pests get worse when one single crop or variety is grown

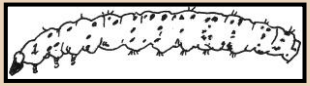
Using a range of crops, and a mix of varieties, is normally a good safeguard against bad insect pest damage.

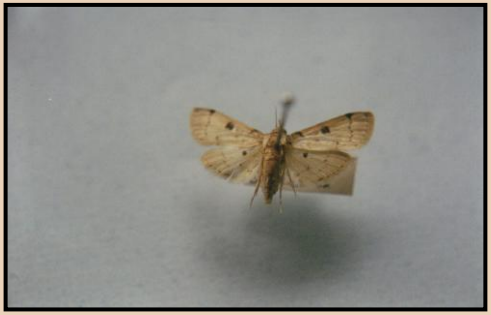


Get to know insect pests

Banana scab moth can cause lots of trouble







Pull the flower bracts off, because the small moth hides under these to keep out of the sun.

Save your own seed

In many small gardens, corn plants and cobs are small, because the seed is inbred.

If you get all the seed off one cob, these are all related and will become inbred and small.

Seed from a range of cobs, or better still, from a range of gardens, should be mixed together to stop inbreeding.

Save your own seed

Many pumpkin family plants get mildew and other diseases

A pumpkin patch

Mildew

Plants grown from seed that is saved locally usually get a lot less disease, as they are adapted.

Fruit trees to suit hot humid to monsoonal tropical climates

Mangosteen

Rambutan

Guava

Mango

Cashew

Decreasing humidity

Tropical fruit trees

Air-layering

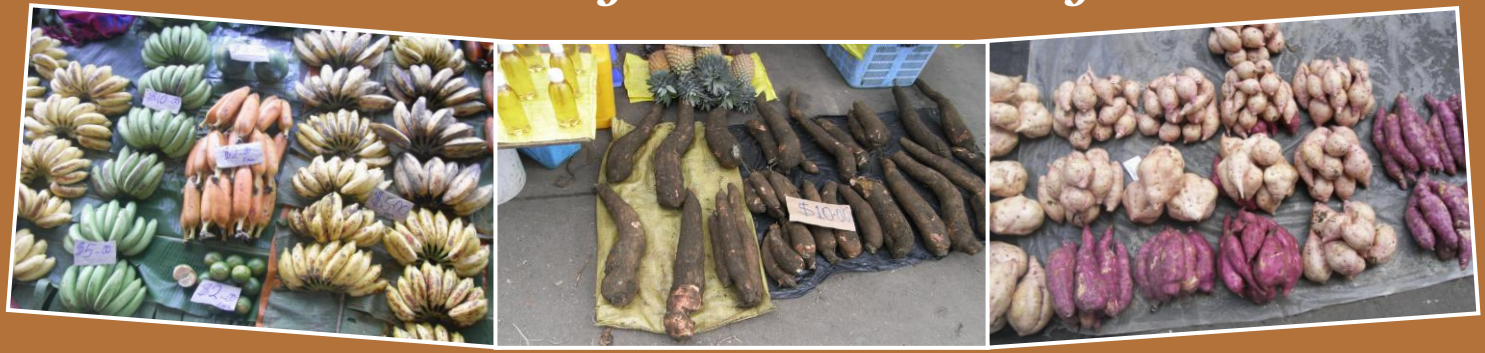
Air-layering of guava

If a sweeter or preferred fruit or nut is found, it is best to grow it from cuttings, or air-layering, so the new tree is the same as the old.

Air-layering is a special way of taking cuttings. A shallow cut is made around a small branch while it is still on the tree. Some soil and mulch is wrapped around this and covered with plastic. It soon forms roots. It can then be cut off and planted.

Root Crops (and other important starchy staple foods) in Solomon Islands

These foods are the backbone of the country, so we need to get to know them very well



Real food

- **Each family has some kind of starchy staple food they use to provide energy food for the family.**
- **The roots, tubers and other starchy staple foods, like bananas, sago and breadfruit, are not greatly different in food energy value.**
- **To provide proteins, vitamins, minerals and other important nutrients in our diets, it is important to eat vegetables, beans, edible leaves and fruit every day.**

Food value of starchy staple foods

Food	Preparation	Moisture %	Energy kJ	Protein g	ProVit A µg	ProVit C mg	Iron mg	Zinc mg
Banana – cooking	Boiled	69	465	0.8	10	0	0.5	0.2
Banana - cooking	Baked	71	456	1.4	17	15	1.0	0.1
Breadfruit	Boiled	81	313	1.3	3	22	0.2	0.1
Breadfruit	Baked	74	429	1.3	2	22	0.3	0.1
Cassava	Boiled	68	490	0.6	0	15	0.2	0.3
Cassava	Baked	54	740	2.0	0	0	2.2	0.4
Potato	Boiled	79	275	2.6	0	21	0.5	0.3
Potato	Baked	71	450	3.0	0	18	0.7	0.3
Sago	Flour	13	1391	0.4	0	0	0.7	1.3
Sweet potato	Boiled	74	382	1.4	5	18	0.5	0.3
Sweet potato	Baked	66	540	1.4	5	25	0.5	0.4
Chinese taro	Boiled	76	393	1.1	3	5	1.0	0.2
Chinese taro	Baked	65	558	1.5	3	7	1.4	0.4

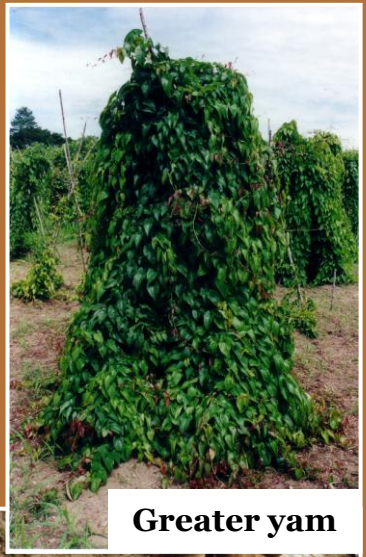
Food value of starchy staple foods

Food	Preparation	Moisture %	Energy kJ	Protein g	ProVit A µg	ProVit C mg	Iron mg	Zinc mg
Taro	Boiled	75	414	0.9	3	5	1.0	0.8
Taro	Baked	60	640	1.4	4	8	1.6	1.4
Elephant foot “yam”	Raw	78	328	2.2	35	4	0.5	1.0
Giant taro	Boiled	73	386	2.0	0	8.5	0.8	1.5
Giant taro	Baked	68	463	0.9	0	9.2	1.4	1.7
Swamp taro	Boiled	78	302	0.5	2	8	0.6	2.3
Swamp taro	Baked	73	360	0.6	3	8.5	0.7	1.9
Winged bean root	Baked	66	584	6.4	0	0	1.6	1.1
Greater yam	Average	70	480	1.5	9	12.1	0.5	0.2
Greater yam	Baked	60	649	3.0	10	8	1.2	0.7
Lesser yam	Raw	74	374	2.1	9	20.3	0.8	0.4
Rice - white	Boiled	69	515	2.3	0	0	0.3	0.6
Rice - brown	Boiled	66	574	3.0	0	0	1.1	0.8

Root crops are perfect plants for hot humid tropical climates

Starchy staple foods are the lifeblood of Solomon Islands.

We need to look out for pests, disease, and signs that the plants are growing in poor soil.



Greater yam

Taro

Cassava

Tannia

Lesser yam

Pests, diseases and deficiencies

If plants are grown well, they are damaged less by insect pests and diseases.
If the soil is poor, plants go dry or pale.
Good farmers learn how to recognise these signs and take action early.

Cassava short of nutrients

Cassava grown in poor coral soil cannot take up enough plant food

Banana scab moth damage

The very small moth hides from the sun under the flower bracts

Pests, diseases and deficiencies

Taro blight fungus washes in the rain on hot wet nights

Taro blight

This fungus scab gets bad when soils are poor, and also on varieties from overseas

Wrinkled kumara leaves

This fungus makes leaves die off early when the leaves get damaged

Yam anthracnose

Yams

Greater yam
Dioscorea alata

Lesser yam
Dioscorea esculenta

Five leaflet yam
Dioscorea pentaphylla

Potato yam
Dioscorea bulbifera

Yams

Greater yam

Lesser yam

Potato yam

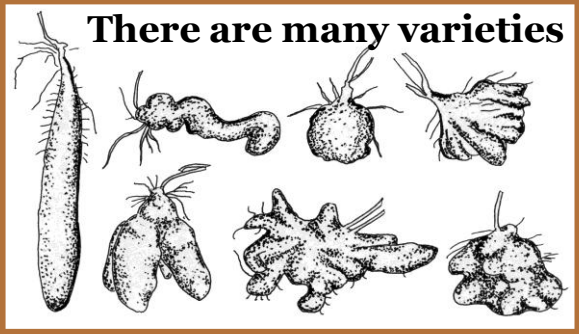
Yams need good soils and seasonally dry climates, and can be stored.

Nummularia yam

Five leaflet yam

Growing yams

Planting tops



A successful yam grower

A well staked yam

- Yams should be put into a loose, friable, fertile soil.
- They need plenty of sun.
- They should have strong stakes about 2 m high.
- A large section of the top of the old yam tuber is the best planting material.
- Yam tops are normally stored in a cool, dry place until they develop shoots.

Yam diseases

Yam anthracnose

Yam leaves can turn black and die early due to a fungus that gets worse in older plants, in wet seasons, and when plants get damaged.

Yam rust

Yellow rust-coloured lumps can occur in some varieties and damage leaves.

Yam diseases

Virus

A virus-affected yam with small yellow leaves. It should not be used for planting material.

Leaf spot lesser yam

This obvious leaf spot due to a fungus does not cause serious damage if plants are growing well.

Taro family plants as food

Elephant foot yam
Amorphophallus paenifolius

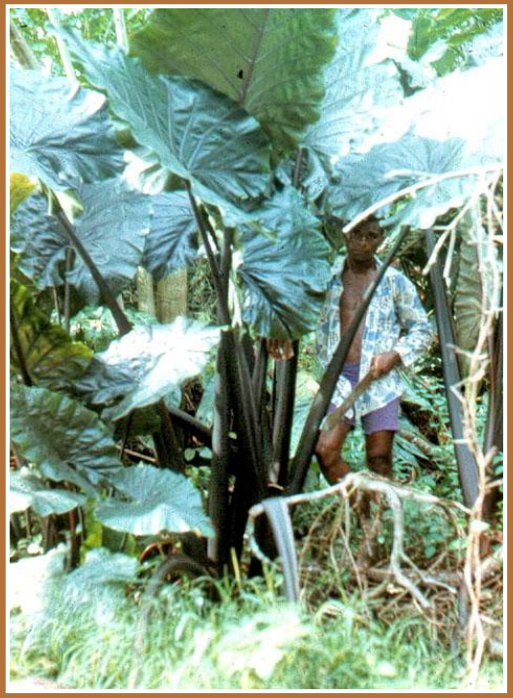
Tannia
Xanthosoma sagittifolium

Taro family plants as food

Swamp taro
Cyrtosperma merkusii

Taro
Colocasia esculenta

Taro family plants as food



Giant taro
Alocasia macrorrhiza

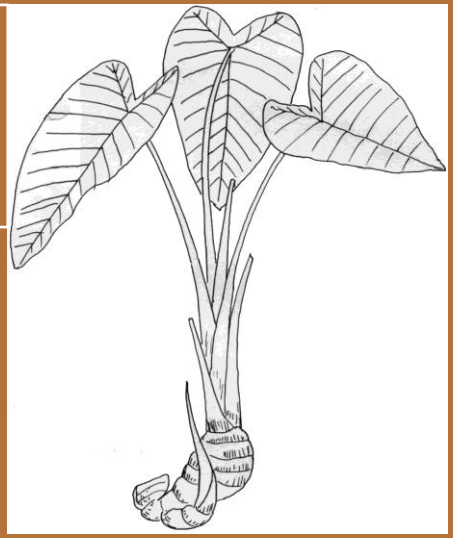
Growing taro family plants

Chinese taro is best grown from the top of the corm in soils that are not wet. It takes about 9 months to be ready to eat. It can grow in moderate shade.

Elephant foot "yam" is grown from small side corms. It suits seasonally dry grassland areas and can be stored.

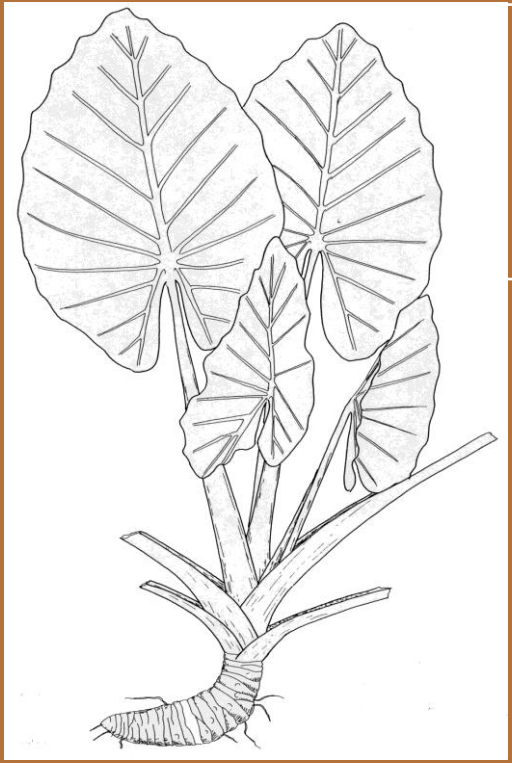
Growing taro family plants

Taro grows best from the top of larger corms. It can grow in moving water and light shade. It takes 6-9 months to be ready to eat.



Swamp taro is grown from the top of the corm, can grow in swamps, and takes 2-3 years to be ready to eat.

Growing taro family plants



Giant taro is best grown from the top of the corm. It prefers drier soil, and takes over 12 months to be ready to eat.

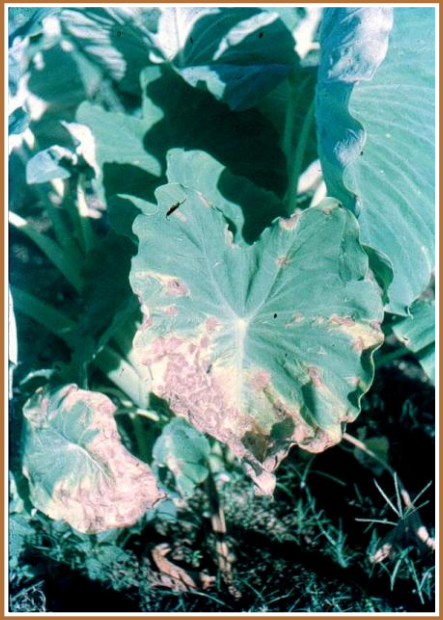
All taro family plants can have kinds that are high in oxalate crystals. These burn the throat and are therefore too 'sour' to eat.

Taro diseases

Taro blight and Alomae/Bobone virus are the most serious taro diseases.

Alomae/Bobone virus

Use a mix of varieties and mixed cropping to reduce damage.



Taro blight - a devastating fungal disease

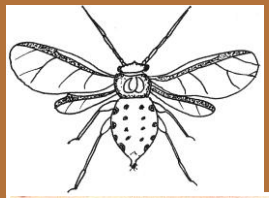
Taro diseases

Taro shot hole - a minor fungal disease

Taro mosaic virus

Taro diffuse yellow leaf spot

Taro insect pests



Aphids sucking sap

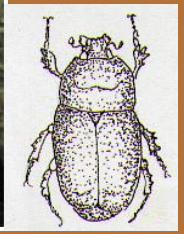
Taro hawkmoth

Grasshopper nymphs on taro

Taro insect pests

White fly on taro

Cluster caterpillar



Taro beetle

Kumara or sweet potato

There are many different kinds of sweet potato. Some grow quickly, but only give small amounts of food. Grow a mixture to make meals more interesting.

Sweet potato needs:

- Air in the soil. Plant them in mounds if soil is wet or clay.
- A position in full sun.
- A soil rich in nutrients especially potash (ashes).

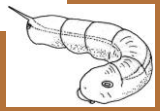
Sweet potato pests & diseases

Elsinoe scab

Leaf spot

Leaf miner

Hawk moth



Sweet potato borer

Hawk moth

Avoid serious pest and disease problems by improving the soil so plants grow quickly and well. Many insects chew sweet potato leaves. This has little affect on yield if plants are growing well.

Bananas

There are 650 different kinds of bananas

Bananas are normally grown from suckers

Bananas with seeds can produce seedlings and breed new types.

Seeded varieties are needed for breeding and crossing.

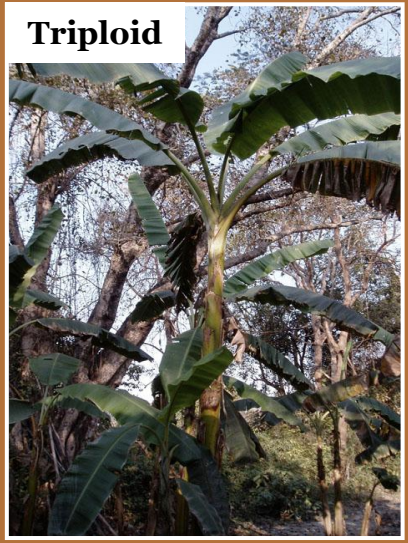
Banana types

A new type of banana that comes from crossing is called a hybrid

Bananas belong to three different breeding groups:

Diploid

Triploid



Tetraploid

Diploid bananas are smaller and harder to grow. The best cooking bananas are triploid. Triploid and tetraploid bananas usually get less disease, and often grow in poor soils.

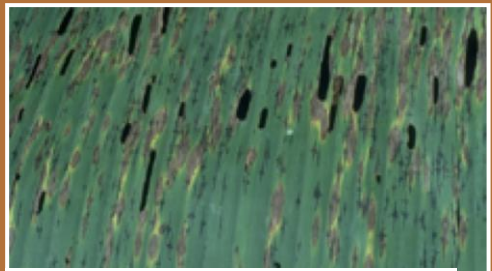
Banana diseases

Black spot

Several different fungi cause leaf spots on banana leaves, especially in wet seasons.

Sigatoka leaf spot

Banana rust



Black cross and leaf spot

Choose banana varieties that show less of these diseases.

Diamond leaf spot

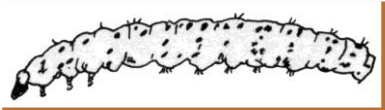
Banana insect pests

Rhinoceros beetle - some Rhinoceros beetles and taro beetles can dig into banana stems and roots and make plants weak.

Shot hole weevil - several caterpillars, grasshoppers and weevils chew banana leaves. Grow plants well so that new leaves grow quickly.

Banana insect pests

Banana scab moth -
the banana scab moth is a very small moth that hides from the sun under flower bracts. The grubs spoil the fruit. Pull flower bracts off and use varieties with widely spaced fruit.



Banana weevil borer
- the banana weevil borer can dig into the roots of banana plants causing them to fall over.

Cassava

Cassava is grated to make cassava cakes

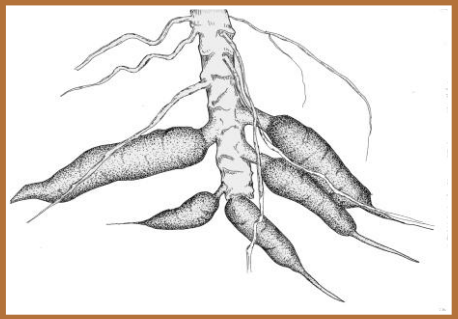
Cassava should always be well cooked as it contains a bitter poison called cyanide that can build up in the body and damage nerves. Cooking removes this.

Cassava leaves can be cooked and eaten.

Cassava is a root crop that is easy to grow, can be stored in the ground, will grow in poor soils and survive dry times.

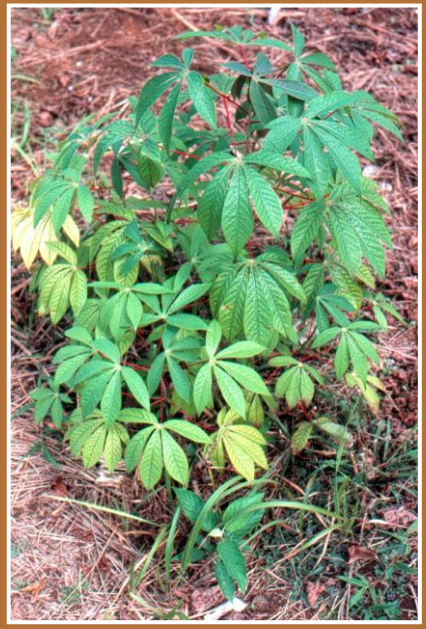
Growing cassava

Cassava is grown by planting woody sections of the stem. Sections about 15 cm long are cut and simply stuck in the ground at any angle. If the soil is loose, it does not have to be dug first.



Cassava crops are usually harvested 10 - 14 months after planting. Yields of roots are lower in very acid soils and in shady places.

Some problems with cassava



Older leaves going yellow means the soil is short of nitrogen.

Cassava leaves often get brown spots due to a fungus. It does not normally get too bad in good soils.

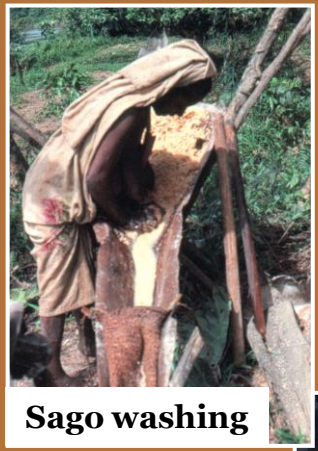
Young leaves turn yellow when the soil is sour, as in limestone and coral sites.

Like most root crops, cassava produces more food if the soils are rich in potash. Ashes from fires have potash.

Sago

Sago is a very good energy food, but has no other food nutrients.

Sago grubs



Sago washing

Common sago will grow well in swamps, and is a good way to use swampy land.

Always eat other foods as well as sago.

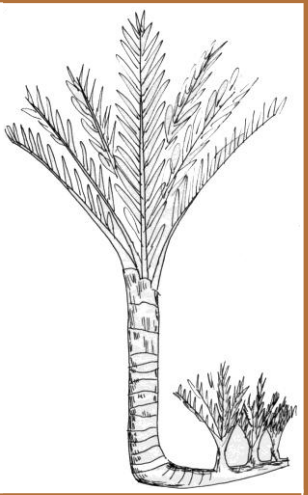
Sago pounding in PNG

Solomon's sago

Common sago

Growing sago

Solomon's sago does not produce suckers so is grown from the large seeds. *A seed is planted into soil that is not too damp. It cannot grow in swamps like common sago.*

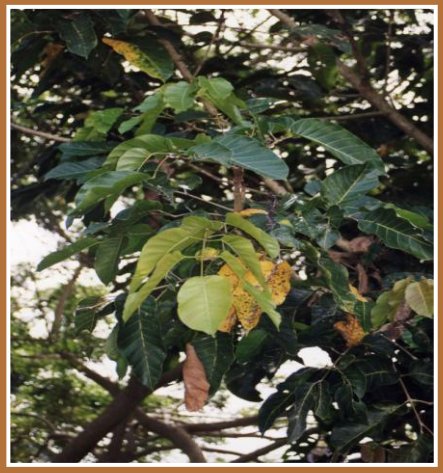


Common sago is usually grown from suckers. Sometimes it is self-sown from seeds. *A sucker of the preferred type is cut off and planted into damp soil.*

Breadfruit family

Breadfruit
Artocarpus altilis

Rakwana
Parartocarpus venenosus



Jackfruit
Artocarpus heterophyllus

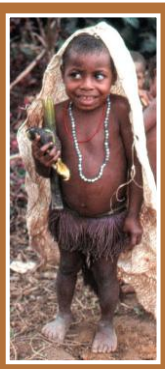
Breadfruit

There are many varieties of breadfruit

Seedless breadfruit

Breadfruit is seasonal so it needs to be stored for later use.

Seeded breadfruit



Young leaves can be cooked and eaten

Growing breadfruit

Seedless breadfruit is grown from root suckers

Trees need a warm, humid, tropical climate and a well-drained soil.

Seeded breadfruit is grown from seeds. These need to be sown while fresh.

The breadfruit season can be extended over 5-6 months by using different varieties with overlapping fruiting times. Trees can start to bear after 3-5 years and can produce 50-150 fruit in a season. A large tree can produce up to 700 fruit. It takes 65-95 days from flowering until the fruit are ready.

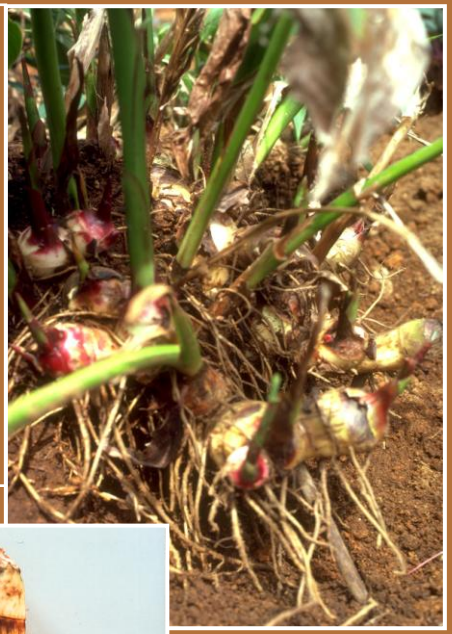
Some minor root crops

This root crop is grown from small tubers. It is harvested after the leaves die back. The tubers are scraped and mashed, then prepared like sago.

Polynesian arrowroot

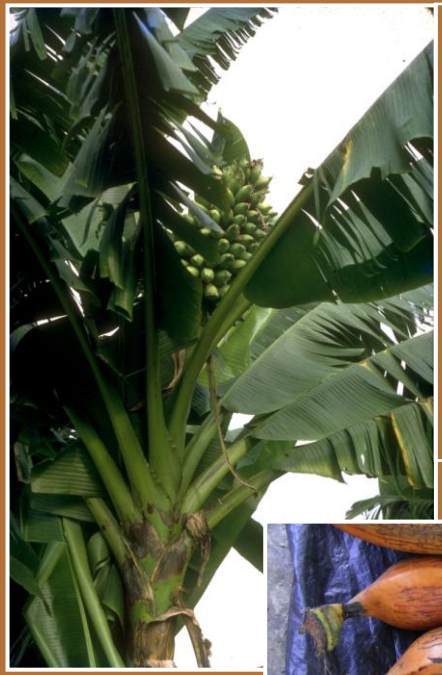
Flower

This clumpy plant grows about 2 m high and has red flowers. A tuber is planted about 15 cm deep and the root is ready to harvest after 8 months. It can be boiled or baked or have starch extracted.



Queensland arrowroot

Other starchy crops



Fei banana

This banana plant has fruit that stick upwards. The fruit are large and yellow inside. They are cooked. They colour the urine and faeces red.

Some varieties of winged bean, when grown in the hills and with the flowers picked off, will form fattened roots. These are good for roasting and eating.

Winged bean

Notes

Notes

Acknowledgements
The production of this booklet has been made possible through the support of the Food Plants International and Learn♦Grow teams, the Rotary Clubs of District 9830, particularly the Rotary Club of Devonport North who founded the project, and the Rotary Clubs of Launceston West and Hobart. The development and implementation of the program in Solomon Islands would not have been possible without the support of Rotary District 9600 and the Rotary Clubs of Honiara and Gizo, and this is gratefully acknowledged.

Funding and in-kind support from the following individuals and organisations is gratefully acknowledged: Rotary District 7610 and the Rotary Club of Burke; Rotary Club of Devonport North ; Rotary Club of Parkes; Rotary District 9640; Crawford Fund; Chas Kelly Transport; Carolyn Wootton; Kieran Bradley (Workhorse Design Group); Troy Melville (Move Media); Print Domain

Nothing would have been possible without the commitment and support of the volunteers, some affiliated with Rotary Clubs, and some not, who have shared the vision, and unselfishly given their time and energy over several years to support this project.

Cover and background graphic design – Kieran Bradley (Workhorse Design Group)
Editorial review – John McPhee, Buz Green
Pre-press layout and formatting – John McPhee