

Potentially Important Food Plants of Sierra Leone



**FOOD PLANT
SOLUTIONS
ROTARIAN ACTION GROUP**

*Solutions to Malnutrition
and Food Security*



**Africa Youth for
Peace and Development**



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

www.foodplantsolutions.org



Africa Youth for Peace and Development

AYPAD is a youth serving, empowerment, and advocacy movement with a mission and vision of ensuring peace and development among youth around Africa through enabling empowerment activities. We welcome this noble opportunity to partner with Food Plant Solution a credible institution working to aid grass roots organizations like ours.

This Field Guide will be a powerful tool to improve the nutritional values on the diets of many people through increasing the variety with less known foods. Matching our values, we believe this partnership will create an impact on our agricultural projects and the lives of many women and youth.

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AYPAD MANGEMENT TEAM

Potentially Important Food Plants of Sierra Leone

Dedication

This book is dedicated to the 3 billion hard working farmers and families around the world who cultivate these, and other, food plants for their own subsistence, and who help conserve them in their rich diversity for other people to enjoy.

Preface

This guide is based on information from the Food Plants International (FPI) database developed by Tasmanian agricultural scientist Bruce French. The source material and guidance for the preparation of the book has been made possible through the support of Food Plants International, the Rotary Clubs of District 9830, particularly the Rotary Club of Devonport North who founded Food Plant Solutions, (previously the LearnGrow project), and many volunteers who have assisted in various ways.

The selection of plants included in this guide has been developed by Lyndie Kite working in a voluntary capacity using the selection criteria developed by Food Plant Solutions. These selection criteria focus on the local plants from each of the main food groups with the highest levels of nutrients important to human nutrition and alleviation of malnutrition. It is intended as a **Draft Guide only** to indicate some important food plants that serve as examples for this purpose. Other important nutritious plants may be equally useful, and it is recommended that the FPI database be used to source information on the full range of plants known to occur in Sierra Leone. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Sierra Leone, and on the understanding that it will be further edited and augmented by local specialists with appropriate knowledge and understanding of local food plants.

Food Plant Solutions was initiated by the Rotary Club of Devonport North to assist in creating awareness of the edible plant database developed by Food Plants International, and its potential in addressing malnutrition and food security in any country of the world. In June 2007, Food Plant Solutions was established as a project of Rotary District 9830, the Rotary Club of Devonport North and Food Plants International. The primary objective of the project is to increase awareness and understanding of the vast food resource that exists in the form of local plants, well adapted to the prevailing conditions where they naturally occur, and how this resource may be used to address hunger, malnutrition and food security. For more information, visit the website www.foodplantsolutions.org. More detailed or specific information on plants, including references to material by other authors, is available on DVD on request.

Disclaimer: This Field Guide has been produced using information from the “Edible Plants of the World” database compiled by Bruce French of Food Plants International. Although great care has been taken by Food Plants International and Food Plant Solutions, neither organisation, or the people involved in the compilation of the database or this Field Guide:

- makes any expressed or implied representation as to the accuracy of the information contained in the database or the Field Guide, and cannot be held legally responsible or accept liability for any errors or omissions
- can be held responsible for claims arising from the mistaken identity of plants or their inappropriate use
- assume responsibility for sickness, death or other harmful effects resulting from eating or using any plant described in the database or this Field Guide

Always be sure you have the correct plant, and undertake proper preparation methods, by consulting with specialist scientists or local users of the plant. The Food Plants International database, from which the information in this Field Guide is drawn, is a work in progress and is regularly being amended and updated.

Contents

INTRODUCTION	1
STARCHY STAPLES	11
LEGUMES	20
LEAFY GREENS.....	28
FRUIT	34
VEGETABLES.....	43
NUTS, SEEDS, HERBS AND OTHER FOODS.....	51
NUTRITIONAL VALUES OF FOOD PLANTS BY PLANT FAMILY	56

Introduction

This book is designed as a simple introduction to the more common food plants of Sierra Leone. It is hoped people will take greater pride and interest in these plants and become confident and informed about how to grow and use them. Many of the local food plants that occur in every country are very good quality foods. Unfortunately, people often reject traditional food plants and grow more of the introduced vegetables, such as ballhead cabbage. These do not have the same food value as many traditional, tropical, dark green, leafy vegetables.

Growing food

Growing food to feed a family is, without doubt, one of the most important things anyone can do. The more interest you take in your garden and the more you learn about plants and how to grow them well, the more interesting and fun food gardening becomes.

A country with very special plants

The local food plants of most countries have not been promoted and highlighted in the way they deserve. Visiting a local food market will quickly show what a rich variety of food plants can be grown in this country. Good information about these plants is often still in the minds and experience of local farmers, and has not been written down in books. This can make it hard for the next generation of young people to find out how to grow them.

In many countries, some of the traditional food plants are only harvested from the wild and others are only known in small areas. Others have hundreds of varieties and are the main food for people in different regions. Information on all these plants, their food value and the pest and diseases that damage them is available in the Food Plants International database.

Getting to know plants

People who spend time in gardens and with their food plants get to know them very well. It is a good idea to learn from someone who grows plants well. Each plant grows best in certain conditions and there are often special techniques in getting it to grow well. For example, sweet potato will not form tubers if the soil is too wet, but it may still grow lots of green leaves. Taro will grow in light shade, but sweet potato will not. Ginger can grow in fairly heavy shade. Pruning the tips of betel leaf or pepper vines will cause more side branches to grow and therefore, produce more fruit. Stored yam tubers need special treatment if you want them to put out shoots early. There are lots of unique things about every plant and learning about these helps a good gardener produce more food.

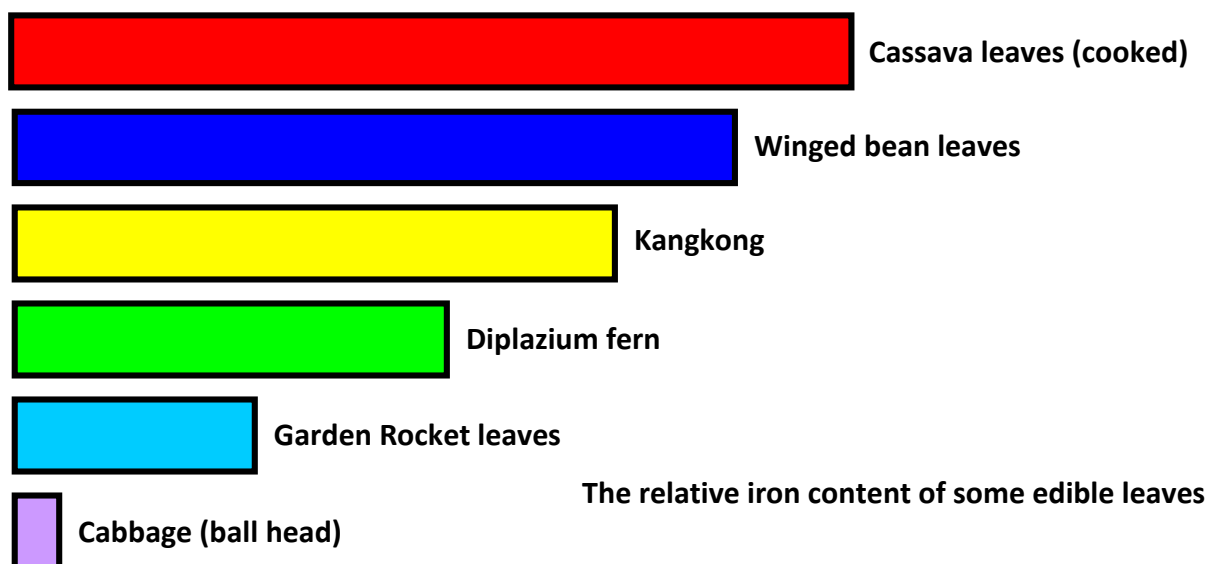
Naming of plants

Many food plants have local names, as well as a common English name. Every type of plant also has its own scientific name. Although the scientific name might not be widely recognised, this is the link by which people in different countries and with different languages can recognise the same plant. We know that many plants are grown in many different countries, but relying on local or common names, we might not recognise the same plant grown in different places. By using scientific names to accurately identify plants, we can get useful information from people in other countries. Wherever possible, plants in this book are named by their common English name and their scientific name.

Local food plants are often very good

People sometimes think that local food plants are not very special and that any food plant that is new or comes from another country must be a lot better. This is often not true. Many of the newer or introduced food plants, such as the round or ballhead cabbages, have very little food value. Many traditional tropical green, leafy vegetables and ferns have 10 times or more food value as ballhead cabbage or lettuce. It is important to find out more information about the food value of different foods if we want to eat well. Citrus fruit, such as lemons and oranges, are often grown for vitamin C that helps keep people healthy. These fruits do not grow well in the tropics - the common guava fruit has three times as much vitamin C and is loved by children. This is just one example that there are often much better choices of local foods with higher levels of important nutrients.

Our bodies need a variety of food plants to enable us to grow, stay healthy and have enough energy to work. Different foods are needed to provide energy, protein, vitamins and minerals. The following diagram highlights the iron content value of some traditional edible, tropical plant leaves, compared with cabbage. Iron is a nutrient that is very important for our bodies and especially our blood. People who are short of iron become anaemic and lack energy.



A healthy balanced diet

Good nutrition, or eating a healthy balanced diet, is really very simple. If people eat a wide range of food plants, their bodies will normally get a balanced amount of all the different nutrients they require. If a nutrient is lacking in one food plant, then they are likely to get it from another plant if they are eating a range of food plants. For this reason, everybody should eat a range of different food plants every day. The food group that is especially important for young people is the dark green leaves. Everyone should eat a good serving of dark green leaves every day. They have many vitamins and minerals, as well as protein. There are many spices or flavouring plants that can improve the taste of foods, but taste should be considered separately from food value.

Learning to cook well

Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Many plants in the tropics develop cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) only become available when food is cooked in oil.

Learning to grow “wild” food plants

Many plants grow wild in the bush and are not cultivated by people. We can normally find someone who has taken an interest in them and has learned to grow them. This may be people from a different language group. It may be that in their area they have found better types than the ones that simply grow wild.

Saving better types of plants

If we simply allow plants to grow from seed, the improvements that have been made in finding sweeter or better types may get lost. Some fruit trees are like this and the fruit produced may not be sweet at all. It is often necessary to take cuttings from a tree to be sure the new plant is exactly the same as the old one. If the plants won't easily grow from cuttings simply by sticking a piece of the branch in the ground, there are other ways of helping these plants to form roots and start to grow. One good way is to make a small cut in the bark of a young branch and then wrap soil around the cut and cover it with plastic. With plants like guava, new roots will start to grow from this cut and grow into the soil wrapped around the branch. It can then be cut off and planted. This is called air-layering. A similar method is used with the roots of breadfruit. A shallow root is uncovered and a small cut made from which a new sucker will start to grow. This can be cut off and replanted.

Growing from cuttings and suckers

Many food plants are grown from cuttings and suckers. This is very important, as it allows all the different kinds of yams, taros, bananas, sweet potato and sugarcane to be continually grown and ensures the varieties are preserved. Each plant has its own special propagation method. It is important to use healthy planting material, as diseases can be spread in planting material.

Saving seed

Some food plants are grown from seed. Sometimes this is very easy as the seeds are large, store well, grow easily and grow the same as the original plant. It is more difficult with other plants. Many large fleshy seeds, such as breadfruit, need to be planted while still fresh as they do not store easily. Other seeds do not “breed true” or do not grow into new plants that are the same as the original plants. For example, the fruit may not be as large or sweet or have the same colour or taste. With many of these plants, it may be necessary to find ways of growing them from cuttings or other methods such as grafting. Some plants “inbreed” and get smaller or poorer. This happens when a plant self-pollinates or receives pollen from a close relative. Corn grown in small plots normally does this and the plants grown from seed grown in this situation get smaller and smaller each year. The seed needs to be saved from several different plants with different history and then mixed together before sowing. All the seeds on one cob are related and will inbreed. Some seeds develop a hard seed coat and need to be scratched, soaked in water, or even put into hot water, before they will start to grow. Saving local seeds is often a good idea as they are already adapted to local conditions. For example, seed saved from pumpkins grown locally will produce plants with less pest and disease damage than those grown from imported seed. *If you can't get seeds or planting material from local gardens – it is probably not a suitable local plant!*

Growing a garden of mixed plants

In nature, one variety of one plant never grows alone. There are always lots of different plants of different kinds and sizes, all growing together. Anyone who has ever walked into a tropical jungle will know this very well. The reason people all over the world want to save the rainforest is because it has so many different kinds of plants all growing together. Growing plants in a food garden in a way similar to how they grow in nature, as a mixed group of plants, is very good agriculture. Mixing plants in a garden usually gives more reliable food production, as any disease from one plant will wash off in the rain onto a different plant, where it cannot survive. Small plants fill the gaps and reduce the need for weeding.

Different types of plants for food security

There is another reason for growing a range of food plants in a local garden or around a village. If something goes wrong, like extreme insect damage to plants, some disease occurring in the garden, or a poor growing season, some plants will be more

damaged than others. With a variety of plants, there will still be some food to eat until the other plants recover and grow again. Also, a wide variety of plants will mean that different ones will be maturing at different times, which helps ensure a continuous supply of food. There are shrubs that can be planted as edible hedges around houses, and fruit and nut trees that need to be planted as a gift for your children, several years before they will be able to enjoy them. Some nuts can be stored and eaten when other foods are not available. Most yams will store well for a few months.

Looking after the soil

Gardeners in traditional tropical agriculture usually move their gardens often by shifting to a new piece of land. There are usually three reasons for this:

- In the tropical lowlands, weeds can become a very big problem. There are usually a lot fewer weeds in the first year or two after clearing and burning the land, but weeds increase in the following years.
- Some of the nutrients in the soil are used each year and the soil becomes poorer and plants do not grow as well. There are ways of reducing this loss of nutrients.
- Very small worms called nematodes build up in the soil after a few years and get into the roots, especially of annual vegetable plants, and stop their roots working properly. For example, root knot nematode will cause the roots of plants like tomatoes and beans to become twisted resulting in poor growth of the plant.

Building up the soil

When a new garden has been cleared, it has lots of leaf mulch and other old plant material. This provides plant nutrients for new plants to grow. There is a simple rule for growing plants and improving the soil - "If it has lived once, it can live again." Any old plant material can provide nutrients for new plants to grow, but it must be allowed to rot into mulch or compost for this to happen. If this plant material is burnt, some nutrients, especially phosphorus and potassium ("potash"), get left behind in the ashes for new plants to use, although it also allows these important nutrients to be lost by being washed away by rain. But with burning other important nutrients, such as nitrogen and sulphur, get lost in the smoke and disappear from the garden and soil. These last two plant nutrients are especially important for growing green leaves and when their levels are low, plants grow small or pale green. When nitrogen is lacking, the old leaves of the plant go pale and fall off early, and when sulphur is lacking, the young leaves go pale. Wherever possible, old plant material should be covered with some soil to allow it to rot down and not simply dry out or get burnt.

Poor soils where crops won't grow

When soils are very acid (or sour), plants cannot get the necessary nutrients. Natural chemicals in the soil that are toxic to plants when present at higher levels become soluble, get into plants, and stop them growing. Adding limestone to these soils can improve them. Using compost will not make them less acid, but will keep the plant nutrients in the soil in a more readily available form that plants can use.

Soil nutrients

Plants need 16 different kinds of plant food or nutrients in different amounts to grow properly. A plant that has already been growing will have these nutrients in them and probably even have them in a balanced amount. That is why composting old plant material is so important. Plants usually show some signs or symptoms if any of these nutrients is running out.

One of the most common and important nutrients for plant growth is nitrogen, which actually comes from the air, but gets into plants through the soil. When plants are short of nitrogen, their older leaves often become yellow or pale. When grass family plants, like sugarcane and corn, are short of nitrogen, the centre of the oldest (lowest) leaves starts to develop a dry or dead V-shape. The plant cannot find enough nitrogen in the soil so it gets it from an old leaf to grow a new leaf. This causes the old leaf to die, forming a characteristic V-shape in the centre of the leaf. The plant does not get any bigger as an old leaf dies each time a new leaf is produced. Village farmers often walk through grassland before they clear it for gardens, looking to see if the grass leaves are dry and dead, because they know gardens on this soil won't grow well. It is necessary to use compost or legumes (such as beans) to put nitrogen back into the soil. Growing plants from the bean family (legumes) is the most efficient way to increase the level of nitrogen in the soil.

Corn is a good plant for indicating which nutrients are running short in the soil. If the older leaves go dry along the edges, the soil is running out of potash. If leaves that are normally green develop a bluish colour, the soil is short of phosphorus. Generally, leafy crops need lots of nitrogen, and root crops need lots of potash.

Making compost

Compost is old plant material that has been allowed to rot down into a fine, sweet smelling mulch that is full of nutrients that can be put back on the soil to grow new plants. Making good compost is very simple. A simple heap of plant material can be made in the corner of a garden or near a house. The composting process is carried out by small bacteria that live in the soil and feed on decaying plants. They break down old plant material into compost. These bacteria are living, so they need air, water and food. A good compost heap must have air, so don't cover it with plastic or put it in a container. This makes a foul smelling compost, as different bacteria that don't need air turn it into an acid mixture that preserves it. Good compost must have

moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off. As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil.

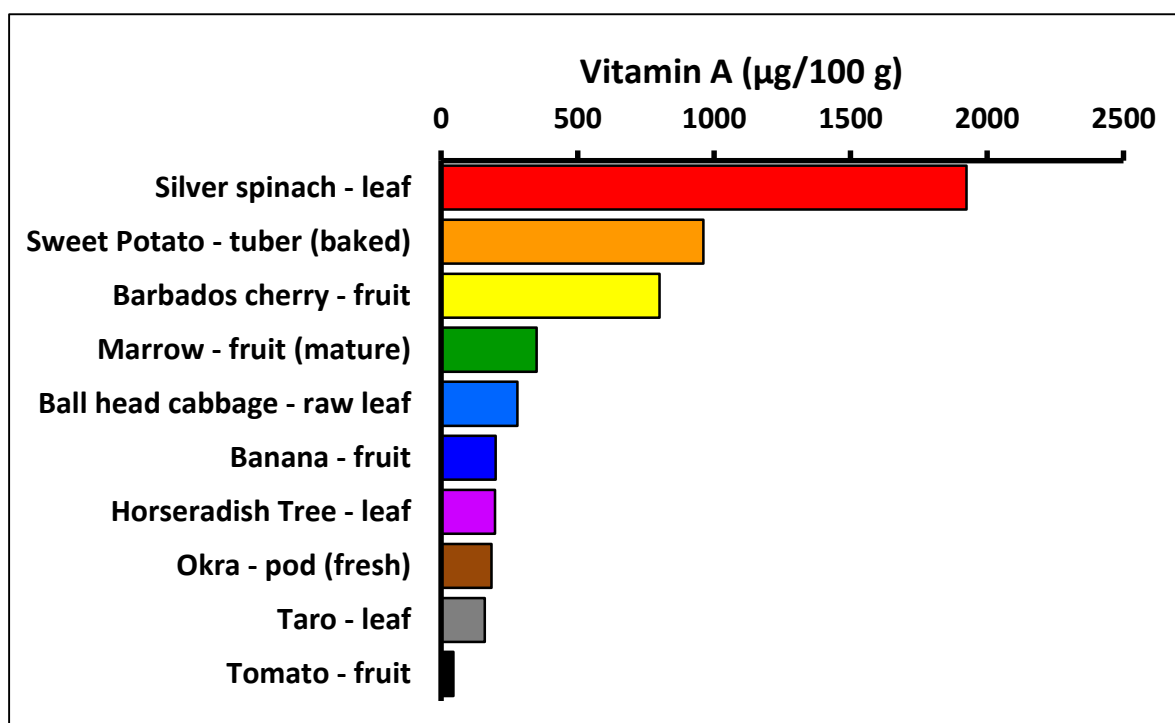
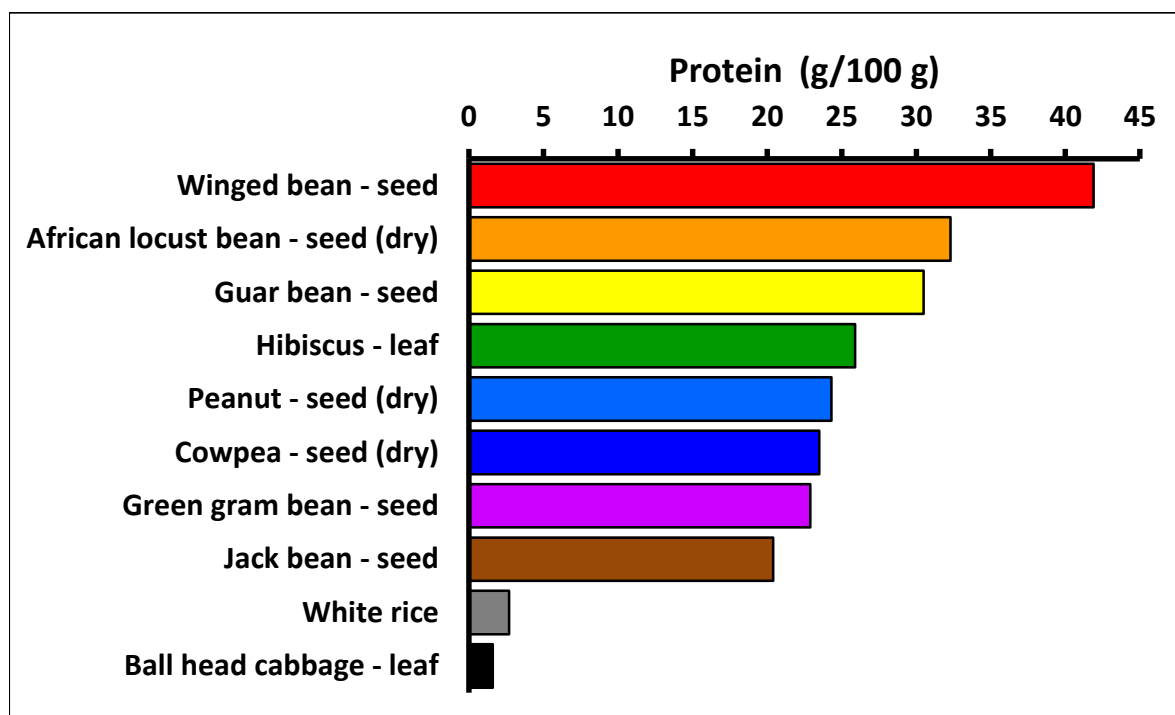
Pests

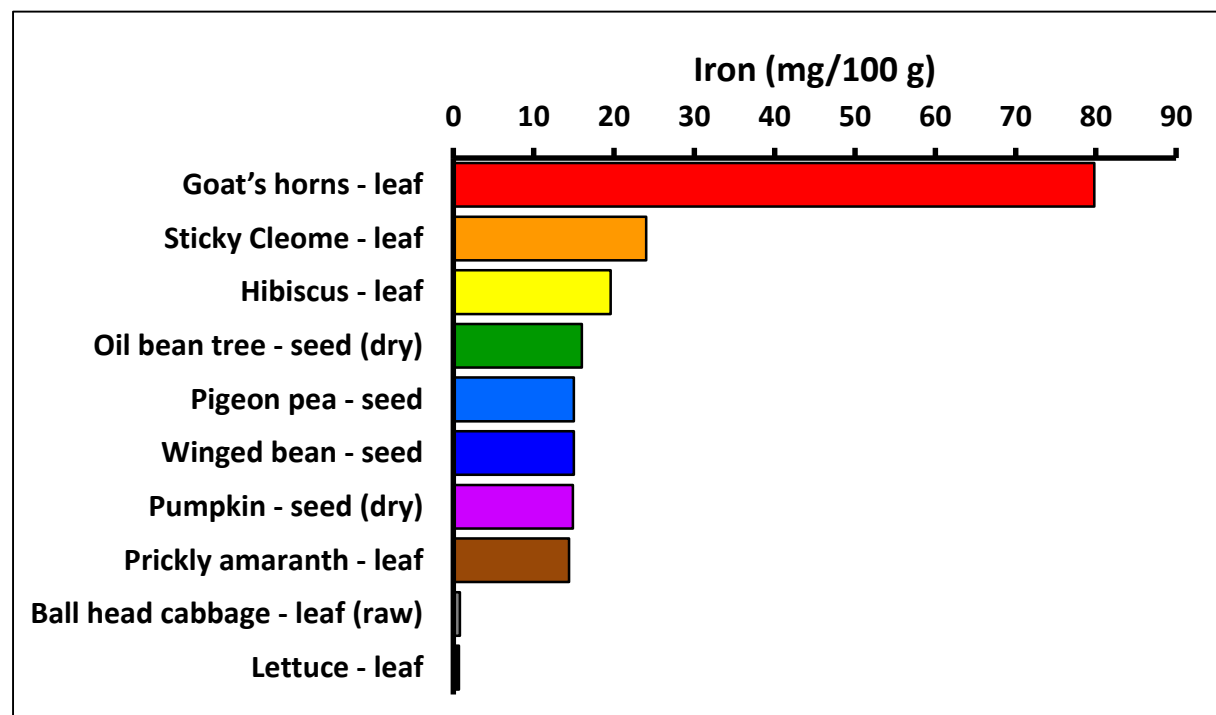
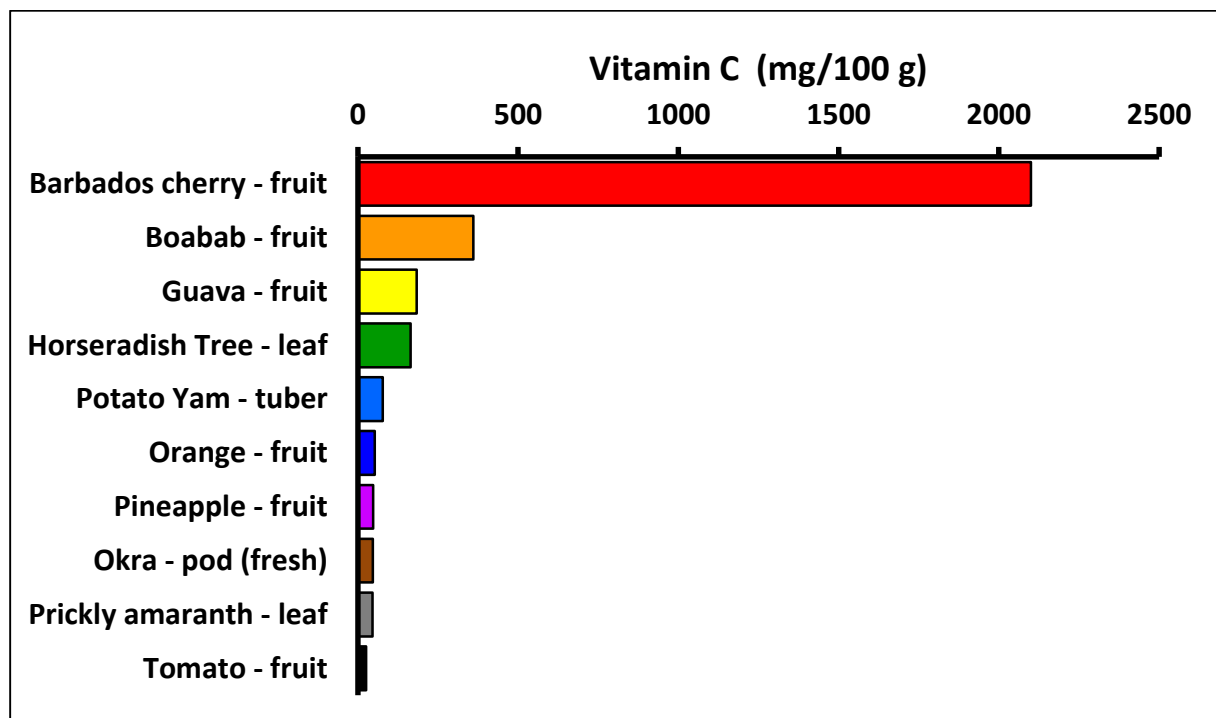
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move “like an army” into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth that damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage.

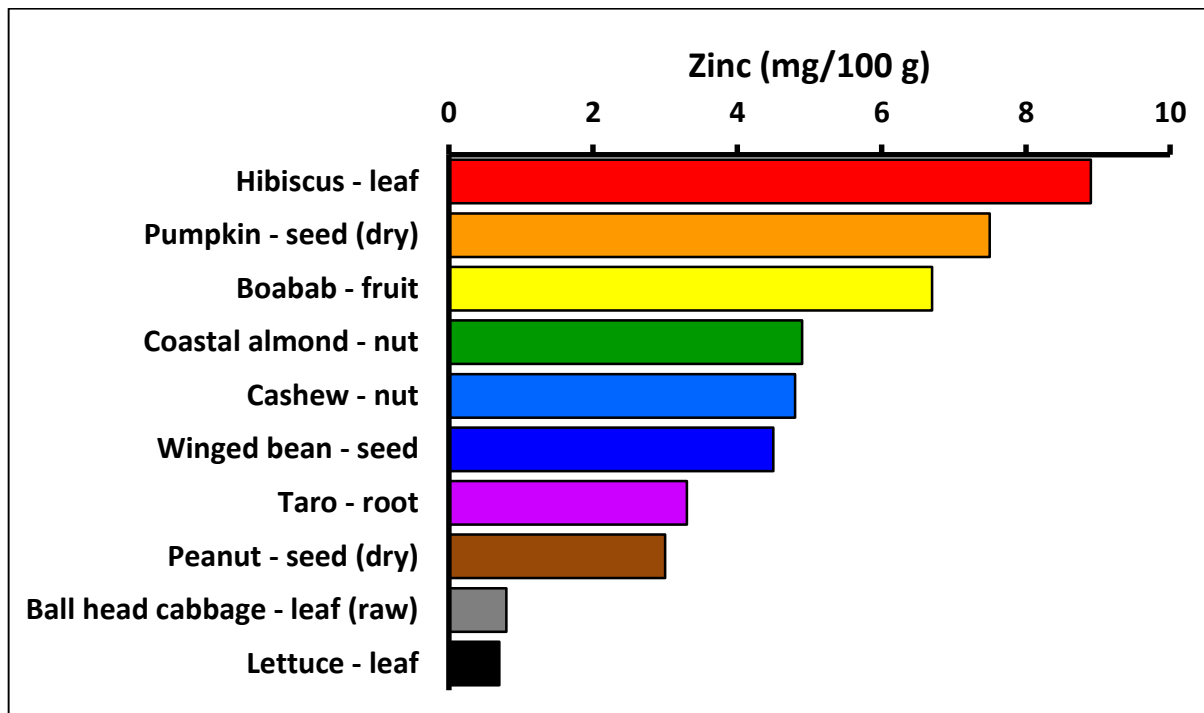
Diseases

The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct dry spots on leaves and other plant parts. Fungi have spores that often blow in the wind. Bacteria are often smaller and live in damp places. They usually make plants go soft and squashy, and they may cause a smell. Bacteria are mostly spread with rain and in water. Viruses are very, very small and usually make irregular stripes and patterns on leaves and other plant parts. Viruses usually spread in planting material or in the mouths of small sucking insects. One common fungus disease on sweet potato causes the leaves to become wrinkled and twisted. It usually gets worse in old gardens and where soils are running out of nutrients. It doesn't affect all kinds of sweet potato to the same extent. The answer is not to stop the disease, but to improve the soil. The general rule is that healthy plants that are growing well will suffer less damage from disease.

Food value charts for a selection of plants from Sierra Leone







Note regarding plant selection: In compiling these field guides, we acknowledge that some staple foods and commercial crops which are grown widely in the target country may be omitted. Such foods are often in the starchy staple category (e.g. rice). This does not mean that they are not useful, but merely reflects a desire to concentrate on plants that are less well known and/or underutilised.

Starchy staples

English: Banana

Local: Banana

Scientific name: *Musa sp (A &/or B genome) cv.*

Plant family: MUSACEAE

Description: These are the main group of cultivated bananas. They can be classed into diploid, triploid and tetraploid kinds with various amounts of the A or B parents. They grow 2 - 9 m high. They are large non woody herbs with broad long leaves. Most kinds have several suckers. Bananas grow a soft firm false stem from an underground corm. The fruiting stalk eventually emerges from the top of this false stem and normally curves over pointing towards the ground. Fruit occur in clumps or hands along this stem. The male flowers are in a red bud at the end of the flower stalk. The colour of the stem, bracts, bud and fruit varies considerably depending on the variety. The fruit can be 6 - 35 cm long depending on variety. They can also be 2.5 - 6 cm across.



Distribution: A tropical and subtropical plant. They grow from sea level up to about 2,000 m altitude in the tropics. They are rarely an important food above about 1,600 m. In Nepal they grow to about 1,800 m altitude. They do best in warm and humid tropical climates. Temperatures need to be above 15°C. The best temperature is 27°C. The maximum temperature is 38°C. Bananas grow best in full sun. For best growth, a rainfall of 200 - 220 mm per month is needed. A deep friable soil is best. They can tolerate a pH between 4.5 - 7.5. It suits hardiness zones 10 - 12. It is widely grown in many countries.

Use: Fruit are eaten raw or cooked depending on variety. Male buds and flowers are eaten on some varieties. They are cooked as a vegetable. The central pith of the false stem and the underground rhizome are also sometimes eaten.

Cultivation: They are planted from sword suckers. Diploids need re-planting annually but many triploids can be re-suckered from the base on the same site. Spacing depends on variety. A spacing of 1,000 – 3,000 plants per hectare is used depending on variety. Suckers are usually put 30 cm deep.

Production: Time to maturity varies from 6 - 18 months depending on variety and altitude. Triploids have larger bunches than diploids. Tetraploids are very large plants.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (cooking)	65.3	510	2.0	113	18.4	0.6	0.1
fruit (sweet)	70.7	365	1.7	-	2	0.9	0.4
flower buds	91.3	109	1.6	-	-	1.0	-

Starchy staples

English: Taro

Local: Cocoa root

Scientific name: *Colocasia esculenta*

Plant family: ARACEAE

Description: This plant has large flat leaves on the end of upright leaf stalks. It grows up to 1 m high. The leaf stalk or petiole joins the leaf towards the centre of the leaf. The leaves are 20 - 50 cm long. Near the ground a thickened rounded corm is produced. Around this plant there is normally a ring of small plants called suckers. Many different varieties occur. If left to maturity, a lily type flower is produced in the centre of the plant. It has a spathe 15 - 30 cm long which is rolled inwards. The flowers are yellow and fused along the stalk. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and



Colocasia esculenta var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.

Distribution: It is a tropical plant. Taro grows from sea level up to about 2,300 m altitude in the tropics. It grows well in humid places. It can stand damp soil and grow under light shade. It suits hardiness zones 9 - 12.

Use: The corms, petioles and leaves are all edible after cooking. The leaves are also dried and stored. Fresh leaves can be stored for 4 - 5 days. **Caution:** Some varieties burn the throat due to oxalate crystals.

Cultivation: Taro can be planted from cormels or from the top of the central corm. Other sections of the corm could also be used but this is not commonly done. Flowering of taro and seed production can lead to new cultivars. Flowering can be promoted by the use of gibberellic acid. The general growth pattern is for an increase in top growth, in terms of leaf number, leaf area and petiole length, to continue for about 6 months under tropical lowland conditions then for each of these to decrease and tuber storage to continue to increase. Corm weight increases significantly from 5 - 11 months. Starch content also increases with time but protein content declines over the corm development period.

Taro can be grown under flooded conditions but root rots develop if the water becomes stagnant. For flooded cultivation, the land is cleared, ploughed, cultivated and puddled. The aim is to get a field that is flat with embankments allowing the impounding of water. Planting is done into 2 - 5 cm of standing water.

For dryland taro, the soil is prepared by digging, unless a fresh bush fallow is used where the natural friability of the soil allows plants to be put into the undug soil in a small hole that is prepared. Plants are put into a hole 5 - 7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth is beneficial. Setts from corms normally give higher yield than that from cormels. The greater leaf area and root production may be responsible for this. Setts of about 150 g are optimum.

The time of planting is primarily determined by the availability of moisture. Planting is done shortly after the rainfall has become regular, if seasonally distinct wet and dry occur. Higher rainfall, higher

temperatures, and higher hours of sunlight, enhance production and determine seasonality of production.

Evapotranspiration for flooded taro averages about 4 mm per day, ranging from 1.5 - 7.2 mm, with a total of about 1,200 mm for the crop. Intermittent moisture can result in irregular shaped corms. Flooding has been found to be more effective than sprinkler irrigation, or furrow irrigation. Increased suckering, giving greater leaf area, seems to be the reason for this.

Taro is sensitive to weed competition throughout most of its growth, but it is more critical during early growth up to 3 - 4 months. About 7 - 9 weedings are required, to keep the crop clean under tropical lowland conditions, where flooding is not used. Due to the decrease in height and leaf area towards the end of the growth cycle when starch accumulation in the corms is maximum, weed competition and weed control are again significant. Mechanical weeding needs to be shallow to avoid damaging the superficial taro roots. A range of herbicides have been recommended in various situations.

Taro produces the highest dry matter yield under full sunlight, but it can still grow under moderate shade. Under shaded conditions it grows more slowly and develops fewer cormels. They require good moisture conditions and have little tolerance for drought. Taro residue has an allelopathic factor which can reduce the germination and growth of other plants, for example, beans.

Taro tends to demand high fertility, and is responsive to additional NPK fertiliser. Higher doses of K increases starch content and higher doses of N increases protein content. Both N and K applications increase oxalic acid content of the tubers.

Spacing affects total yield, and marketable, harvestable yield, of corms. Close spacing increases the corm yield per area, and the shoot yield per area, but decreases the corm yield per plant, and the contribution of sucker corms, to the yield. Where spacings of 30 cm x 30 cm are used, giving about 110,000 plants per hectare, a very large amount of planting material is required, which reduces the net return per unit of planting material. A spacing of 60 cm x 60 cm is more common. Wider spacings of 90 cm x 90 cm reduces overall yield.

Production: Crops mature in 6 - 18 months. Yields of 5 - 15 tonnes per hectare are probably average.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	66.8	1231	1.96	3	5	0.68	3.2
leaf	85.0	210	5.0	57	90	0.62	0.7
leaf stalk	93.0	101	0.5	180	13	0.9	-
leaf (cooked)	92.2	92.2	2.7	424	35.5	1.2	0.2

Starchy staples

English: Bullrush millet, Pearl millet

Local: Kus-kus

Scientific name: *Pennisetum glaucum*

Plant family: POACEAE

Description: An annual grass that grows to 3 m tall. The leaf blades are 20 - 100 cm long by 2 - 5 cm wide. The flower is dense and 40 - 50 cm long by 1.2 - 1.5 cm wide. They also vary in shape and size. Plants that tiller produce smaller heads. The species varies a lot. There are 13 cultivated, 15 weed and 6 wild races of this grass. It has a cylindrical ear like a bullrush. The grains are small and round and have a shiny grey colour like pearls. There are thousands of cultivated varieties.



Distribution: A tropical plant that suits regions with a short growing season. It grows in areas with less than 600 mm of rainfall. It is replaced with sorghum between 600 - 1,200 mm rainfall and then by finger millet or maize above 1200 mm rainfall.) It is important in the drier areas of India and Pakistan. It can grow in arid places.

Use: The seeds are eaten like rice. They are also ground into flour and made into bread and cakes. They are used to make alcoholic drinks. They are mixed with other grains and seeds to make fermented foods. Some kinds have sweet stalks that are chewed. The young ears can be roasted and eaten like sweet corn.

Cultivation: Plants are grown from seed. It is usually sown directly into the field. The plant density is adjusted to suit rainfall and soil fertility. The spacing is 45 cm apart up to 200 cm apart. It is also intercropped with other crops such as cowpea, sorghum and peanut. Crops are normally weeded 2 or 3 times.

Production: It takes from 75 - 180 days to maturity. The heads can be picked by hand or the plant removed. Some types need to be picked 2 or 3 times as heads mature.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	13.5	1363	12.7	-	-	3.5	-

Starchy staples

English: Potato yam

Local: Poliapul

Scientific name: *Dioscorea bulbifera*

Plant family: DIOSCOREACEAE

Description: A yam with a long smooth stemmed vine, round in cross section and without spines. The vine winds to the left, can climb into trees and grow to long lengths. The large leaves (14 - 30 cm across and slightly longer than wide) have pointed tips and round bases. About 7 veins arise from the tip of the leaf stalk. It produces often flattened bulbils (potatoes) in the leaf angles along the vine. They can be grey brown or purple. The smaller tuber underground is normally covered with roots. The flowers are large. The male flowers are in spikes up to 20 cm long. The female spikes are usually in pairs. The winged fruit are about 2.5 cm long by 1.5 cm across. The seeds have wings. The bulbils normally have few fibres through the tissue compared to some yam tubers. Many varieties have yellow flesh.



Distribution: An annual tropical plant. It will grow from the coast up to about 1,700 m altitude in equatorial zones. It is common near the edge of grassland and forest at mid altitudes. Both wild and cultivated forms occur. It is common near secondary forest at low and medium altitudes.

Use: The cooked tubers are eaten. More commonly the cooked aerial bulbils are eaten. Some kinds are bitter and inedible or at least require special processing and cooking. Some varieties are poisonous.

Cultivation: Either the vine bulbils or the underground tubers are planted. It is convenient to train the long vines up trees. The bulbils need a set storage time before sprouting. The leaves die off for 1 - 4 months each year before re-sprouting from the tuber. Bulbils only grow shoots from one end unless the bulbil is cut into pieces. If the larger bulbils are cut, the cut surfaces should be dried and healed in a shady place for 2 - 3 days before planting. Bulbils are planted 8 - 12 cm below ground at a spacing of about 100 cm by 100 cm. Normally nitrogen and potassium fertilisers give greater responses than phosphorus. Friable well drained soils are most suitable. Often little cultivation or mounding is done. A high level of organic matter improves yield. Strong staking is required with branched 2 m stakes, or with trees or living stakes. Vine and tuber growth can be extensive and heavy.

Production: Bulbils or aerial yams are produced as leaves begin to unfold, continue until plant maturity, and often fall. Harvesting can start 3 months after planting but immature tubers have less starch. Underground tubers are normally not harvested until leaf die back. Wounds and damage to the tubers normally heal naturally given dry aerated conditions. Some varieties have seasonally dormant aerial tubers which only grow after an extended storage period. Others germinate quickly.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
tuber	70.8	357	2.7	-	78	3.1	0.4
bulbil	79.4	326	1.4	-	-	2.0	-

Starchy staples

English: Sweet potato

Local: Petete

Scientific name: *Ipomoea batatas*

Plant family: CONVOLVULACEAE

Description: This is a root crop which produces long creeping vines. The leaves are carried singly along the vine. Leaves can vary considerably from divided like fingers on a hand, to being entire and rounded or heart shaped. Purple trumpet shaped flowers grow at the end of the vine. Fattened tubers are produced under the ground. There are a large number of varieties which vary in leaf shape and colour, tuber shape, colour, texture and in several other ways.



Distribution: A tropical and subtropical plant. They grow from sea level up to about 2,700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow with a pH between 5.2 - 6.8. Sweet potato are not tolerant to shading. It suits hardiness zones 9 - 12.

Use: Tubers are boiled or baked. They can be steamed, fried, mashed or dried. They can be fermented into alcoholic drinks. They can also be used in pies, cakes, puddings and candies and jams. They can be used in noodles. The chopped and dried tubers can be boiled with rice or ground into flour and mixed with wheat flour to make cakes or bread. The young leaves are edible.

Cultivation: Vine cuttings are used for planting. In grassland soils it is grown in mounds, ridges or other raised beds. In bush fallow, it is mostly planted in undug loose soils. It needs a sunny position. Tubers won't form if the ground is waterlogged when tubers start to develop. Sweet potato is grown by cuttings of the vine. About 33,000 cuttings are required per hectare. These weigh about 500 kg. Vine lengths of about 30 cm are optimum. As long as the vine is adequately inserted in the soil, the length of vine inserted does not significantly affect yield. Fresh sweet potato seeds germinate relatively easily and lead to continuous production of new cultivars under tropical conditions. Excess nitrogen restricts storage root initiation and therefore excess leaves are produced without significant tuber yield. Dry matter percentage increases with increasing age of the crop. Higher dry matter tubers are normally preferred.

Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivars can be selected for increased production under mild shade but not heavy shade. The survival of cuttings at planting is also reduced under shaded conditions. Under shaded conditions, plant become more climbing and with fewer, larger leaves. With increasing shade, fewer tubers are produced and these grow more slowly. Sweet potato tends to be responsive to potassium fertiliser. Cultivars are often selected for yield under low fertility conditions.

Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar, but once ground coverage has occurred, weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason, sweet potatoes are often grown on

mounded beds. In well drained or high organic matter soils, digging or mounding is not as essential. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage, plants need to be hilled or have the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

Production: The time to maturity ranges from 5 months to 12 months depending on the variety planted and the altitude at which it is being grown. Yields range from 6 - 23 t/ha.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3
tuber (raw)	70.0	387	1.2	709	25	0.7	0.4
tuber (boiled)	72.0	363	1.1	787	15	0.6	0.3
leaf	86.3	168	3.9	105	58	2.9	-

Starchy staples

English: Cassava

Local: Casada

Scientific name: *Manihot esculenta*

Plant family: EUPHORBIACEAE

Description: A plant which can re-grow year after year from the thickened roots. It has several stems. The stems are woody and have some branches. Plants grow up to 3 metres tall. Stalks have distinct scars where leaves have fallen. The leaves tend to be near the ends of branches. The leaves are divided like the fingers on a hand. The leaves have long leaf stalks. The leaves have 3 - 7 long lobes which can be 20 cm long. These are widest about 1/3 of the distance from the tip and taper towards the base. The colour varies.



It produces several long tubers. These can be 50 cm long by 10 cm across. The flowers are on short stalks around a central stalk. They are produced near the ends of branches. The female flowers are near the base of the flower stalk and the male flowers higher up.

Distribution: A tropical plant. Plants grow from sea level up to about 1,650 m. In Fiji they grow to 900 m. They can grow in poor soil and can survive drought. It is native to tropical America. It grows between 25°N and 25°S and needs a rainfall above 750 mm. It suits hardiness zones 10 - 12.

Use: The tubers are eaten after thorough cooking. They are boiled, roasted or made into flour. The starch is used in puddings, soups and dumplings. Young leaves are edible after cooking. They are also sometimes dried and stored. Seeds are also eaten. **Caution:** Bitter kinds of cassava contain poison but this is destroyed on heating. This kind of cassava should be cooked, sun dried, soaked and cooked again.

Cultivation: Cassava is planted from sections of the stalk. Sections about 15 - 20 cm long of the more mature woody stem are cut and stuck into the ground. They can be completely buried or put at almost any angle and it affects the growth little. Soon roots form and leaves start to sprout from the stalk. Cassava seeds need a soil temperature of 30°C for their germination. Flower and fruit production is more common under lower temperatures such as in highland or less equatorial conditions.

It is not necessary to dig a hole to plant cassava and on many soils where the soil is loose it can be planted without digging the soil first. Cassava does not suit waterlogged soils and preferably they should not be too shallow or stony.

Cassava can be planted at any time of the year but to get started it needs moisture so is often planted near the beginning of the wet season. The crop once established can survive for several months without rain. The ability to tolerate drought varies significantly with cultivar. During drought less and smaller leaves are produced and leaves die off more quickly but storage roots can be increased in the short term.

Because cassava can still grow satisfactorily in poorer soils it is often put last in a rotation after others crops have already been grown on the piece of land. Cassava is more responsive to nitrogen and potassium than phosphorus under many field situations. Nitrogen can increase cyanide levels. Under very acid conditions with high soluble aluminium levels, cassava has been able to achieve and maintain top growth but with significantly reduce root yields. When drainage is good and soil

moisture is adequate, cassava stalks can be planted at any orientation from horizontal to vertical, but in very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

Because of the slow growth in early establishment stages, soil loss from erosion with heavy rains can be significant. To avoid this planting should be timed so that the maximum vegetative growth is occurring during the heaviest rains. A leaf area index between 2.5 - 3.5 is optimal for cassava yield. The critical period for weed control is the time from 2 - 8 weeks after planting. Cassava tuber bulking is delayed under shaded conditions. Yields are also reduced. In mixed cropping situations using crops which mature early, allowing the cassava time to recover, is one possible strategy. For optimum production shading should be avoided.

Cassava takes about 10 - 12 months to produce mature tubers in the lowlands tropics although some varieties produce a smaller yield earlier. Yields in the range of 20 - 45 t/ha have been recorded for 12 - 14 month crops. The plants can be left growing and the tubers stored in the soil for considerable time. Crops of 24 months duration occur. Once the tubers have been dug they do not keep for more than a few days. Pre-harvest pruning of plants increases the storage time of tubers after harvest.

Spacing and plant density varies with soil climatic conditions and variety. Plant densities from 10,000 to 30,000 plants per hectare are used. Plants from the higher density crops have been shown to have quick post harvest deterioration. Mulching has given significant yield increases in some conditions. It also reduces the incidence and damage of some root boring insects.

Production: Plants can be harvested after 10 months in the lowlands. There are some faster growing varieties. Yields in the range of 20 - 45 t/ha have been recorded for 12 - 14 month crops.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
tuber	62.8	625	1.4	30	15	0.23	0.48
leaf	82.0	382	7.1	57	275	7.6	-

Legumes

English: Pigeon pea

Local: Pigeon binch

Scientific name: *Cajanus cajan*

Plant family: FABACEAE

Description: An upright perennial shrubby legume that can live for 3 - 4 years. They can grow up to 4 m tall and spread to 1.5 m wide. It has a bushy appearance and a strong deep taproot. The root nodules are round and sometimes lobed. The leaf consists of 3 narrow, green leaflets which are silvery-green underneath. The end leaflet is larger with a longer leaf stalk. The pea shaped flowers are red and yellow and occur on branched flower stalks which stick upwards in the axils of leaves. Pods are long, straight and narrow, often with 4 - 8 seeds. Seeds vary in shape, size and colour. The pods are slightly hairy. Pods are often 4 - 8 cm long and have a beak at the end. Pods are constricted between the seeds. Many varieties of pigeon pea occur. Some are dwarf and day length neutral.



Distribution: A tropical plant that requires a tropical or subtropical climate. Plants grow from sea level up to about 1,800 m in the tropics. They can tolerate drought and are suited to a drier climate. They can grow in places with less than 600 mm rainfall per year. They do less well in the wet tropics. They suffer in waterlogged soils and are damaged by frost. It can also tolerate heat. It will grow on poor soils cannot grow on salty soils. It can grow in arid places and suits hardiness zones 10 - 12.

Use: Young leaves, shoots and pods are eaten. The pods can be used in curries. The leaves and shoots as potherbs. Young seeds are cooked and eaten like peas. Ripe seeds are also cooked and eaten in soups and curries. Bean sprouts can be produced and eaten. Preparation of the seeds for dahl is somewhat complicated.

Cultivation: They are grown from seeds. It is best to sow seeds where the plants are to grow. Seeds normally germinate easily and well. Before sowing seed it helps to soak them in cold water for one day. Seeds store well if kept cool and dry. A spacing of 1.5 m x 1.5 m is suitable. Plants can be cut back and allowed to re-grow. Plants can also be grown from cuttings.

Production: Plants are fast growing. Pods are ready after 5 months. Mature seeds take about 8 months. Plants will often live for 3 - 4 years. Plants are cross pollinated by insects, or self pollinated.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	10.0	1449	19.5	55	-	15.0	-
pod (young)	64.4	477	8.7	-	-	2.0	-
seed (young, boiled)	71.8	464	6.0	2	28.1	1.6	0.8

Legumes

English: Jack bean

Local: Binch

Scientific name: *Canavalia ensiformis*

Plant family: FABACEAE

Description: A perennial climber, although short kinds do occur. Often it is a more bushy plant than the sword bean. Plants grow up to 1.5 m long. Stems can be hairy. Leaves have 3 leaflets. The leaflets are oval and 5.7 - 20 cm long by 3.2 - 11.5 cm wide. The leaf tends to be wedge shaped at the base. The leaf stalks are 2.5 - 11 cm long. Flowers are red/purple. They occur on flower clusters 5 - 12 cm long and with flower cluster stalks which are 10 - 34 cm long. The individual flower stalks are 2 - 5 mm long. Pods are long and sword shaped. Pods can be 15 - 35 cm long. Seeds are white with a light brown hilum half as long as the seed. Seeds are 2 cm long, by 1 cm across.



Distribution: It grows in tropical and subtropical places. It requires a fairly high temperature (15° - 30°C). It will possibly grow up to 900 m altitude. It is fairly drought resistant and also has some resistance to water-logging and salt in the soil. It can tolerate shade. It can tolerate pH from 4.5 - 8.0 but does best at about 6.1. The optimum mean annual temperature is 14.4° - 27.8°C. Seed germinate between 24 - 27.5°C. It is a short day plant growing well with a daylength of 10 - 12 hours of sunlight. It can grow in arid places.

Use: The leaves and top shoots are eaten. The very young pods are boiled and eaten. The flowers can be eaten. The young seeds are eaten boiled, roasted, or peeled and cooked. The seeds are also fermented. The ripe seeds are roasted and used as a coffee substitute. **Caution:** The ripe seeds can contain poison and need to be well cooked and the water changed before eating. They are also often left under running water or fermented.

Cultivation: It is grown from seeds. Seeds need to be 2 cm deep. A spacing of about 60 cm is suitable. Plants preferably need a support to climb over. It benefits from a fertile soil but adding nitrogen depresses yield.

Production: Green pods are produced in 3 - 4 months, but ripe seeds need 6 - 9 months. Yield of seeds can range from 700 - 5,400 kg/ha.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	10.0	1423	20.4	160	0	4.9	-
pod (fresh)	88.0	155	2.4	-	-	-	-

Legumes

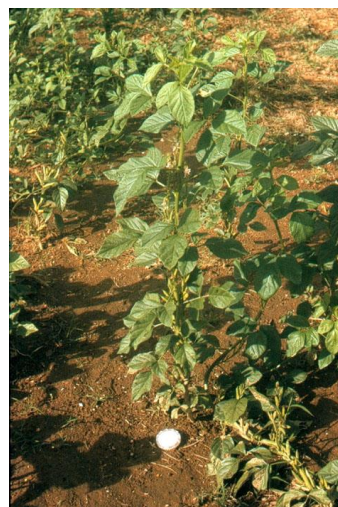
English: Guar bean, Clusterbean

Scientific name: *Cyamopsis tetragonolobus*

Local:

Plant family: FABACEAE

Description: An upright bushy plant often only 1 m tall. Some kinds grow to 3 m. The branches are stiff and usually with white hairs. The branches stick upwards and are angled and with grooves. The leaves are produced alternately and have 3 leaflets. The leaflets are oval and with slight saw teeth around the edge. The leaf stalks have grooves. The flowers are small in clusters in the axils of leaves. The flowers are white with pink wings. It produces clusters of thick fleshy pods. They are stiff and straight. There is a double ridge along the top of the pod and a single one below. There are also 2 ridges along the flat sides. The pods have a beak at the end. There are 8 - 10 small oval seeds inside.



Distribution: A tropical plant. It is a hardy, drought resistant plant that suits dry areas. It grows well on alluvial and sandy soils and in areas with high summer temperatures and low rainfall. It can tolerate an alkaline soil with pH 7.5 - 8.

Use: The green immature pods are eaten cooked. They are added to curries. They can be fried in oil, salted or dried for later use. The seeds are eaten. The seeds contain a gum used as a thickening agent. It is used in ice cream, baked goods, gluten free foods and salad dressing. The sprouted seeds are also eaten.

Cultivation: They are grown from seed, often in mixed cropping situations. It requires 15 - 24 kg of seed to sow a hectare. Seeds are sown 2 - 3 cm deep. They are often put 20 - 30 cm apart in rows 65 cm apart. Seeds germinate within one week.

Production: Plants mature in 3 - 3.5 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.9	1452	30.5	-	-	-	-
pod (fresh)	82.0	-	3.7	198	49	5.8	-

Legumes

English: Lablab bean

Local: Hondoi towai (mende)

Scientific name: *Lablab purpureus*

Plant family: FABACEAE

Description: A climbing bean which can have vines 1 - 5 m long. It keeps growing from year to year. The stems can be smooth or hairy. Leaves are made up of 3 almost triangular leaflets. The leaflets are 5 - 15 cm long and 3 - 14 cm wide. The side leaflets are somewhat asymmetrical. Often the plants are flushed purple. The flowering clusters are 5 - 20 cm long. Flowers are often white but can vary from red to blue. The pods are flattened, pointed and up to 12 cm long and 2 cm wide. They can be green, purple or white.



Inside there are 3 - 5 white or dark seeds. Seed pods have a wavy margin. The seeds are 0.5 - 1.5 cm long. (This bean is similar to Lima bean but the keel of the flower is not spirally twisted, the pod ends more bluntly with a long thin style at the end and the hilum on the seed is longer.)

Distribution: It is a tropical and subtropical plant. It mostly grows between 750 and 2175 m altitude in the tropics. It is drought resistant and can grow in quite low rainfall areas. Some varieties are short day and some are long day kinds. It suits hardiness zones 9 - 12.

Use: The young pods, ripe seeds and young leaves are edible, cooked. Flowers can be eaten raw, steamed or added to soups and stews. Dried seeds can be cooked as a vegetable. The seeds can also be sprouted then crushed and cooked. The large starchy root is edible. **Caution:** Many types can be poisonous. They should be boiled and the cooking water thrown away.

Cultivation: Seeds are sown at 30 x 60 cm spacing near stakes or trees. About 20 kg of seed per hectare are required. Fertilising with nitrogen and potash until flowering is recommended.

Production: Young pods are ready 4 - 6 months after planting and seeds 6 - 8 months. Pods are often harvested over 2 or 3 years. Pollination and seed setting are reduced in cold weather.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1428	22.8	-	-	9.0	-
seed (young)	86.9	209	3.0	14	5.1	0.8	0.4
pod (fresh)	86.7	203	3.9	-	1	2.4	-

Legumes

English: African locust bean

Local: Locus binch

Scientific name: *Parkia filicoidea*

Plant family: FABACEAE

Description: A deciduous tree that grows up to 35 m tall. It has a spreading flat crown. The trunk has small rounded buttresses. The grey to yellow-brown bark can be scaly or smooth, and dark becomes dark and cracked with age. The bark has an orange coloured resin. The leaves are feathery. A leaf is made up of 6 - 9 pairs of leaflets each divided into 16 - 24 pairs of smaller leaflets. These are about 2 cm long and 5 - 8 mm wide. The flowers are small and in bright red club shaped heads. These hang down on stalks 30 cm long. The flower heads are up to 8 cm long. The fruit are dark brown to purple pods which hang down in clusters. They are 30 - 60 cm long and 2 cm wide with their stalk. The pod is narrowed slightly between the seeds. The seeds are red-brown in a dry, mealy, edible, yellow pulp.



Distribution: A tropical and subtropical tree of lowland rainforests. It grows in Africa in forests near streams. It occurs in sub-humid and humid places with an annual rainfall of 950 - 1,750 mm annually. It grows from 250 - 1,370 m above sea level. It can grow in arid places.

Use: The pods and the pulp are eaten. The seeds are boiled and fermented then eaten. This has a strong smell but is removed by frying or roasting. The seeds can also be powdered and used for flavouring soups and rice dishes. The leaves are cooked as used as a vegetable.

Cultivation: Plants can be grown from seed. The pod is crushed and the seed removed from the pulp. The seed they should be boiled briefly, then allowed to cool and soaked for 12 hours, before sowing.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	7.0	1780	32.3	-	-	-	-
fruit	13.2	1263	3.4	-	-	-	-

Image accessed from http://farm8.staticflickr.com/7277/7804911110_92bcd0012a_b.jpg

Legumes

English: Mung bean

Local: Concho binch

Scientific name: *Vigna radiata*

Plant family: FABACEAE

Description: An upright hairy bean plant which can grow to 1 m tall. It has many branches. The leaves have 3 leaflets, are dark green and grow on long leaf stalks. There are oval stipules at the base of the leaf. Flowers are pale yellow and small. They occur in bunches of 10 - 20 on the ends of long hairy flower stalks. Pods are black and straight. They do not have a beak. Pods contain 10 - 20 seeds which are usually green or golden yellow. They are smaller than black gram. The beans can be black. They have a flat white hilum. There are 2,000 varieties.



Distribution: A tropical and subtropical plant. The plant will grow from sea level up to about 2000 m in the tropics. It is drought resistant but can't stand water-logging. Plants are damaged by frost. They cannot stand salinity. Rainfall at flowering is detrimental. It requires a deep soil. Both short day and long day varieties occur. It can grow where annual temperatures are from 8 - 28°C. It can tolerate a pH from 4.3 - 8.1. It suits a drier climate and can grow in arid places. It suits hardiness zones 10 - 11.

Use: Seeds are eaten ripe, raw or roasted. They are added to soups and stews. They are also fermented. Young pods and leaves can be eaten. The seeds can be germinated for sprouts and used in salads and stir-fried dishes. The seeds are ground and used for starch to make noodles.

Cultivation: Plants are grown from seed. In some areas these are broadcast while for small plots often 2 - 3 seeds are sown in holes 50 - 60 cm apart. Seeding rates of 6 - 22 kg per ha are used in different locations. It normally requires phosphorus fertiliser for adequate growth. Seeds germinate in 3 - 5 days.

Production: Green pods are ready after about 2 months and ripe pods may take another 1 - 2 months. For ripe beans the whole plant is harvested and dried before threshing. Yields of 450 - 560 kg/ha of seeds are common.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	11.0	1432	22.9	55	4	7.1	-
seed (cooked)	-	439	7.0	2.4	1.0	1.4	-
seed (sprouted)	90.4	126	3.0	2	13.2	0.9	0.4

Legumes

English: Cowpea

Local: Binch black eye

Scientific name: *Vigna unguiculata subsp. unguiculata*

Plant family: FABACEAE

Description: A creeping bean type plant with straight firm pods. There is a deep tap root and many branches occur from it in the surface of the soil. The root nodules are large and round. The leaves have 3 leaflets. The end leaflet can be 12 - 16 cm long. The side leaflets are assymetrical. The stipules at the base of the leaf are large and with spurs at their base. Flowers occur often in pairs on the end of long flowering shoots. Only 2 - 4 flowers in each stalk produce pods. Flowers are white, yellow or blue. They are large and showy. The pods are about 15 cm long. The seeds are white except for a dark scar.



Distribution: It grows in tropical and subtropical climates. It grows from sea level to 1,800 metres altitude in the tropics. Plants can stand high temperatures. Some kinds can tolerate drought. They are sensitive to cold and killed by frost. Plants germinate with a temperature between 11.5 - 15.5°C. The best growth occurs between 20 - 35°C. They can grow on a range of soils providing they are well drained. They are a short day plant. They do well in the semiarid tropics. It will not tolerate acid or alkaline soils. It grows in areas with an annual rainfall between 280 - 410 mm. It can grow in arid places.

Use: The young leaves, young pods and ripe seeds are all eaten. They can be steamed, boiled, stir-fried etc. The leaves can be dried and stored. The dried seeds are used in soups and stews. They are ground into flour or fermented. The seeds are also used for bean sprouts. Roasted seeds are used as a coffee substitute.

Cultivation: It is grown from seeds. Seeds remain viable for several years if carefully stored. A seeding rate of about 20 kg per ha is suitable and seed are sometimes broadcast then thinned.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	11.2	1189	23.5	-	1.5	6.4	-
Seed (young, boiled)	75.5	406	3.2	79	2.2	1.1	1.0
leaf	88.4	143	4.2	36	35	4.7	0.3
young pod + seed (boiled)	89.5	142	2.6	45	17.0	0.7	0.2
leaf (boiled)	91.3	92	4.7	29	18	1.1	0.2

Legumes

English: Prickly amaranth

Local: Greens

Scientific name: *Amaranthus spinosus*

Plant family: AMARANTHACEAE

Description: An annual plant that grows 60 - 100 cm tall. It can be erect or lie over. The stems can be either nearly round or angular. The plant branches from the base upwards. Leaves are fairly smooth or hairless but can be tinged purple. The leaf stalk can be 0.5 - 10 cm long. The leaf blade is oval or sword shaped and 2 - 7 cm long by 0.6 - 3 cm wide. There can be a short tip at the top end and it gradually tapers to the base. Flower clusters occur at the sides and these can be single or arranged in compound spikes. The flower clusters at the top can be 3 - 10 cm long. The top flowers often droop over. Parts of the flowers in the clusters of the leaves form sharp spines 0.5 - 2 cm long. The upper flowers are male and the lower flowers are female. The seeds are 1 - 1.2 mm across and flattened.



Distribution: A tropical plant that grows world wide from the tropics to the warm temperate zone. It can grow in sun or light shade. In Tanzania it grows from sea level to 1,800 m altitude, in areas with 800 - 1,300 mm annual rainfall. It grows well in moist, damp soil and can also grow in arid places.

Use: The leaves are edible when cooked. The seeds are ground into flour and cooked. **Caution:** This plant can accumulate poisonous nitrates if grown with high nitrogen inorganic fertilisers.

Cultivation: Plants are often self sown but can be grown from seed.

Production: Leaves are often picked early in the season before spines develop. Leaves can be dried and stored.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	91.7	84	3.6	109	46	14.4	0.3

Leafy greens

English: Quail grass

Local: Yokoto sokoto

Scientific name: *Celosia argentea*

Plant family: AMARANTHACEAE

Description: An erect short lived annual herb that grows up to 1 m tall. The leaves are alternate and light green, and 2 cm wide by 6 cm long. They are dark green and longer on the flowering shoots. The 20 cm long flower spike grows on the end of the main stem and is red or purple. The seeds are small (1 mm across). Two kinds occur as red and green forms.



Distribution: It is a tropical plant that grows well in the lowland humid forest zone. It suits damp, humid places and is often on clay soil. The plant is widespread as a wild plant at low altitudes.. Temperatures of 25 - 30°C at night and 30 - 35°C in the day are best. It needs good sunlight and does best in soils with high organic matter. It can grow in light shade and in dry conditions. It can grow in arid places.

Use: The tender leaves and young flowers are cooked and eaten as a vegetable. It is best eaten before flowering. The dried leaves can be added to wheat flour and cooked. They are used in soups, sauces and stews. An edible oil can be extracted from the seeds. The red colouring from the flowers can be used to colour lamb stew.

Cultivation: The plant can be grown by seeds. The seeds are very small so can be mixed with sand to allow more even distribution. The seed are broadcast then mulched with dry grass, which is removed once the seeds have germinated. Seedlings do not transplant easily. They can be transplanted after 2 - 3 weeks. It is good for inter-cropping amongst other vegetables. These plants are often grown as ornamentals.

Production: Harvesting of leaves can commence about 4 - 5 weeks after planting. Tops can be cut off over a period of 3 - 5 months. It grows slowly at first, therefore repeated picking of tips gives better production than harvesting whole small plants.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	84.0	185	4.7	-	33	7.8	-

Leafy greens

English: Silver spinach
Local: Manikpa (mende)

Scientific name: *Celosia trigyna*
Plant family: AMARANTHACEAE

Description: A branched and straggling herb that grows 25 - 120 cm tall. The lower leaves have long leaf stalks. The plant looks like *Amaranthus hybridus* until it starts to flower. Where the leaf stalk joins the stem there is a pair of small moon-shaped leaflets that lie around the stem. The small white or silvery flowers are crowded together in separate clusters. The fruit is a capsule which is almost round and has several seeds.



Distribution: A tropical plant that grows in tropical lowlands and highlands in Africa. It is often along the coast but grows from sea level to 1,960 m above sea level. It needs an annual rainfall of up to 2,500 mm and an average temperature of 25 - 30°C. It cannot tolerate a temperature below 15°C. It grows best on fertile, well drained soils.

Use: The young shoots and leaves are cooked and eaten. They are finely cut and used in soups, stews and sauces. Because they can be bitter, they need extensive cooking or mixing with other foods.

Cultivation: Plants are grown from seeds which germinate in 4 - 5 days. It grows for 90 - 120 days. Because the seeds are small, they are best mixed with sand to give a more even distribution when sowing.

Production: Plants can be uprooted and harvested or leaves removed. Harvests of 4 - 5 t/ha can be achieved from weekly harvests over 2 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	89.0	139	2.7	94	10	5.0	-

Image accessed from <http://www.flickr.com/photos/36517976@N06/5063937939>

Leafy greens

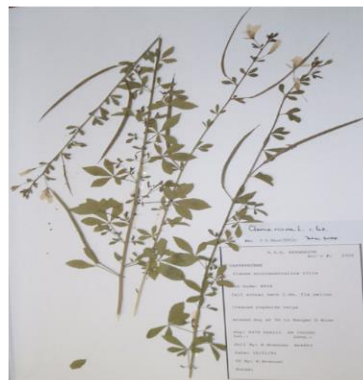
English: Sticky cleome

Local:

Scientific name: *Cleome viscosa*

Plant family: CLEOMACEAE

Description: An erect annual herb about 0.3 to 1 m tall. It is sticky and has a rank smell. The leaves are made up of 3 - 5 leaflets each 1 - 3 cm long. The flowers are in leafy groups at the end of branches. The flower stalks are less than 1 cm long. The petals are yellow and 7 - 8 mm long. The fruit is a narrow capsule and gradually tapers near the tip. The stems and seed pods are hairy. The seeds are round, black and 1 mm across.



Distribution: It is a tropical plant found in waste places at low and medium altitudes. It is damaged by drought and frost. It can grow in arid places. It restricts the germination and growth of Pearl millet.

Use: The leaves are edible when cooked. The young fruit are eaten candied. Roasted seeds are used in curries and pickles. Seed oil is used for cooking. The leaves are soaked, fermented and used as a spice.

Cultivation: Plants are grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	80.4	-	5.6	-	-	24	-

Leafy greens

English: Hibiscus

Local: Hibiscus

Scientific name: *Hibiscus rosa-sinensis*

Plant family: MALVACEAE

Description: A shrubby, evergreen, woody, shrub used for hedges. It grows 2 - 5 m tall. The bark is grey and flaky and has fine stripes. The leaves are bright green and oval with long tips. The edges are entire on the lower leaves. The upper leaves are coarsely toothed. The flowers occur singly in the axils of leaves. Flowers can be single or double. They are bell shaped and 10 - 15 cm across. There are a range of colours. The fruit are rounded capsules with many seeds inside. The capsules are beaked. Plants usually do not produce fruit in the hot humid tropics.



Distribution: A tropical and subtropical plant, common as an ornamental throughout the tropics. It originally came from China. It thrives on any type of soil. Different types are adapted to sunny or shady places. It grows in open, moist places. It grows where average temperatures are 15 - 30°C. It is very sensitive to frost and can grow from sea level to 1,000 m altitude. It requires a minimum rainfall of 700 mm per year and suits hardiness zones 9 - 11.

Use: The leaves are eaten cooked. In some places they are pounded before cooking. The flowers are eaten raw or pickled. They are also added to drinks. They are used to colour foods including preserved fruit, sliced pineapple, agar-agar jellies, and cooked vegetables. The fresh flower ovary is eaten.

Cultivation: It is mostly grown from cuttings.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (dry)	6.4	1339	25.9	-	-	19.6	8.9
leaf (fresh)	76.0	321	2.3	-	-	-	-

Leafy greens

English: Horseradish tree

Local: Moringa

Scientific name: *Moringa oleifera*

Plant family: MORINGACEAE

Description: A small, soft-wooded tree that grows 9 - 12 m tall. The tree loses its leaves during the year. The bark is grey, thick, corky and peels off in patches. The leaves are pale green and the leaf is divided 3 times. The whole leaf is 30 - 60 cm long and the leaflets are usually oval and 1 - 2 cm long. The leaflets are jointed with a gland near the joint. The flowers are pale yellow. They occur in long sprays 30 cm long. Each flower has 5 petals and of these one is erect and 4 are bent backwards. The fruit is a long capsule 30 - 100 cm long by 2 cm wide. The seed capsules are up to 45 cm long. They are roughly triangular in shape. The seeds have 3 wings. Often the fruiting kinds are grown as annual plants.



Distribution: A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits hardiness zones 9 - 12.

Use: The young tops and leaves are eaten cooked. They are eaten as potherbs or used in soups and curries. They can be dried and stored for later use. The very young long pods are eaten cooked, especially in curries and soup. They are also pickled. The young seeds are eaten roasted or fried. Sometimes the roots are used as a horseradish substitute. A gum from the bark is used as seasoning. The bark is used for tea. The roots, leaves, flowers and fruits are eaten cooked in water and mixed with salt and chili peppers. The oil expressed from the seeds is used in salads.

Cultivation: It is best to grow plants from 1 metre long cuttings but they can be grown from seed. They can be used as a hedge and pruned regularly to produce more leaves. Properly dried seed can be stored for a long time in sealed containers in a cool place. Normally perennial types are grown from cuttings and annual types are grown from seed.

Production: Trees are fast growing. They can be pruned or topped. With one variety the tree flowers and fruits continuously while with the other variety there are flowers and fruit once per year. The fruit ripens 3 months after flowering. Annual types produce fruit 6 months after planting. Leaves are best dried in the shade to retain more of their Vitamin A.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	4	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Leafy greens

English: Goat's horns

Local: Goat hone

Scientific name: *Sida cordifolia*

Plant family: MALVACEAE

Description: An erect, woody shrub that grows about 0.4 - 1 m high. It keeps growing from year to year. It is covered with short and long hairs that make the plant feel soft. The leaf stalk is 1 - 2.5 cm long. The leaves are one after the other and heart shaped at the base. They are toothed at the edge and 1.5 - 4.5 cm long. The flowers are yellow and occur in the axils of the leaves. The fruit are about 6 - 8 mm across and have 20 fine bristles on the top.



Distribution: A tropical plant that grows in open waste places in the tropics and sub-tropics. It is common and widely distributed in the Philippines. It grows in hot arid places with a marked dry season. It grows in places with an annual rainfall below 520 mm. It grows in dry sandy soils and can grow in salty soils. It grows below 1,100 m altitude. It can tolerate shade and can grow in arid places.

Use: The leaves are edible when cooked.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	6.6	1296	24.2	-	-	79.8	-

Image accessed from

[http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_\(Bala\)_in_Hyderabad,_AP_W_IMG_9420.jpg](http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_(Bala)_in_Hyderabad,_AP_W_IMG_9420.jpg)

Fruit

English: Boabab

Local: Monkey brade

Scientific name: *Adansonia digitata*

Plant family: BOMBACACEAE

Description: A large tree. It grows up to 25 m tall. It loses its leaves during the year. The branches are thick, angular and spread out wide. The trunk is short and stout and can be 10 - 14 m around. Often the trunk has deep grooves or is fluted. The bark is smooth and grey but can be rough and wrinkled. The leaves spread out like fingers on a hand. There are 5 - 9 leaflets. Often the leaves are crowded near the ends of branches. The flowers are large and 12 - 15 cm across. The petals are white and the stamens are purple. The fruit hangs singly on a long stalk. The fruit has a woody shell. This can be 20 - 30 cm long and 10 cm across. Inside the fruit are hard brown seeds. They are about 15 mm long. The seeds are in a yellow white floury pulp. The pulp is edible. The thick roots end in fattened tubers.



Distribution: It is a tropical plant that grows in the lowlands. It grows in the hot dry regions of tropical Africa, such as the Sahel. It survives well in dry climates. It grows where rainfall is 100 - 1,000 mm a year. It can tolerate fire. It grows where the annual temperatures are 20 - 30°C. In most places it grows below 900 m altitude but occasionally grows to 1,500 m altitude. It requires good drainage. It can grow in arid places and suits hardiness zones 11 - 12.

Use: The young leaves are eaten as a cooked vegetable. The dried leaves are also used to thicken soups. The fruit pulp is eaten raw. It is also used for a drink. The flowers are eaten raw or cooked. The seeds can be eaten fresh or dried and ground into flour then added to soups. They yield a cooking oil. The shoots of germinating seeds are eaten. The young tender roots are eaten. The fattened root tubers are cooked and eaten. The bark is eaten and the dried leaves are used as flavouring.

Cultivation: Trees are grown from seed. The seed remain viable for several years but before planting the seeds must be treated to break the hard seed coat, by soaking the seeds in hot water for several minutes or by cutting the seed coat. Seeds that float in water should not be used. Seeds can be planted in nurseries in plastic bags then transplanted after 6 months. Plants can also be grown from cuttings.

Production: Trees grow quickly reaching 2 m in 2 years. Trees produce fruit after 2 - 15 years. The plant is pollinated by bats, insects and winds. Trees can last 600 or more years. Fruit can be stored for about a year.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut (dry)	7.8	1832	33.7	-		13.9	-
fruit	16.0	1212	2.2	-	360	7.4	6.7
leaf	77.0	290	3.8	-	50	-	-

Fruit

English: Pineapple

Local: Pineapul

Scientific name: *Ananas comosus*

Plant family: BROMELIACEAE

Description: A perennial herb with a rosette of long, thick, spiky leaves, up to 1 m high and spreading 1 - 1.5 m. The leaves are arranged in spirals. Some kinds have thorns along the edges of the leaves. The plant produces suckers, both near the base of the stem and also higher up the stem near the fruit. These are called slips, or suckers, and are broken off and used for planting. The main plant dies after producing a fruit, but the suckers keep growing. The plant produces a flower and fruit at the end. The fruit is made up of about 150 berry-like fruitlets that are almost fused together. There is a small crown of leaves on top of the fruit. The fruit can be 25 cm long and weigh 0.5 - 4 kg. There are two main types of pineapples. The rough-leafed variety has spines on the leaves and produces a smaller but sweeter fruit. The smooth leaf variety has spineless leaves and larger fruit.



Distribution: The plant has been taken to most tropical and subtropical places. It is a tropical plant. It grows up to 1800 m altitude near the equator. It can survive brief periods down to freezing, but cold retards growth, delays fruiting, and causes fruit to be more acid. A loose, well-drained soil with high organic matter is best. It can survive drought, but adequate soil moisture is necessary for good fruit production. Pineapples need an annual average temperature of 17.2 - 26.9°C. Growth ceases below 20°C. In the equatorial tropics, this is mostly between sea level and 1800 m altitude. Pineapples need well-drained and fertile soil. It suits an acid soil and can develop roots in soils where lime has been added. The soil acidity can be between pH 3.3 - 6.0. The best range is pH 4.5 - 5.5. Soils which are not sufficiently acid can be treated with sulphur. It suits hardiness zones 9 - 10.

Use: The fruit is eaten fresh or used for juice. Unripe fruit are also cooked and eaten. The young, heart-leaves can be eaten. It is an attractive and popular snack food.

Cultivation: The suckers, slips, and the top of the fruit, can be used for planting. The time to maturity is the fastest for the suckers near the bottom of the plant and slowest when the top of the fruit is planted. Therefore, use suckers that grow from the stem near the ground for earliest yield. Pineapple flowering hormone can be used for fruit production with thorny varieties and calcium carbide for smooth varieties. Fruiting is less seasonal in the highlands than in the lowlands. Pineapples can be planted with 35,000 - 43,000 plants/ha or 3 - 4 plants per square metre. If plants are spaced more widely, they produce more suckers. Fruits become more acid where plants are closely spaced. If too many suckers are left growing from the main plant, then smaller fruit will be produced. They can grow in partial shade and, in this situation, the plants are normally more green. The red colouring of pineapple leaves is due to a deficiency of the nutrient nitrogen. This shows up more quickly in plants in full sunlight. When the plant is sufficiently large, it responds to changes, such as less available nutrients or water, and starts to produce a flower, then a fruit. The number of hours of sunlight, as well as reducing temperature and reduced sunlight, also help the flowers form. The result of this is that flowering and fruiting is often seasonal. This can easily be changed by using a fruiting hormone which allows fruit to be produced at times to suit the grower. Pineapples can grow in semi-arid conditions because the leaves can store some water. They also tend to lose only small amounts of water from evaporation through their leaves, but they can grow

well with plenty of water. The roots are very sensitive to water-logging, so the soil must be well-drained. Pineapples do not cover the soil well, so it is good to use a mulch of plant material to help weed control, provide some nutrients and to stop soil erosion.

Production: Plants usually produce for about 4 years. Fruiting is less seasonal in the highlands than in the lowlands in the tropics. The growth rate for pineapples slows at cooler temperatures. Plants grown in the highlands, or at higher latitudes, take longer to mature. It takes 60 days from when the flower starts to form until the fruit appears, then a further 5 months until the fruit is ready for harvest. The time from planting to harvesting ranges from 11 - 32 months, depending on temperature. The fruit are smaller, poorer shape and more acid where the temperatures are lower or there is less sunlight.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	84.3	194	0.5	60	25	0.4	0.1

Fruit

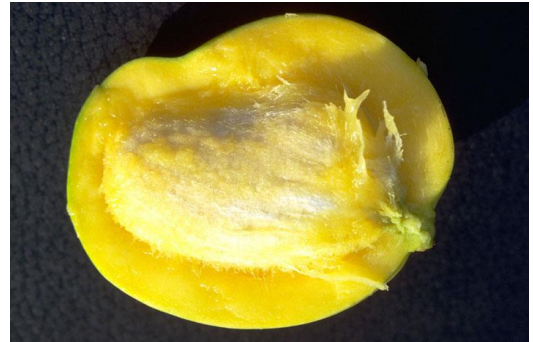
English: Mango

Local: Mango

Scientific name: *Mangifera indica*

Plant family: ANACARDIACEAE

Description: An erect, branched evergreen tree. It can grow to 10 - 40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10 - 30 cm long and 2 - 10 cm wide. They are arranged in spirals. The leaf stalk is 1 - 10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10 - 50 cm long and branching. Up to 6,000 flowers can occur on a stalk. Most of these are male and up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5 - 30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.



Distribution: A tropical and subtropical plant. It grows in the lowlands. It grows from sea level up to 1300 m altitude in the tropics. It does best in areas below 700 m and with a dry season. Rain and high humidity at flowering reduces fruit set. It thrives best where temperatures are about 25°C but will grow with temperatures from 10 - 42°C. Temperatures of 0°C will damage young trees and flowers. Low temperatures (10 - 20°C) at flowering time will reduce fruiting. As temperatures get lower due to latitude or altitude, fruit maturity is later and trees become more likely to only have good crops every second year. Mangoes can grow on a range of soils. In wetter areas soils with less clay are better. They can withstand occasional flooding. A soil pH of 5.5 - 6.5 is best. Soils with pH above 7.5 cause plants to develop iron deficiency. It grows in the Sahel. It can grow in arid places. It suits hardiness zones 11 - 12.

Use: Ripe fruit are eaten raw. Unripe fruit is pickled. Seeds can be eaten cooked. They are boiled or roasted. They are made into meal by powdering. Young leaves can be eaten raw or cooked. Amchur is made from the dried unripe fruit. This is used in curries, and pickles and chutneys. The seed kernels are used for famine food in India. They are boiled, roasted or soaked to remove the bitterness. **Caution:** The sap from the tree or fruit can cause skin problems with some people.

Cultivation: Trees are grown by planting fresh seed and they can be transplanted. Mangoes vary in their ability to breed true from seed. When more than one seedling emerges from the seed some of these are asexual and breed true. Clean seed germinate best if they are treated at 50°C for 20 minutes, then planted on their edge with the round bulge upwards and near the soil surface. The husk around the seed should be removed. Seeds germinate in 3 - 6 weeks. The strongest growing seedlings from this seed are used and the others thrown away. The seedlings from the folds of the seed are vegetative while the seedling from the centre of the seedling near the stalk end may be sexual and show variation from type. Other seeds only produce one seedling and these normally vary and can be different from the parent tree. Plants can be propagated by budding, or by grafting using in-arching. This is not easy and care is required. In wetter places, flowers need to be protected

with fungicides to enable fruit to form. If organic manure is used this should not be directly in the planting hole nor immediately against the new plant. Young transplanted seedlings need regular watering. A spacing of 6 - 12 m between plants is used. Wind protection is advisable to prevent fruit rubbing and getting damaged. Trees should only ever be lightly pruned as fruit develop on new growth and heavy pruning can reduce flowering. Flowering can be brought about by foliar sprays of potassium nitrate.

Production: Seeds germinate after about 20 days. Seedling trees produce after 4 - 6 years and increase in production up to 20 years. Trees often bear better each second year. Rain at flowering reduces fruit setting. Fruiting is at the end of the year. Fruit take 4 - 5 months to mature. Fruit vary in weight from 200 - 1,000 g. Trees can produce one million flowers but only 500 fruit. Trees last for many years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	83.0	253	0.5	54	30	0.5	0.04
leaf	82.1	226	3.9	-	60	2.8	-

Fruit

English: Barbados cherry

Local:

Scientific name: *Malpighia glabra*

Plant family: MALPIGHIACEAE

Description: A small evergreen tree or shrub that grows 5 - 7 m tall. It often has several trunks. The branches are spreading and often drooping. The leaves are opposite and oval to sword shaped. They are 2 - 8 cm long by 1 - 4 cm wide. They are dark green and glossy and can be wavy along the edge. The leaf stalk is short. The flowers have both sexes. The flowering stalks are short with 3 - 5 pinkish-red flowers that are 1 - 2 cm across. The fruit is bright red. And 1 - 2 cm across with has several small triangular seeds. The fruit resemble a common cherry, but is has 3 grooves and 3 seeds. The fruit are carried on the outside of the tree.



Distribution: A tropical and sub-tropical plant that suits the hot, tropical lowlands. It grows on sandy soils and in seasonally drier regions. Rainfall during flowering and fruiting improves fruit quantity and size. They do best in a frost free site and need a well drained soil. They can tolerate frost and drought. They do best in warm to hot climates with temperatures of 30 - 32°C. It can grow in arid places and suits hardiness zones 9 - 12.

Use: The fruit are eaten fresh or used in juice. They can be used for wine. They can be used in jellies, jams and preserves. The sauce or puree can be used as a topping for cakes, puddings, ice cream or sliced bananas. **Caution:** Acerola can produce an allergic reaction similar to that of latex.

Cultivation: They can be grown from hardwood cuttings or budded onto seedlings. They can also be grown by ground layering or from seed, although seed germinate poorly. A spacing of 3 - 4 m is suitable. Cross pollination is needed for good fruit production.

Production: Trees bear in 3 - 4 years and can continue for 15 years. Flowering normally follows periods of rainfall. There can be several flowering and fruiting periods per year. Flowers are pollinated by insects and fruit can ripen in 3 - 4 weeks. Fruit loose their flavour and nutritional value rapidly after harvest. They should be picked and eaten within a few hours. Individual trees can yield 15 - 30 kg of fruit per year.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	83.2	163	1.8	800	2100	0.8	-

Fruit

English: Cape gooseberry

Local: Kape berry

Scientific name: *Physalis peruviana*

Plant family: SOLANACEAE

Description: A perennial herb that grows 45 - 90 cm tall. They are often grown as annuals. It is hairy and slightly branched. The spreading branches are purplish and ribbed. The leaf blade is 6 - 15 cm long by 4 - 10 cm wide. The leaves are heart shaped at the base and taper to the tip. They are slightly wavy and toothed along the edge. The flowers occur singly and hang down in the axils of leaves. The flowers are white with violet anthers and slightly spotted petals. The fruit is a berry 1 - 1.5 cm across. They are orange-yellow or pale brown. This is inside an inflated husk. The seeds are yellow and 2 mm across. There are several named cultivated varieties.



Distribution: A temperate plant that grows in the tropical highlands. It suits warm climates and does best in warm sunny conditions. It needs well drained soil. Plants are not killed by a slight frost but it grows best free from severe frosts and strong winds. In Indonesia plants are found from 700 – 2,300 m altitude, but fruit best above 1,500 m. It can grow in arid places and suits hardiness zones 8 - 10.

Use: The ripe fruit are eaten fresh or cooked. They are used for jam. They can be dried, preserved, stewed, pureed, or used in pies, cakes, jellies and sauces. Roasted seeds are pickled. The leaves have been used instead of hops in beer. The leaves are also used as a potherb.

Cultivation: Plants are grown from seed that is broadcast over the soil. Seeds should be sown 1.5 cm deep in loose soil. Seed germinate irregularly. Plants should be spaced 45 cm apart. In the tropics, plants keep growing from year to year, but in the subtropics they regrow from seed each year. Plants can be grown from softwood cuttings from the upper parts of the shoots. Seedlings can be transplanted.

Production: Plants produce fruit in 1 year.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (mature)	84.2	201	2.0	36	30	1.5	-

Fruit

English: Guava

Local: Gwava

Scientific name: *Psidium guajava*

Plant family: MYRTACEAE

Description: A small evergreen tree 8 - 10 m tall with smooth, mottled bark which peels off in smooth flakes. It branches close to the ground and is shallow rooted. The branches are four-angled. The leaves are opposite, dull green, and somewhat hairy. They are oval and somewhat pointed at both ends, 15 cm long by 2 - 5 cm wide with short leaf-stalks. The showy flowers are white and borne in loose, irregular arrangements of 1 - 3 flowers that grow in the axils of leaves on new growth. The petals are 1.5 - 2 cm long. Both self and cross-pollination occurs. The fruit are rounded and 4 - 5 cm long. They are green, turning yellow when ripe. The outer covering is firm and encloses a pink, or nearly white, sweet-smelling, edible pulp with many seeds. In better selected varieties, the skin and the seeds are fully edible. Fruit vary from very acid to very sweet.



Distribution: A native to Central and South America, it grows in most tropical countries. Guava thrives in both humid and dry tropical climates and does best in sunny positions. It grows wild and is also cultivated. It is killed by frost and fruits better where there is a cooler season. Temperatures near 30°C give best production. It is widely distributed in open places and secondary forests throughout the Philippines and Papua New Guinea, and can become weedy under some conditions. It prefers a well-drained soil with good organic matter, but can stand some brief water-logging. A soil pH of 5 - 7 is best, but can tolerate a pH from 4.6 - 8.9. Trees cannot tolerate salty conditions. It suits hardiness zones 9 - 12.

Use: The fruit are eaten raw and can be used for jams and jellies. Half-ripe fruit are added to help the jelly set. The young leaves are eaten raw or cooked. It is an attractive and nutritious fruit.

Cultivation: They are mostly grown from seeds but seedling trees vary in quality. Seeds remain viable for a year or longer. Seeds usually germinate in 2 - 3 weeks, but can take 8 weeks. Selected trees can be propagated by budding or grafting. They can also be propagated by layering, root cuttings or stem cuttings if hormones are used. For stem cuttings, the tips are used and grown under mist at 28 - 30°C with bottom heat. Suckers can also be used. Using vegetative methods of propagation enables better fruit kinds to be preserved. In the lowland tropics, trees are self-sown. As fruit are produced on new season's growth, pruning does not affect greatly fruiting. Trees should be managed to give the maximum number of vigorous, new shoots. Trees can be pruned for shape. Trees can be grown at 2.5 m within rows and 6 m apart between rows.

Production: Seedling trees may begin to bear 2 - 3 years after transplanting. Pruning back the tips slightly increases fruit production. Fruit taste best if ripened on the tree. Ripening after picking can be hastened by placing them in a brown paper bag with a banana or apple. Mature fruit which have not changed colour can be stored 2 - 5 weeks at temperatures of 8 - 10°C and relative humidity of 85 - 95%. Mature fruit ripen in 2 - 3 days at normal temperatures and will keep for 7 days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.1	238	1.1	60	184	1.4	0.2

Fruit

English: Purple mombin

Local: Malonbo

Scientific name: *Spondias purpurea*

Plant family: ANACARDIACEAE

Description: A medium sized tree that grows 4 - 10 m tall. It has an irregular trunk and broad crown. Often it is low and sprawling. It loses its leaves during the year. The leaves are made up of 5 - 12 pairs of leaflets that are 2 - 4 cm long. They fall before flowering. The flowers are red and in groups 3 - 5 cm long. They occur on the small branches. The edible fruit are small, red and sub-acid. They are round or oval and 2.5 - 5 cm long. They often grow in clusters of three. The fruit has a woody kernel which contains the seed. The flesh is creamy-yellow.



Distribution: It is a tropical plant that suits the hot tropical lowlands. It is resistant to drought and will produce on poor soils. It grows from sea level to 1,200 m altitude in Mexico. It grows naturally in tropical America.

Use: The fruit are eaten fresh or cooked or used for jelly. They are also used for drinks. The stone or kernel can be roasted and eaten. The leaves are cooked and eaten.

Cultivation: Seeds do not normally germinate. Plants are grown by cuttings and stem sprouts. Straight cuttings 6 cm thick and 1.5 m long are used. The cuttings are made at the start of leaf production and kept in the shade for a couple of weeks. They are then planted 8 m apart and at a depth of 30 cm. Flowers bud on the current year's growth so pruning can be done yearly. Pruning increases the size and weight of fruit.

Production: The fruit matures in about 120 days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	76.2	347	0.16	30	45	1.1	-
leaf	88.6	146	4.3	-	-	2.8	-

Vegetables

English: Okra

Local: Okro

Scientific name: *Abelmoschus esculentus*

Plant family: MALVACEAE

Description: A tropical annual herb that grows erect, often with hairy stems. It mostly grows about 1 m tall but can be 3.5 m tall. It becomes woody at the base. The leaves have long stalks up to 30 cm long. Leaves vary in shape but are roughly heart shaped with lobes and teeth along the edge. Upper leaves are more deeply divided than lower ones. The flowers are yellow with red hearts. The fruits are green, long and ribbed. The seeds are 4 - 5 mm across. They are round and dark green.



Distribution: A tropical plant that suits the hot humid tropical lowlands but is unsuited to the highlands. It is very sensitive to frost. It can grow in salty soils. It grows best where temperatures are 20 - 36°C. It can grow well in dry climates with irrigation. It suits hot humid environments. It does best on well drained well manured soils but will grow on many soils. A soil pH of 5.5 - 7.0 is best.

Use: Pods are eaten cooked. They are slimy, but less so if fried. Dried powdered seeds can be used in soups as a thickener. They can also be pickled. Young leaves can be eaten cooked. They can be dried and stored. Flowers can also be eaten. Okra is frozen and canned. The seeds are roasted and used as a coffee substitute.

Cultivation: They are grown from seeds, which are easy to collect. They need high temperatures for germination (over 20°C) and a sunny position. Often seeds are soaked for 24 hours before sowing to give quick germination. Seeds are sown 1.5 - 2.5 cm deep with 2 - 3 seeds per hole. Later these are thinned out to one plant. Seeds can be sown in nurseries and plants transplanted. Pinching out the tops of plants when 30 cm high encourages branching. A spacing of about 90 x 45 cm is suitable. About 8 - 10 kg of seed are required for one hectare. Most kinds respond to fertiliser. Seeds do not breed true and can cross with other kinds of okra growing nearby. This is not normally a problem but simply means plants and fruit are not all the same.

Production: Plants maintain production if the fruits are harvested regularly. Plants are ready to harvest 8 - 10 weeks after sowing. Seed yields of 500 - 800 kg per hectare are recorded. Pod yields of 4 - 6 tonnes per hectare occur. It takes 2 - 4 months from sowing to harvest of young pods. Pods develop 5 - 10 days after flowering. Pod harvests can continue for 1 - 2 months. Leaving pods on the plants stops new pods developing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.2	1721	23.7	-	-	-	-
leaf	81.0	235	4.4	116	59	0.7	-
pod (fresh)	88.0	151	2.1	185	47	1.2	-
fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6

Vegetables

English: Pumpkin

Local: Ponkin

Scientific name: *Cucurbita maxima*

Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is a creeping vine with tendrils. It is an annual plant. The stems are soft and round in cross section. The leaves are large and hang loose. They are dark green and kidney shaped. The edges of the leaves are entire. There are large nodes at the base of the leaf. The tendrils are fairly stout and are divided half way along their length into many branches. Male flowers are carried on long upright stalks. The 5 petals are united into a long yellow tube. The female flowers are larger than the male and are fewer in number and carried on shorter stalks. The fruit varies in size, colour and patterns on the skin. They can be round, oval or flattened, with yellow, orange or green skin. The surface can be smooth and rough and warty. The flesh is yellow and edible. The seeds are in the centre. The seeds are white or brown. They are flattened but plump and have a slanting scar at the top. The seeds are edible. (*C. moschata* does not have hairy stems but has fruit with a thickened stalk near where it joins the fruit.) There are a large number of cultivated varieties.



Distribution: A subtropical plant that grows from sea level to 2,400 m altitude. They need a fertile soil. *C. moschata* is better suited to coastal areas. They are frost sensitive but better suited to cooler areas than *C. moschata*. It can grow in arid places. It suits hardiness zones 8 - 11.

Use: The young leaf tips are eaten cooked. They can also be dried and stored. The fruit can be eaten cooked. They are baked, boiled, fried, steamed or mashed. They are used in pies and cakes. The seeds are edible, raw or roasted. They are also ground into a meal. The male flowers are eaten after removing the stamen and calyx.

Cultivation: They are grown from seed. Usually 2 or 3 seeds are planted together in a mound. The distance apart depends on the cultivar. Some kinds are better for leaf tips. It is good to save seed of adapted varieties.

Production: Fruit are ready for harvest after about 3 - 4 months. Seed can be saved from fruit for re-sowing but as pumpkins cross pollinate different types become mixed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	6.9	2264	24.5	38	1.9	14.9	7.5
fruit	69.6	439	1.4	-	-	-	-
leaf	88.0	160	4.9	260	28	2.5	0.9
flower	88.7	107	1.4	173	14	0.8	0.1

Vegetables

English: Marrow

Local:

Scientific name: *Cucurbita pepo*

Plant family: CUCURBITACEAE

Description: A bristly hairy annual vine in the pumpkin family. It has branched tendrils. The stems are angular and prickly. The leaves are roughly triangular. The leaves have 5 lobes which are pointed at the end and are toothed around the edge. Male and female plants are separate on the same plant. Male flowers are carried on long grooved flower stalks. Female flowers are borne on shorter more angular stalks. The fruit stalks have furrows along them but are not fattened near the stalk. The fruit vary in shape, size and colour.



Often they are oval and yellow and 20 cm long by 15 cm wide. The seeds are smaller than pumpkin and easy to separate from the tissue. The scar at their tip is rounded or horizontal, not oblique. There are a large number of cultivated varieties.

Distribution: A subtropical plant. They are more suited to drier areas. They are frost sensitive, and grow best with day temperatures between 24 - 29°C and night temperatures of 16 - 24°C. It suits tropical highland regions. It suits hardiness zones 8 - 11.

Use: The young fruit are cooked and eaten. They can be steamed, boiled or fried. They are used in pies, soups, stews and cakes. The young leaves and the ripe seeds can also be eaten cooked. The seeds are dried, salted and toasted and eaten as a snack food. The seeds can also be pressed to produce oil. The sprouted seeds are used in salads. Flowers and flower buds can be eaten boiled. They can be dried for later use.

Cultivation: They are grown from seeds. The seeds germinate after one week. They can be grown from cuttings. They are best planted on mounds. A spacing of 2 - 3 m between plants is needed. Hand pollination assists fruit setting. Plants can also be grown from cuttings as plants root at the nodes.

Production: The first usable immature fruit are ready 7 - 8 weeks after planting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	3.7	2266	29.4	-	-	7.3	-
leaf	89.0	113	4.0	180	80	0.8	-
fruit (mature)	92.0	105	1.6	17	16	2.4	-
fruit	91.3	102	1.1	-	12	0.8	0.2
yellow fruit	92.0	97	1.0	180	8	1.4	-
immature fruit (raw)	92.0	92	1.5	-	9	0.4	0.1

Vegetables

English: Winged bean

Local: Binch

Scientific name: *Psophocarpus tetragonolobus*

Plant family: FABACEAE

Description: A climbing perennial bean up to 4 m tall. It can re-grow each year from the fattened roots. The stems twine around supports or trail over the ground. The leaves have 3 leaflets 8 - 15 cm long with long leaf stalks. The flowers are blue or white and occur on the ends of branches from within the axils of leaves. Pods have wavy wings and are roughly square in cross section. They are 6 - 36 cm long with 5 - 30 seeds. Seeds can be white, yellow, brown or black and are bedded in the solid tissues of the pod. The seeds are round and smooth with a small hilum. The root has large nodules.



Distribution: A tropical plant that grows from sea level up to about 1,850 m altitude in the tropics. It normally only produces tubers at 1,200 - 1,850 m altitude. It is a short day plant and needs a daylength less than 12 hours. It will not produce flowers or pods at places far removed from the equator. The main areas of production are between 20°N and 10°S latitudes. It is ideally suited to the tropics including the hot humid lowlands. For maximum seed production, temperatures of 23 - 27°C are needed, and for tubers the temperatures should be 18 - 22°C. Winged beans can grow on a wide variety of soils and have been grown on soils with pH from 3.6 - 8.0. Soils which are very acid have soluble aluminium to which winged beans are sensitive. Soils should not be waterlogged.

Use: The young leaves, flowers, young pods, ripe seeds and root tubers are edible. The seeds can be used to extract an edible oil.

Cultivation: Seeds are sown at the beginning of the rainy season. Seeds germinate and grow slowly for the first 3 - 5 weeks. For tubers, vines are pruned off at about 1 m high (or left unstaked) and some flowers are removed. Cultivation procedures vary slightly depending on which part of the plant is to be eaten. Short podded winged bean are used for tubers and long podded ones have poor tubers. Tuber production is not as efficient in tropical lowland conditions.

Production: The first green pods are ready about 10 weeks after sowing. Tubers are ready after 4 - 8 months. Seed yields of 1.2 tons/ha and tuber yields of 4 tons/ha are possible. A single plant can produce up to 75 pods. Dry bean yields of 45 - 330 g per plant can be produced depending on variety. Tuber yields of 5,500 - 12,000 kg per hectare have been produced. Seeds can contain a trypsin inhibitor which reduces protein digestibility. This inhibitor is destroyed by soaking seeds then boiling them well. Tubers can also contain this chemical and need to be well cooked.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.5	1764	41.9	-	-	15.0	4.5
pod (fresh)	92.0	105	2.1	-	-	-	-
leaf	95.0	197	5.0	809	30	6.2	1.3
seed (young)	87.0	205	7.0	13.0	18.3	1.5	0.4
root	57.4	619	11.6	0	0	2.0	1.4

Vegetables

English: Balsam apple
Local: Fincimar (mende)

Scientific name: *Momordica balsamina*
Plant family: CUCURBITACEAE

Description : A pumpkin family plant that can grow each year from seed, or keep growing from year to year. The leaves have 1 - 5 cm long stalks. The leaves are 4 - 7.5 cm across by 4 - 7 cm wide. They may be round or have 3 - 5 lobes like fingers on a hand. The lobes are narrowly sword shaped and have dots on both surfaces. The flowers are yellow and grow separately with male and female on the same plant. The fruit are oval but narrowed towards both ends. They are smooth or warty. They are smaller than *Momordica charantia*.



Distribution: A tropical plant that grows in tropical and sub-tropical places. It usually grows on sandy soils near rivers. It grows to 300 m altitude in Pakistan, to about 600 m in Nepal and 1,600 m in Africa. It can grow in arid places.

Use: The young fruit are boiled or fried as a vegetable. They are also eaten raw. They are used in stews and pickled. They are used as a flavouring. The young leaves and tendrils are used as a potherb. The seeds are eaten after steeping in salt water and cooking. **Caution:** The ripe fruit cause diarrhoea.

Cultivation: Plants are grown from seed or tubers. It climbs over fences and huts.

Production: It produces from August – October in Rajasthan in India.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	89.4	121	2.0	-	-	2.6	1.0
leaf	89.4	-	3.0	-	-	12.7	0.9

Image accessed from http://upload.wikimedia.org/wikipedia/commons/e/ef/Momordica_balsamina_006.JPG

Vegetables

English: Choko, Chayote

Local: Kayote

Scientific name: *Sechium edule*

Plant family: CUCURBITACEAE

Description: A vigorously growing climber that can last for several years. It has strong tendrils which can attach to fences and trees so that the plant can climb well. The choko leaves are about 15 - 20 cm across and have a rough feel. The stems have furrows along them. The fleshy fruit contain one large seed. The choko fruit is produced in the angle where the leaf joins the vines. Fruit can be up to 20 cm long and they are rough or irregular shaped on the outside. There are white and green fruited varieties. The flowers are separate. Male flowers are in clusters and female flowers are on their own. A choko plant produces a large thickened root tuber and the plant can re-grow from this tuber and go on growing year after year.



Distribution: A tropical and subtropical plant. Choko requires relative humidity of 80 - 85%, annual rainfall of at least 1,500 - 2,000 mm and average temperatures of 20 - 25°C with limits of 12 - 28°C. In equatorial tropical regions, chokos will grow from sea level to about 2,200 m altitude. In the lowlands it grows best in shade. Chokos need a reasonably well drained soil. It can grow in arid places. It suits hardiness zones 9 - 12.

Use: The fruit are edible cooked. They can be pickled, baked, steamed, or made into fritters and puddings. The young leaf tips are eaten. The seeds can be eaten cooked. They are often deep fried. The fleshy root can be eaten cooked. They can be boiled, baked or fried. Starch can be extracted from the fruit.

Cultivation: The entire fruit is planted as the seed cannot withstand drying out. It is planted flat and thinly covered with soil. Often chokos start to develop shoots and roots while they are still attached to the original plant. These eventually fall off and continue growing if they fall on soft moist soil. A spacing 2 m apart along a fence is suitable. Trellis support is required. A well drained, fertile soil is needed. Cuttings can be used for planting. Plants do not breed true.

Production: Fruit can be picked starting 3 - 5 months after planting and continued for many months. The fruit can be stored for several weeks. Tips can be picked regularly. Tubers of 5 kg weight have been recorded. These are normally produced during the second year of growth and after a time of arrested development such as a dry season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	80	331	2.0	-	19	0.8	-
leaf	91.0	105	4.0	75	24	1.4	-
fruit (boiled)	93.4	100	0.6	5	8	0.2	0.3
fruit (raw)	94.0	80	0.7	15	14	0.4	0.7

Vegetables

English: Jute

Local:

Scientific name: *Corchorus olitorius*

Plant family: MALVACEAE

Description: An annual plant. It is upright, branching, and slightly woody. Plants vary in height, shape, leafiness and hairiness. Plants grown for leaves are usually only 30 cm tall. They also have many branches. Leaves are shiny and have leaf stalks. The leaves have teeth along the edge. The tips of the lowest leaves in each side, have long bristle like structures. Small clusters of yellow flowers grow in the axils of the leaves. The fruit are ridged capsules. They can be 7 cm long. These have partitions across them between the seeds. A ripe capsules contains 180 - 230 seeds. The seeds are dull grey and with four faces and one long point. Each seed has one pale line along it.



Distribution: A tropical plant. It is mostly coastal, below 250 m altitude. Temperatures of 22°-35°C are suitable. It can stand both drought (2 - 3 weeks) and water-logging, except when young. A well-drained soil is best. They require humus-rich soils. A soil pH of 5.5 - 7.0 is best, but they can grow in soils with pH up to 8.5. They also need adequate moisture for good leaf production. A rainfall of 1,000 mm is suitable. A high relative humidity (80 - 90%) is best. It produces seeds when day lengths are short. It grows in most African and Asian countries.

Use: The young leaves and stem tops are eaten cooked. They are slimy unless fried. They are also used to make a thick soup. Leaves can be sun dried, pounded to flour, then stored for a long time.

Cultivation: Plants grow from seed, and they can be transplanted. Seeds are often broadcast into fine seed beds at the beginning of the wet season. Mixing the small seeds with sand makes it easier to sow them evenly. Often seeds are slow to start growing. This can be overcome by soaking them in hot water. A spacing of 20 - 30 cm between plants is suitable. For vigorous varieties this could be increased to 45 - 50 cm. Seeds are saved from pods for re-sowing.

Production: First leaves can be harvested after 5 - 6 weeks. Tips about 20 - 30 cm long are picked. Production of edible green tips, is not large. 7 - 8 kg of leaf tips can be harvested from 3 - 8 pickings over 3 - 4 months. Seeds can be collected after 13 - 15 weeks. If seeds of a particular variety are desired, it is necessary to grow these plants 16 m away from other plants, to avoid cross pollination. Seeds can be stored for 8 - 12 months in well-sealed jars.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (raw)	80.4	244	4.5	574	80	7.2	-
leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8

Vegetables

English: Chinese taro

Local: Cocoa

Scientific name: *Xanthosoma sagittifolium*

Plant family: ARACEAE

Description: A herb that grows up to 2 m tall. It has a short stem with large leaves at the top. A corm is produced at the base of the plant. It produces about 10 flask-shaped cormels, about 15 - 25 cm long, on the underground corm. They get wider towards the tip. There is a vein around the edge of the oval leaf blade which is 50 - 75 cm long. The leaf has triangular lobes at the bottom. The flower is produced below the leaves. The large bract around the flower is pale green and about 20 cm long. The bases of this bract overlap. The closely arranged spike of flowers is about 15 cm long. The smaller female part is at the bottom of the spike and the larger male part towards the top.



Distribution: It grows in many tropical countries and suits tropical rainforest regions. It can tolerate high rainfall and light shade. It does well in regions with an annual average temperature of 26°C and a well distributed rainfall of 1,400 - 2,100 mm during the growing season. It grows from sea level up to about 2,000 m. Soils need to be well-drained, but moist with a pH of 5.5 - 6.8.

Use: Cormels, or small corms, are eaten roasted or boiled. Main corms are often fed to pigs. Young leaves can be eaten after cooking.

Cultivation: *Xanthosoma* taro is normally planted by using the top piece of the main central corm or stem. Pieces weighing 1.5 kg are often used. It can also be grown by using the small side corms which may weigh 0.3 kg, or pieces of the corm can be used as long as they have some buds on them. These are often presprouted before planting. To multiply large amounts of planting material and still achieve acceptable yields, the latter method of using sections of the main corm works well. In crop growth, an axillary bud is produced in the axil of each leaf but only some of these develop into cormels. Often 10 or more cormels develop per plant into cormels 15 - 25 cm long.

Production: The crop grows for about 9 months, although may be left for 12 months before harvest. Crops can be planted at any time of the year, but are often planted to make best use of natural rainfall. The middle of the dry season should be avoided. Naturally loose or well cultivated soils are needed. The water table must be at least 45 cm below the soil surface. *Xanthosoma* taro grows better in good soils with plenty of nitrogen. It can be grown in poorer soils and still give satisfactory yield. It can grow in shade and is inter-cropped under cacao and coconuts. Yield is reduced, but it is still worth doing if no other land is available. Weed control is important. The corms can be harvested without digging out the whole plant by carefully digging soil away from the plant and breaking off small corms. The main stem is then covered to produce a new crop. The corms store reasonably well under dry, cool, well-ventilated conditions. The corms will also remain in good condition if they are left growing in the ground and just harvested when needed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	67.1	559	1.6	5	13.6	0.4	0.5
leaf	90.6	143	2.5	160	37	2.0	-
shoot	89.0	139	3.1	-	82	0.3	-

Nuts, seeds, herbs and other foods

English: Cashew

Local: Cashu

Scientific name: *Anacardium occidentale*

Plant family: ANACARDIACEAE

Description: An evergreen tree, with spreading branches, growing 7 - 14 m tall. The canopy can spread to 12 m. The roots grow deeply and spread widely. The shiny leaves are pale green and large. They are 10 - 15 cm long by 6 - 8 cm wide. They have fine veins. The flowers are produced on the ends of the branches. They are red in colour. The kidney-shaped nut is about 3 cm long and is borne below the "apple" which is really a fleshy stalk.



Distribution: It is a tropical plant that suits the lowland tropics but will grow up to about 1,200 m altitude. It only bears well in dry areas because of blight of the flowers. It grows with temperatures between 22 - 26°C. A rainfall of 1,750 mm per year is considered suitable but good yields have been obtained with rainfall of 750 mm. It can grow on poor soils but needs good drainage.

Use: The fleshy "apple" is edible but acid until very ripe. It is used for jams and drinks. It is also candied, made into chutney and pickles. The nut is eaten after roasting. The young shoots and leaves are edible. They are picked during the rainy season and eaten fresh with hot and spicy dishes.

Caution: The oil of the nut can blister the skin until roasted. The apple is used to make spirits.

Cultivation: It is usually grown from seeds. Seeds germinate poorly and slowly. Only nuts which sink in water (or a solution of 150 g of sugar in a litre of water) should be planted. Seeds are sun dried for 2 - 3 days to improve germination. Seeds can be sown in a nursery then transplanted, or more commonly, are sown directly. Trees are spaced 7 - 10 m apart. The crop is cross pollinated mostly by insects. For good production, complete fertiliser or appropriate organic material should be applied. Pruning to shape the tree is often undertaken in the first 2 - 3 years. Cashews are often planted scattered in gardens or amongst other trees. Clearing under the tree prevents fire and makes finding nuts easier. Allowing nuts to fall before harvesting ensures only ripe nuts are collected. Resin in the cashew nut shell can damage hands and discolour the nuts. Roasting the nuts before removing the kernel avoids this.

Production: Trees commence bearing after 3 years. Fruit production is seasonal, normally October - January. Mature nuts are produced in 2 - 3 months. Yields of 80 - 200 kg of nuts per hectare are normal. Trees reach maximum production after 10 years and trees last for about 100 years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut	4.0	2478	17.5	-	-	2.8	4.8
leaf	69.9	418	5.2	-	-	-	-
fruit	84.7	213	0.8	0.12	265	1.0	0.2

Nuts, seeds, herbs and other foods

English: Peanut

Local: Granat

Scientific name: *Arachis hypogea*

Plant family: FABACEAE

Description: Peanuts grow on spreading bushy plants up to about 40 cm high. The leaves are made up of 2 pairs of oppositely arranged leaflets. Flowers are produced in the axils of the leaves. Two main kinds of peanuts occur. The runner kind (Virginia peanut) has a vegetative or leafy branch between each fruiting branch and therefore produces a spreading bush. The bunch type (Spanish-Valencia peanuts) produces fruiting branches in a sequence one after the other along the branches. They grow as a more upright plant and grow more quickly. Pods are produced on long stalks which extend under the ground and they contain between 2 - 6 seeds. The stalk or peg from the flower grows down into the soil and then produces the pod and seed under the ground. The flowers need to be no more than 18 cm from the soil surface for the seed pod to develop underground.



Distribution: Peanuts grow in tropical and subtropical areas. They grow well from sea level up to about 1,650 metres in the equatorial tropics. They require temperatures of 24 - 33°C. Plants are killed by frost. They need a well drained soil and cannot stand water-logging and often require raised garden beds. Peanuts need 300 - 500 mm of rain during the growing season. Dry weather is needed near harvest.

Use: The seeds can be eaten raw or cooked. They are boiled, steamed, roasted, salted or made into peanut butter or flour. The young leaves and unripe pods are edible after cooking. Sprouted seeds can be eaten. An edible oil is extracted from the seeds. The remaining meal can also be eaten.

Cultivation: Peanuts require soil with good levels of calcium and boron or they produce empty pods. Peanuts have nitrogen fixing root nodule bacteria and therefore can give good yields in soils where nitrogen is low. The nuts are normally removed from the shell before planting and are sown 2 - 3 cm deep, with 10 cm between plants and 60 - 80 cm between rows. The soil needs to be weeded and loose by the time the flowers are produced to allow the peg for the seed pods to penetrate the soil.

Production: Flowering can commence in 30 days and it takes 3.5 - 5 months until maturity. Peanuts are harvested by pulling out the plant when the top of the plants die down. After harvesting, they should be left to dry in the sun for 3 - 4 days. Virginia peanuts have a longer growing season and the seeds need to be stored for 30 days before they will start to re-grow.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	4.5	2364	24.3	-	-	2.0	3.0
seed (fresh)	45	1394	15	-	10	1.5	-
leaf	78.5	228	4.4	-	-	4.2	-

Nuts, seeds, herbs and other foods

English: Oil bean tree

Local: Farwai (mende)

Scientific name: *Pentaclethra macrophylla*

Plant family: FABACEAE

Description: A large tree, with a spreading crown, that grows to 30 m tall. The leaves are twice divided. There are 12 - 20 pairs of secondary leaflets. The flowers are in groups 30 cm long in the axils of leaves or at the ends of branches. The fruit are pods 40 - 60 cm long. There are 5 - 8 purplish-brown, flat, oval seeds, 4 - 7 cm long by 2 - 3 cm wide.



Distribution: A tropical plant that grows in tropical Africa from sea level to 500 m altitude. It needs temperatures above 18°C. An average temperature of 25°C and an annual rainfall of 1,500 - 2,000 mm per year is best. It grows best on a well-drained soil but can tolerate waterlogging. It can grow in acid soils and arid places.

Use: The seeds (with skin removed) are soaked in water, then ground and cooked in leaves. They are also shredded and fermented. The seeds are rich in oil that is used in cooking. The seeds are used as a condiment.

Cultivation: Plants are grown from seed. Fresh seed should be used. Seed can be stored for 3 months at 15°C. They can be grown from cuttings, air-layering or budding. Young stem cuttings need to be used and rooting hormone helps.

Production: Trees from cuttings can produce seed after 4 years. Harvesting pods can occur throughout the year but is a difficult task.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	6.2	2332	22.6	-	-	16.0	-

Image accessed from

<http://database.prota.org/PROTAhtml/Photfile%20Images%5CPentaclethra%20macrophylla%20fruit%20and%20seed.JPG>

Nuts, seeds, herbs and other foods

English: Tamarind

Local: Tombi

Scientific name: *Tamarindus indica*

Plant family: FABACEAE

Description: A large spreading tree up to 24 m tall. It has a broad, dense, evergreen crown. The trunk can be 1 m across. The bark is rough and grey with a checkered pattern. The tree can lose its leaves in dry areas. The leaves are carried one after another along the branch. The whole leaf is 6 - 12 cm long and it is divided into 10 - 17 pairs of leaflets. These are oblong and without stalks. The whole leaf has a leaf stalk about 15 cm long. The leaflets are 1 - 2.5 cm long and 4 - 9 mm wide. They are a dull dark green with a rounded tip. The flowers are pale yellow with brown markings. The flowers are about 2.5 cm across and hang on long, many flowered stalks. The fruit is an oblong, thin-skinned, fleshy capsule. The brown seeds are inside this long rough surfaced, sausage-like fruit. This pod is 6 - 8 cm long and about 2 cm wide and contracted between the seeds. The pod cracks when mature. The seeds are shiny and hard. The edible pulp is date like and reddish brown.



Distribution: A tropical legume. The tree is cultivated in a number of coastal towns in the tropics as a street tree. It is probably best grown below 800 m altitude in the tropics. It is drought resistant and cannot stand water-logging. It does well on coastal dunes above high water level. It suits semi-arid areas. It grows in the Sahel and must be in frost free locations. In Kenya it grows from sea level to 1,600 m altitude. It suits hardiness zones 11 - 12.

Use: The pulp of the fruit is edible and is also used for drinks. The seeds are also edible when cooked. They can be roasted and ground into flour. The outer skin is removed. The young leaves, flowers and young pods are also edible and are eaten in curries. They are used to make dishes acid. They are used in sauces and chutneys. The young seedlings are also edible.

Cultivation: It can be grown by seeds or cuttings. It is best to sow seedlings in pots then transplant them, but seed can be sown direct. There are about 1,400 seeds per kg. Seed should be soaked in hot water or the seed coat nicked before sowing. Seed can be stored for 2 years if kept dry, cool and away from insects. Trees can be topped or cut back and allowed to re-grow. Nothing grows under the trees due to the acidity of the leaves. Trees can be grown by air layering or cuttings.

Production: Trees are long-lived and grow very slowly. Fruiting is seasonal from April to June. It takes 8 - 9 months from flowering to ripe fruit. If plants are grown for shoots, they are planted close together.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	38.7	995	2.3	20	60	1.1	0.7
flower	80.0	314	2.5	-	-	1.4	-
leaf	78.0	305	3.1	-	-	2.0	-

Nuts, seeds, herbs and other foods

English: Coastal almond

Local: Almond Granat

Scientific name: *Terminalia catappa*

Plant family: COMBRETACEAE

Description: A large tree, up to 25 - 40 m tall. It loses its leaves during the year. The trunk can be straight or twisted. There can be buttresses up to 3 m tall. The branches lie horizontally and come out in layers. The leaves are long, smooth and shiny, with an abrupt point at the tip and a rounded base. Leaves tend to be near the ends of branches. Leaves can be 17 - 29 cm long and 10 - 15 cm wide. Young leaves have soft hairs. The leaves turn red and fall off twice a year. Flowers are greenish-white and in a spike at the end of the branches. The lower flowers on a spike are female, and the others are male. The fruit is about 6 cm long by 3 - 4 cm wide, thick and flattened, with a flange around the edge. The fruit are green and turn red when ripe. The pulp is edible.



Distribution: It grows on beaches in almost all tropical countries in the world, including Solomon Islands. It is a tropical plant, and sometimes cultivated as a shade tree. The tree is common in lowland areas particularly on sandy or rocky beaches. Seeds are spread by bats and sea water, as well as being planted by people. It is common along streets in coastal towns. It will grow from sea level up to about 800 m altitude. Plants are frost-susceptible. It can tolerate drought. It suits hardiness zones 11 - 12.

Use: The kernel of the fruit is eaten raw. An edible oil can also be extracted.

Cultivation: Plants can be grown from seed. Seeds can be stored dry for a year or more. Seeds germinate freely and most seeds grow. Insects can badly damage the leaves of young seedlings.

Production: It is fast growing. Nut production is seasonal.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut (fresh)	31	1810	15.9	-	4	4.6	4.9
nut (dry)	4.2	2987	20.0	-	2	6.3	8.8

Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	<i>Amaranthus spinosus</i>	Prickly amaranth	leaf	91.7	84	3.6	109	46	14.4	0.3	27
AMARANTHACEAE	<i>Celosia argentea</i>	Quail Grass	leaf	84.0	185	4.7	-	33	7.8	-	28
AMARANTHACEAE	<i>Celosia trigyna</i>	Silver spinach	leaf	89.0	139	2.7	1925	10	5.0	-	29
ANACARDIACEAE	<i>Anacardium occidentale</i>	Cashew	nut	4.0	2478	17.5	-	-	2.8	4.8	51
ANACARDIACEAE	<i>Mangifera indica</i>	Mango	fruit	83.0	253	0.5	54	30	0.5	0.04	37
ANACARDIACEAE	<i>Spondias purpurea</i>	Purple Mombin	fruit	76.2	347	0.16	30	45	1.1	-	42
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.3	12
ARACEAE	<i>Xanthosoma sagittifolium</i>	Chinese taro	leaf	90.6	143	2.5	160	37	2.0	-	50
BOMBACACEAE	<i>Adansonia digitata</i>	Boabab	fruit	16.0	1212	2.2	-	360	7.4	6.7	34
BROMELIACEAE	<i>Ananas comosus</i>	Pineapple	fruit	84.3	194	0.5	3	47.8	0.4	0.1	35
CLEOMACEAE	<i>Cleome viscosa</i>	Sticky Cleome	leaf	80.4	-	5.6	-	-	24	-	30
COMBRETACEAE	<i>Terminalia catappa</i>	Coastal almond	nut	31	1810	15.9	0	4	4.6	4.9	55
CONVOLVULACEAE	<i>Ipomoea batatas</i>	Sweet Potato	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	16
CUCURBITACEAE	<i>Cucurbita maxima</i>	Pumpkin	seed (dry)	6.9	2264	24.5	38	1.9	14.9	7.5	44
CUCURBITACEAE	<i>Cucurbita pepo</i>	Marrow	fruit (mature)	92.0	105	1.6	350	16	2.4	-	45
CUCURBITACEAE	<i>Momordica balsamina</i>	Balsam apple	fruit	89.4	121	2.0	-	-	2.6	1.0	47
CUCURBITACEAE	<i>Sechium edule</i>	Choko	fruit (boiled)	93.4	100	0.6	2	8	0.2	0.3	48
DIOSCOREACEAE	<i>Dioscorea bulbifera</i>	Potato Yam	tuber	70.8	357	2.7	-	78	3.1	0.4	15
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	18
FABACEAE	<i>Arachis hypogea</i>	Peanut	seed (dry)	4.5	2364	24.3	0	-	2.0	3.0	52
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed	10.0	1449	19.5	55	-	15.0	-	20
FABACEAE	<i>Canavalia ensiformis</i>	Jack bean	seed	10.0	1423	20.4	160	0	4.9	-	21
FABACEAE	<i>Cyamopsis tetragonolobus</i>	Guar bean	seed	9.9	1452	30.5	-	-	-	-	22
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	seed (young)	10.0	1428	22.8	-	-	9.0	-	23
FABACEAE	<i>Parkia filicoidea</i>	African locust bean	seed (dry)	7.0	1780	32.3	-	-	-	-	24
FABACEAE	<i>Pentaclethra macrophylla</i>	Oil bean tree	seed (dry)	6.2	2332	22.6	-	-	16.0	-	53
FABACEAE	<i>Psophocarpus tetragonolobus</i>	Winged bean	seed	8.5	1764	41.9	-	-	15.0	4.5	46
FABACEAE	<i>Tamarindus indica</i>	Tamarind	fruit	38.7	995	2.3	20	60	1.1	0.7	54
FABACEAE	<i>Vigna radiata</i>	Green gram bean	seed	11.0	1432	22.9	6	4.8	7.1	2.68	25

FABACEAE	<i>Vigna unguiculata</i> <i>subsp. unguiculata</i>	Cowpea	seed (dry)	11.2	1189	23.5	-	1.5	6.4	-	26
MALPIGHIACEAE	<i>Malpighia glabra</i>	Barbados cherry	fruit	83.2	163	1.8	800	2100	0.8	-	39
MALVACEAE	<i>Abelmoschus</i> <i>esculentus</i>	Okra	pod (fresh)	88.0	151	2.1	185	47	1.2	-	43
MALVACEAE	<i>Corchorus olitorius</i>	Jute	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	49
MALVACEAE	<i>Hibiscus rosa-sinensis</i>	Hibiscus	leaf	6.4	1339	25.9	-	-	19.6	8.9	31
MALVACEAE	<i>Sida cordifolia</i>	Goat's horns	leaf	6.6	1296	24.2	-	-	79.8	-	33
MORINGACEAE	<i>Moringa oleifera</i>	Horseradish Tree	leaf	76.4	302	5.0	197	165	3.6	-	32
MUSACEAE	<i>Musa sp</i>	Banana	fruit	70.7	337	1.1	200	10	0.4	0.2	11
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	31	184	1.4	0.2	41
POACEAE	<i>Pennisetum glaucum</i>	Pearl millet	seed	13.5	1363	12.7	-	-	3.5	-	14
SOLANACEAE	<i>Physalis peruviana</i>	Cape gooseberry	fruit	84.2	201	2.0	36	30	1.5	-	40



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