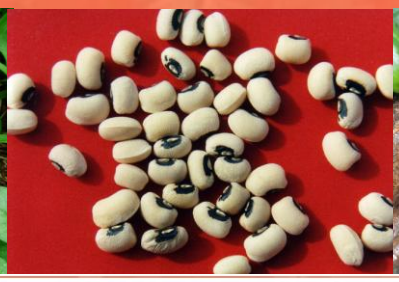
Potentially Important Food Plants of Mozambique

FOOD PLANT SOLUTIONS
ROTARIAN ACTION GROUP

Solutions to Malnutrition and Food Security

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

www.foodplantsolutions.org

Potentially Important Food Plants of Mozambique

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.

Food Plant Solutions Field Guide – Mozambique, Version 3, June 2013

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 Learn♦Grow project), and many volunteers who have assisted in various ways.

The selection of plants included in this guide has been developed by Peracto SA 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 Uganda. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Uganda, 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

This book is designed as a simple introduction to the more common food plants of Mozambique. 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

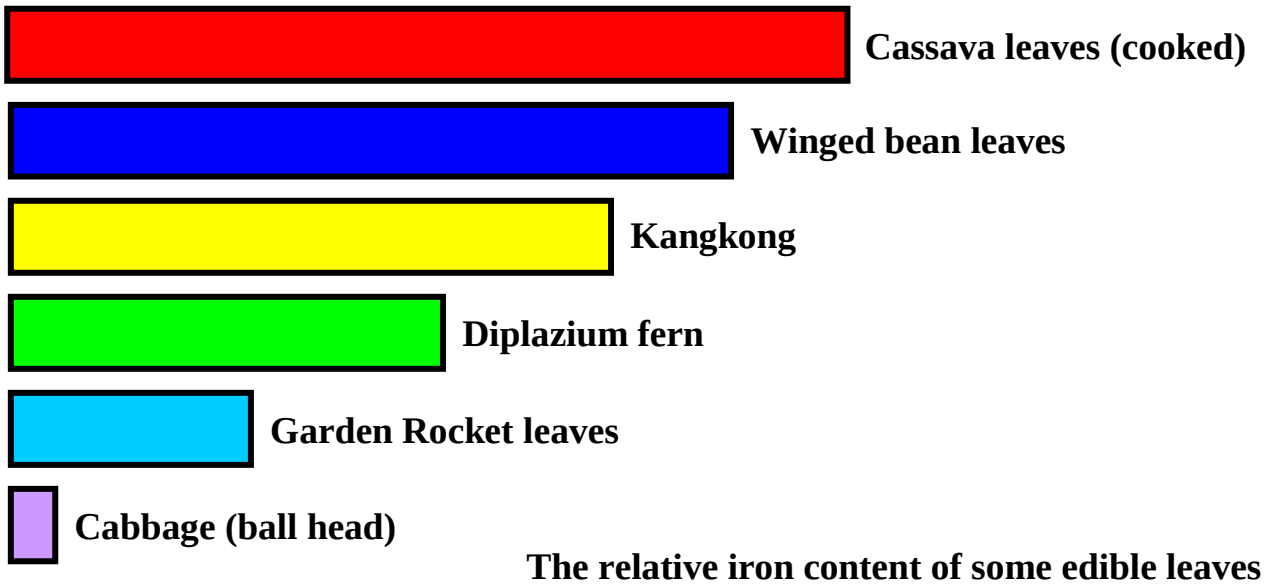
Many food plants have local names, as well as a common English name. Every type of plant also has its own scientific name. Although the scientific name might not be

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.



The relative iron content of some edible leaves

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.

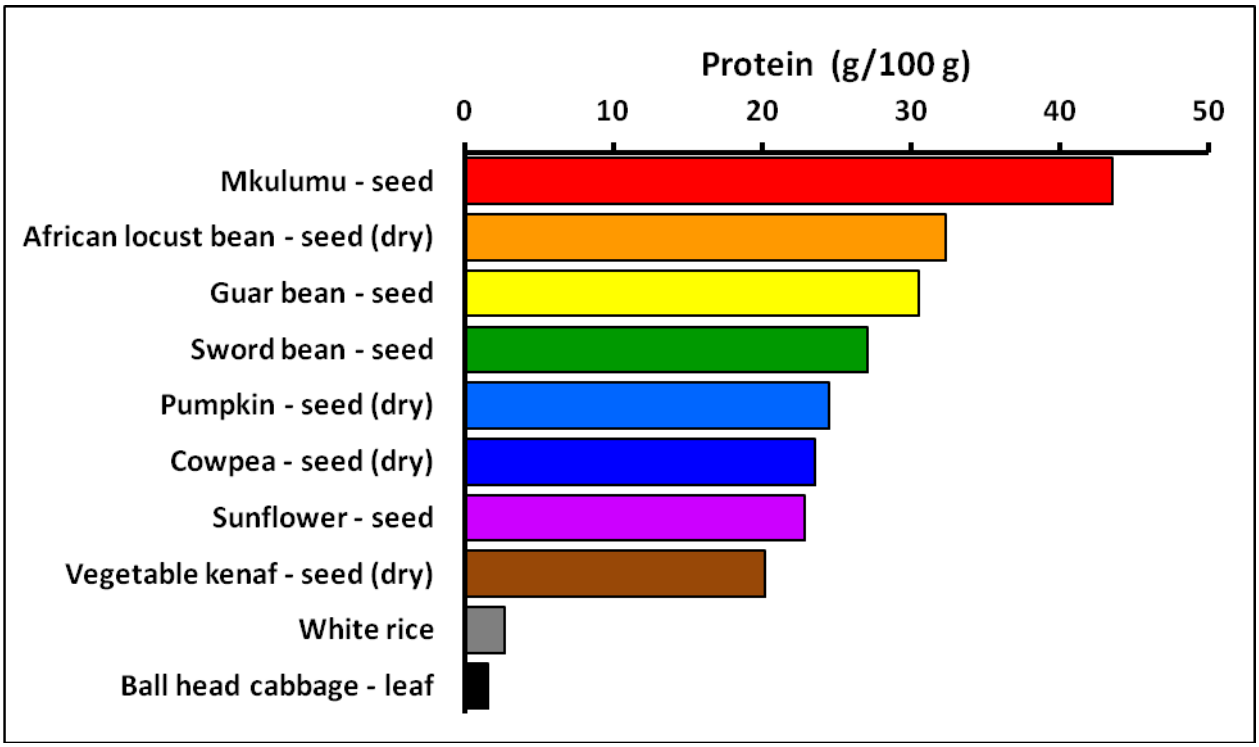
Pests

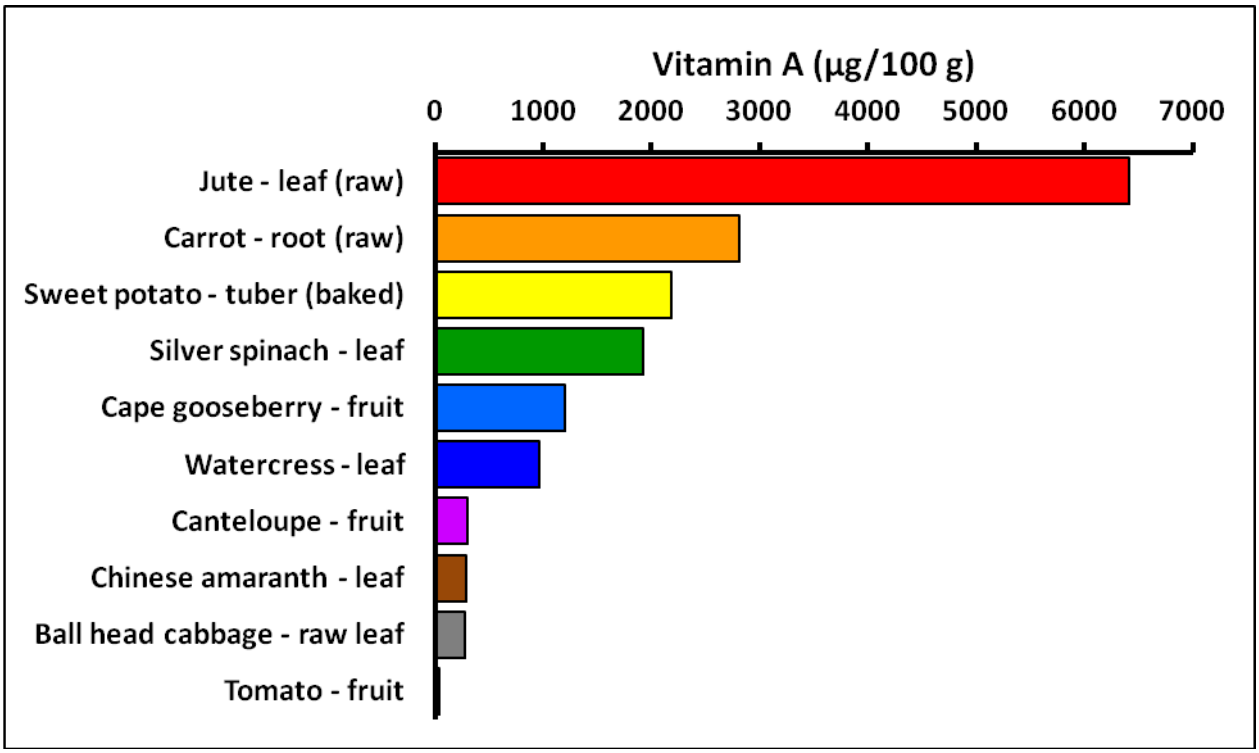
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects 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 than 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.

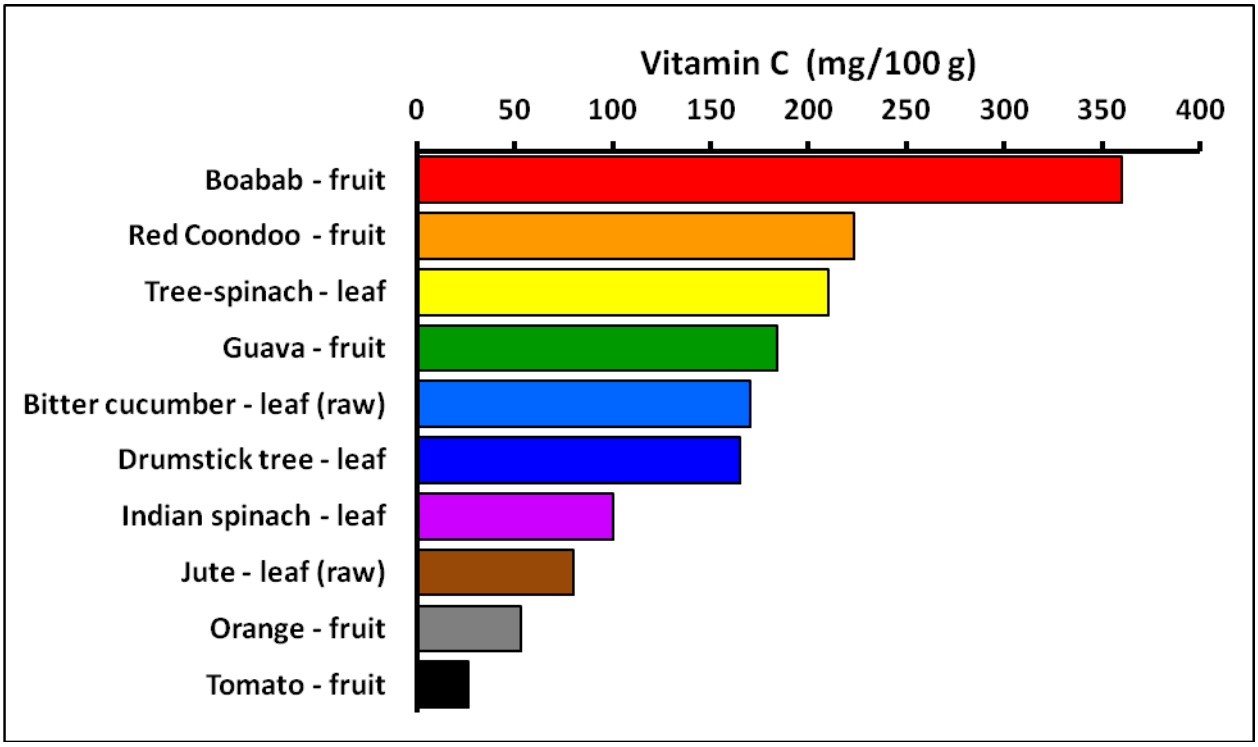
Diseases

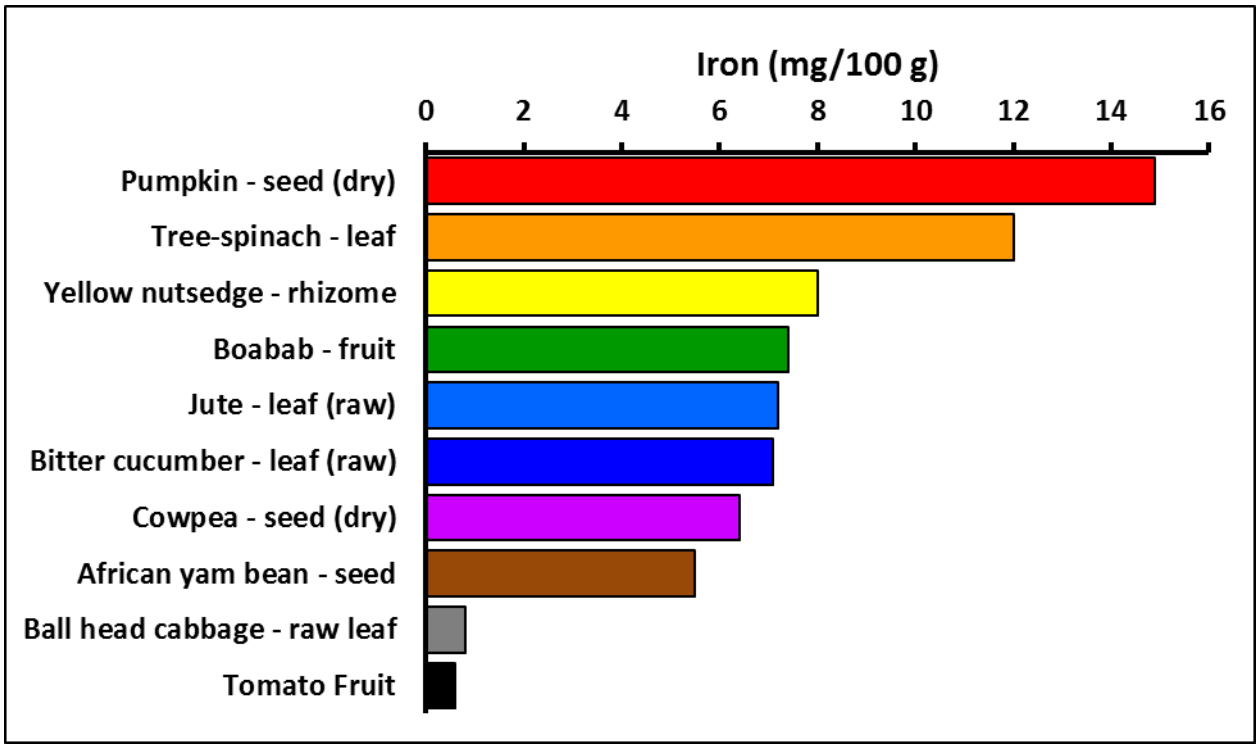
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct 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.

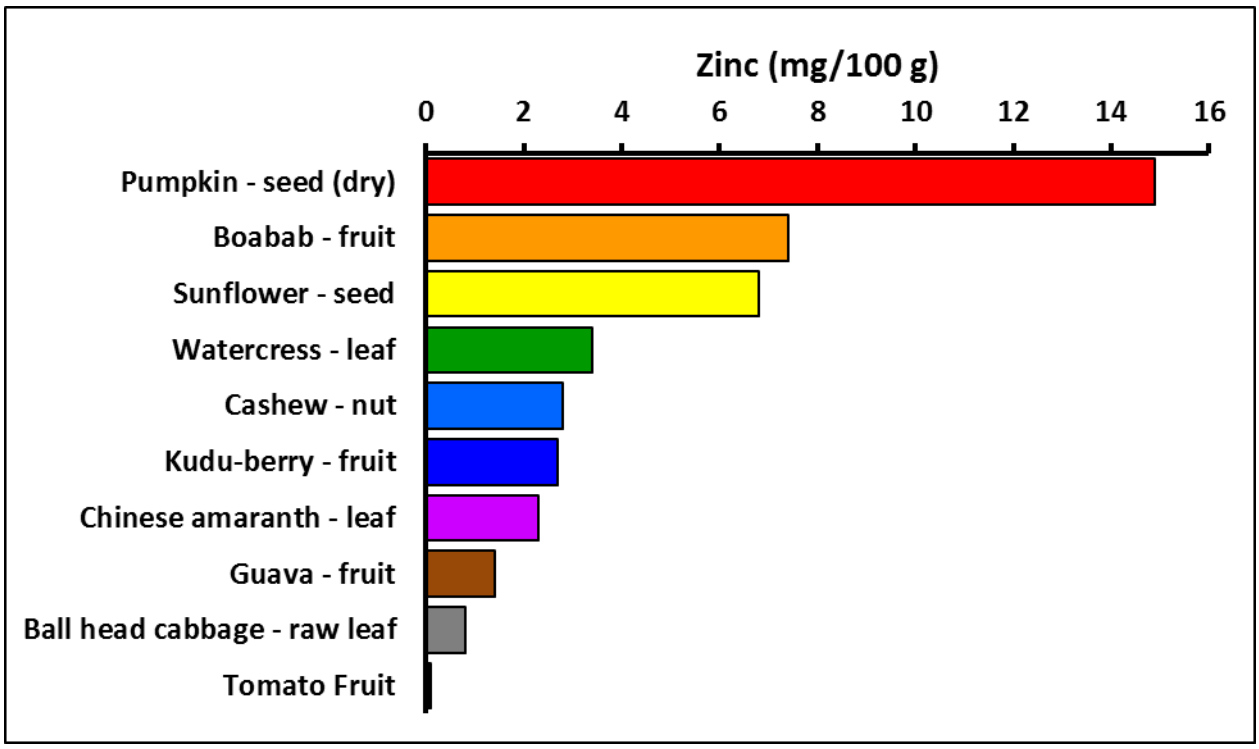
Food value charts for a selection of a selection of plants from Mozambique






Vitamin C (mg/100 g)
0
50
100
150
200
250
300
350
400
Boabab - fruit
Red Coondoo - fruit
Tree-spinach - leaf
Guava - fruit
Bitter cucumber - leaf (raw)
Drumstick tree - leaf
Indian spinach - leaf
Jute - leaf (raw)
Orange - fruit
Tomato - fruit


Iron (mg/100 g)
0
2
4
6
8
10
12
14
16
Pumpkin - seed (dry)
Tree-spinach - leaf
Yellow nutsedge - rhizome
Boabab - fruit
Jute - leaf (raw)
Bitter cucumber - leaf (raw)
Cowpea - seed (dry)
African yam bean - seed
Ball head cabbage - raw leaf
Tomato Fruit


Zinc (mg/100 g)
0
2
4
6
8
10
12
14
16
Pumpkin - seed (dry)
Boabab - fruit
Sunflower - seed
Watercress - leaf
Cashew - nut
Kudu-berry - fruit
Chinese amaranth - leaf
Guava - fruit
Ball head cabbage - raw leaf
Tomato Fruit

Starchy staples

English: Taro
Local:

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 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. 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. 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: Taro grows from sea level up to about 2300 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. **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. 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 to 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 a small prepared hole 5-7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth in 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 seasons 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 to 7.2 mm, with a total of about 1200 mm for the crop. Intermittent moisture can result in irregular shaped corms. Flooding has been found to be more effective than sprinkler 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 (e.g. 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 average 5-15 tonnes per hectare.

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	0.68
leaf	85.0	210	5.0	57	90	0.62	0.7
leaf stalks	93.0	101	0.5	180	13	0.9	-
leaf - cooked	92.2	100	2.7	424	35.5	1.2	0.2

Starchy staples

English: Potato
Local:

Scientific name: *Solanum tuberosum*
Plant family: SOLANACEAE

Description: A branched annual plant up to 50 cm high. The stems are soft and 4 angled with compound leaves. The leaves are irregular shape and have 6-8 pairs of leaflets as well as small irregular leaflets between the others. It has swollen stem tubers under the ground. The tubers can vary in colour from white to red and purple. The tuber shape can also vary greatly. The flowers are white pink or purple. The fruit is a berry. It is smooth, round and green but often striped.

Distribution: In the tropics they mostly grow at high altitude above 1500 m, but plants are grown between 900 and 2800 m. Tubers form best when soil temperatures are 15.5°C. Tuber formation stops with a soil temperature of 30°C and decreases with temperatures above 20°C. Potatoes should have a mean temperature below 18°C. They are damaged by frost but slightly more frost tolerant than sweet potato. Short daylength helps tuber production. They can grow with a pH of 5.2-6.6. It suits hardiness zones 7-11.

Use: The tubers are cooked and eaten. They are also fried, canned and made into starch. The tubers are boiled, baked, roasted, mashed and used in soups, stews, dumplings, pancakes and potato salads. Potatoes are also use for alcoholic drinks. **Caution:** Alcohol is a cause of cancer. The tender leaves are also occasionally eaten. **Caution:** The green tubers and leaves contain a poisonous alkaloid solanine. Tubers need to be cooked.

Cultivation: Plants are grown from tubers. Due to virus diseases it is necessary to get fresh seed tubers each few years. Large tubers can be cut to include a bud or "eye". A seed piece of 40-50 g is suitable. It is best to inter-crop as this stops bacterial wilt spreading. The plant is surrounded by dirt when 20-25 cm tall. Later the tubers need to be kept covered with dirt. Providing extra light (4-5 hours) allows plants to form flowers and true seed to be collected.

Production: The time to maturity is between 17 and 24 weeks. Yields of 5 to 12 tons/ha can be expected. Higher yields can be obtained with good care.

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	71.2	456	2.3	0	12.9	1.4	1.4
tuber	77.0	344	2.0	25	21	0.8	0.27
leaf	86.1	-	-	3.4	-	-	-

Starchy staples

English: Sunflower
Local:

Scientific name: *Helianthus annuus*
Plant family: ASTERACEAE

Description: An upright annual plant. It varies in height from 1-4 m. It has a strong tap root. Plants are mostly unbranched but may have some branches. The stems are hairy. The leaves are large and oval to heart shaped. They have teeth around the edges. They are roughly hairy and mid to dark green. Leaves can be 10-40 cm long by 5-20 cm wide. The leaf stalk is long. The flowers are yellow and daisy like. Flowers are 9-20 cm across. Sometimes they are tinged red or purple.

Distribution: A temperate plant. It suits the highlands of the tropics and can stand a light frost. It needs a well drained soil. It prefers a rich soil. It is drought and frost resistant. Sunflowers grow from the equator to 55°N latitude. They do not suit the wet tropics. They cannot tolerate very acid soils. It can grow in arid places. It suits hardiness zones 4-11.

Use: An edible oil is extracted from the seeds and used for cooking. Sometimes seeds are eaten raw or roasted. The seeds can be ground into a meal for using in bread and cakes. They are also dried, roasted and ground and used as a coffee substitute. The seeds are boiled with water and honey to make a drink. The germinated seeds are fermented into a yogurt or cheese.

Cultivation: Plants are grown from seed. Only well filled seed should be planted. It is easy to save your own seed. Dry seed stores well. It will grow on most soils. A plant spacing of 1 m by 0.5 m is suitable. Seed are sown at a depth of 2-4 cm. At maturity heads are collected by hand and dried then threshed.

Production: Time to maturity is usually 4-5 months. Seeds are ready to eat when the flower starts to wither.

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	5.4	2385	22.8	5	1.4	6.8	6.8

Starchy staples

English:
Local:

Scientific name: *Dioscorea schimperiana*
Plant family: DIOSCOREACEAE

Description: A yam. The vine can be 8 m long. It has a single tuber. This is 3 cm wide and 60 cm long. It grows downwards into the soil. The stem twines to the right. It is stout and does not have prickles. The leaves are usually opposite. They are 10-20 cm long and heart shaped. The flowers hang down in spikes in the axils of leaves. It can have bulbils. They are 1 cm across. The fruit are 4 winged capsules. They become papery when dry.

No picture available.

Distribution: A tropical plant that grows in subsaharan Africa. It grows near river banks and can be amongst rocks or on termite mounds. It grows between 800-1,800 m altitude.

Use: The bulbils are occasionally eaten. It is a famine food.

Cultivation:

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
Tubers	77.0	323	1.2	-	-	-	-

Starchy staples

English: Finger millet
Local:

Scientific name: *Eleusine coracana*
Plant family: POACEAE

Description: A millet grass. It is an annual grass. It is robust and forms many tillers or young shoots from the base. It grows 40-120 cm tall. The stems are somewhat flattened. The leaves are narrow. The flower heads are made up of 2-7 finger like spikes. These spikes are 1.5 cm across and 10-15 cm long. These in turn have about 70 smaller spikes. Each one of these smaller spikes has 4-7 seeds. The seeds can be 1-2 mm across. The seeds are roughly rounded. The colour varies. There are *coracana* and *africana* subsp.

Distribution: It is a tropical plant. It is a very drought resistant crop. For good yields it needs good soil drainage and adequate moisture. It cannot stand water-logging. It becomes important where rainfall is 900-1250 mm. It especially suits areas with long hot summers. It needs a minimum temperature above 18°C and does best where temperatures are above 27°C. It grows from sea level to 2400 m altitude in Africa. It is a short day length plant and does best where daylength is 12 hours. It can grow in arid places.

Use: The seed are eaten either roasted or ground into flour. This is used for porridge and flat bread. Alcohol is brewed from the grain. **Caution:** Alcohol is a cause of cancer. The leaves are also edible.

Cultivation: It is grown from seed. Often plants are grown mixed with sorghum or maize. Good soil preparation is needed to reduce weed competition. Seed can be broadcast or drilled. Young plants need to be weeded and thinned. Seed viability drops to about 50 % after 2 years. Spacing of 5 cm apart in rows 30-33 cm apart or 10-12 cm apart in rows 25 cm apart are recommended. About 25-35 kg of seed per hectare are needed if seed are broadcast. 5-10 kg per hectare are required if seed are drilled. Using fertiliser can dramatically increase yield. 125 kg per hectare of sulphate of ammonia when plants are 15 cm high is used in Uganda.

Production: It is self pollinating and pollination occurs over 8-10 days. Millet seed stores very well and can be stored without damage for 10 years. Often it is stored on the head. Yields of about 450-900 kg of dried grain per hectare are usual. This can easily be increased to 1650 kg per hectare. Crops take 3-6 months until harvest.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seeds	11.7	1594	6.2	-	-	5.3	-

Starchy staples

English: Sweet potato
Local:

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. At the end of the vine, trumpet shaped flowers grow. They are purple. Under the ground fattened tubers are produced. 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 some of the highest gardens at about 2700 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. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivated varieties 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 leaves which are however larger. With increasing shade less tubers are produced and these grow more slowly. Sweet potato tends to be responsive to potassium fertiliser. cultivated varieties are often selected for yield under low fertility conditions. Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 to 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. 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. **Caution:** Alcohol is a cause of cancer. 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.

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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	2182	24.6	0.5	0.3
tuber - raw	70.0	387	1.2	4000	25	0.7	0.7
tuber - boiled	72.0	363	1.1	1705	15	0.6	0.3
leaves	86.3	168	3.9	105	58	2.9	-

Starchy staples

English: Cassava, manioc, tapioca
Local:

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 2 or 3 metres high. 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 1650 m. In Fiji they grow to 900 m. They can grow in poor soil. They can survive drought. It is native to tropical America. It grows between 25°N and 25°S. It 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 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 to 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.

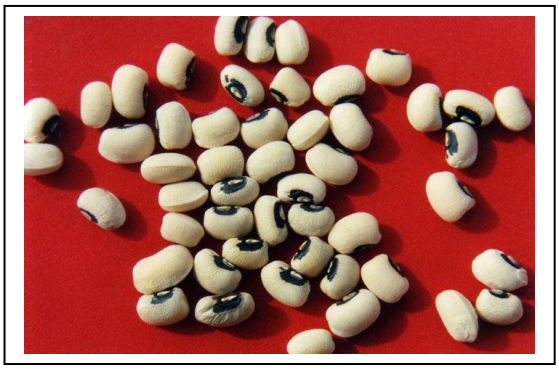
Food Value: Per 100 g edible portion

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	0.23
leaf	82.0	382	7.1	57	275	7.6	-

Legumes

English: Cowpea
Local:

Scientific name: *Vigna unguiculata subsp. unguiculata*
Plant family: FABACEAE



Description: A creeping bean type plant with straight firm pods. Both cover crop types (leafy) and grain types occur. 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. They can be 5 mm across. The leaves have 3 leaflets. The end leaflet can be 12-16 cm long. This leaflet is larger than the side leaflets. 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. This stalk can be 2 cm to 30 cm long. Only 2-4 flowers in each stalk produce pods. Flowers are white, yellow or blue. They are large and showy. The standard petal is 2-3 cm across. 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 1800 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 is 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. Seed collection is easy. 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. Cowpeas mostly inbreed giving pure lines.

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
seeds - dry	11.2	1189	23.5	-	1.5	6.4	-
seeds young boiled	75.5	406	3.2	79	2.2	1.1	1.1
leaves	88.4	143	4.2	712 IU	35	4.7	0.3
young pods + seeds boiled	89.5	142	2.6	45	17.0	0.7	0.2
leaves - boiled	91.3	92	4.7	576 IU	18	1.1	0.2

Legumes

English: Sword bean
Local:

Scientific name: *Canavalia gladiata*
Plant family: FABACEAE

Description: A climbing or sometimes bushy and upright bean plant. Mostly it is a climber. It can be 4 m long. The leaves have 3 large leaflets. The leaflets are oval and 7.5-20 cm long by 5-12 cm wide. The top of the leaf can narrow abruptly to a tip while the base can be rounded or broadly wedge shaped. The leaves are slightly hairy on both surfaces. The leaf stalk is 5-12 cm long. The flowers are in groups and are white. The flower cluster is 7-12 cm long and the flower cluster stalk 4-20 cm long. The individual flower stalks are 2 mm long. The pods are long (20-40 cm) and curved. Seeds are coloured red or pink. The hilum is dark brown and almost as long as the seed.

Distribution: A tropical plant. It requires a tropical climate. Temperatures of 20-30°C suit it well and it grows from sea level to about 1000 m altitude in equatorial zones. They are drought and salt resistant. They can grow on lowland tropical nutrient depleted soils. They can grow on soils with pH from 4.5-7.0. They can tolerate some shade.

Use: Young pods are cooked and eaten. Seeds can be cooked and eaten, but the water should be changed and they should be well boiled. They are also fermented. The leaves are blanched and eaten. **Caution:** The seeds can be poisonous due to hydrocyanic acid and saponin. Cooking will remove these.

Cultivation: They are grown from seeds. Seeds germinate readily and the plant is relatively fast growing. Seeds can be sown 5 cm deep. Plants should be 60-70 cm apart. Climbing types need support. Often natural supports such as trees, walls and fences are used in backyard production. For large scale production 25-40 kg/ha of seed are needed.

Production: Green seeds/pods are produced in 3-4 months and mature seeds in 5-10 months. Seed yields of 700-900 kg/ha are possible. Green pods are hand picked when 10-15 cm long before they swell and become fibrous.

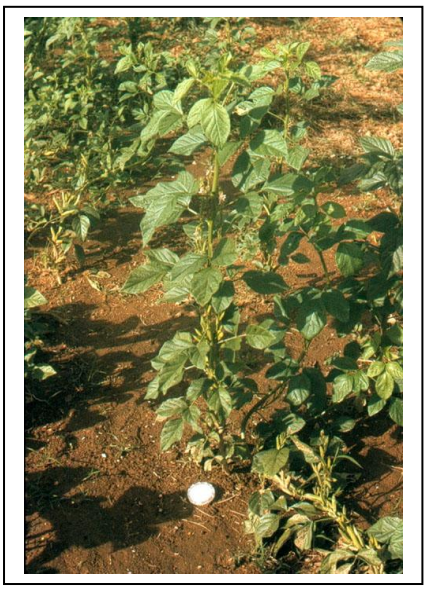
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seeds	15.0	1335	27.1	-	-	-	-
fresh pods	89.0	142	2.8	-	-	-	-
leaves	-	-	-	-	-	-	-

Legumes

English: Guar bean, cluster bean
Local:

Scientific name: *Cyamopsis tetragonolobus*
Plant family: FABACEAE



Description: A herb. It is an upright bushy plant often only 1 m high. Some kinds grow 3 m high. 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. It suits dry areas. It grows well on alluvial and sandy soils. It grows well in areas with high summer temperatures and low rainfall. It can tolerate an alkaline soil with pH 7.5-8. It grows in many African and Asian countries.

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 they are grown 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. Seed germinate within one week.

Production: Plants mature in 3 to 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
seeds	9.9	1452	30.5	-	-	-	-
fresh pods	82.0	-	3.7	198	49	5.8	-

Legumes

English: African winged bean
Local:

Scientific name: *Psophocarpus scandens*
Plant family: FABACEAE

No picture available.

Description: A climbing herb that continues to grow from year to year. It has long stems which can be slightly hairy. The stems can be 1-6 m long. The leaflets are oval or broadly rounded. They are 2.5-12 cm long and 1.8-10 cm wide. They can taper to a point at the tip. They are rounded or wedge shaped at the base. The leaf stalks are 5-18 cm long. The flower cluster is 5-12 cm long. The flower stalk is 3-40 cm long. The flower petals are pale blue. The fruit are long pods 3.5-8 cm long by 6-7 mm wide. They are square in cross section. There are 4-8 seeds inside. The pods have prominent wings which can have slight teeth along the edge. The seeds are blackish purple. They are 5-7.5 mm long and 3.5-6 mm wide.

Distribution: It is a short-day tropical plant. In Africa, it grows between sea level and 950 m altitude. It grows in areas with a rainfall of 1,200-1,800 mm per year. With an average temperature of 25°C.

Use: The young leaves and shoots are eaten as a vegetable. They can be dried and stored. The immature pods and ripe seeds are also cooked and eaten.

Cultivation: Plants are grown from seed, which can be stored. Seeds need to have the hard seed coat broken by scratching before planting. Plants can be allowed to climb over fences or shrubs.

Production: Leaves are usually picked before fruit form.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaves	82.0	-	7.1	-	-	-	-
pods	87.0	-	3.6	-	-	-	-

Legumes

English: African locust bean **Scientific name:** *Parkia filicoidea*
Local: **Plant family:** FABACEAE

No picture available.

Description: A deciduous tree up to 30-35 m tall. It has a spreading flat crown. The trunk has small rounded buttresses. The bark is scaly or smooth and grey to yellow brown. The bark becomes dark and cracked with age. If the bark is cut it 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 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 pods which hang down in clusters. They are dark brown to purple. 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 pulp. The pulp is yellow. The pulp is edible.

Distribution: A tropical and subtropical tree of lowland rainforests. It grows in Africa in forests near streams. It occurs in subhumid and humid places with a rainfall between 950 and 1750 mm annually. It grows between 250-1,370 m above sea level. It can grow in arid places. It grows in many African countries.

Use: The pods are eaten. The pulp in the pods is 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. The seeds are pressed for cooking oil.

Cultivation: Plants can be grown from seed. To extract the seed the pod is crushed then the seed removed from the pulp. Before sowing the seed they should be boiled briefly then alowed to cool and soaked for 12 hours.

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
Seeds dried	7.0	1780	32.3	-	-	-	-
fruit	13.2	1263	3.4	-	-	3.6	-

Legumes

English: **Scientific name:** *Tylosema fassoglensis*
Local: Mkulumu **Plant family:** FABACEAE

No picture available.

Description: A trailing or climbing plant. It is evergreen and shrubby. It can be 6 m long. It has a large tuberous root. This can be to a depth of 2.5 m. Young plant parts have rusty coloured hairs. The leaves are simple and almost round but with two lobes or divided at the tip. Leaves are 5-20 cm long by 6-23 cm wide. There are rusty hairs on the veins underneath the leaf. The flower clusters are 2-42 cm long on stalks 2-17 cm long. The flowers have 5 petals. Four of these are yellow and one is reduced to a green stub. The petals are yellow. The outer layer or sepals have wings. Fruit are 7-12 cm long and 4-7 cm wide. The seeds are not quite round and are 1.7-2.8 cm long.

Distribution: It is a tropical plant. It does well in seasonally wet and dry climates. It needs well-drained soil. In Malawi it grows at 900-1200 m altitude. It needs full sun. It can grow in arid places. It suits hardiness zones 9-12. It grows in many African countries.

Use: The pods are eaten raw or cooked. Young pods are eaten raw. The seeds can be eaten raw but are usually cooked or roasted. The seeds are also used as a coffee substitute. The tubers are eaten raw. They also provide water. They can be roasted and eaten or then stored for later use. They can also be crushed and pounded to make a meal.

Cultivation:

Production: Plants grow rapidly. Tubers up to 78 kg have been recorded.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
Seeds	7.5	452	43.5	-	-	-	-

Leafy greens

English: Vegetable kenaf, Indian hemp **Scientific name:** *Hibiscus cannabinus*
Local: **Plant family:** MALVACEAE

Description: A herb. It can grow from seed each year or keep growing from year to year. It grows up to 3.5 m high. It has a few sharp spines. The leaf stalk is 6-20 cm long. The leaf blade has 2 forms. The leaves lower on the stem are heart shaped and those higher on the stem have 4-7 lobes arranged like fingers on a hand. These lobes are sword shaped and 2-12 cm long by 0.6-2 cm wide. They have teeth around the edge. They taper at the tip. The flowers are yellow, white or ivory and red at the base. They occur singly in the axils of leaves. They are large and up to 10 cm across. They have very short stalks. The fruit is a capsule about 1.5 cm across. The seeds are kidney shaped.

Distribution: A tropical plant. It is cultivated in S China. It can grow in well-drained sandy soils and in dry but seasonally waterlogged places. It grows between 15-2,130 m above sea level. It grows in areas with an annual rainfall between 500-635 mm. It can grow in arid places. It suits hardiness zones 10-12. It grows in many African and Asian countries.

Use: The leaves are eaten cooked as a vegetable. They are also used as a substitute for tamarind for curries. They are used in soups. The leaves are cooked with the aid of potashes. The seeds are roasted and eaten. They are also fermented. The seeds yield an edible oil. The flowers are eaten cooked as a vegetable. The bark is sweet and is chewed by children.

Cultivation: It is usually grown from seeds. It can be grown from cuttings. Seeds will last for about 8 months. Seeds germinate best at 35°C.

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
seeds dried	8.1	1785	20.2	-	-	-	-
leaves	79.0	280	5.5	34	-	12.1	-

Leafy greens

English: Bitter cucumber
Local:

Scientific name: *Momordica charantia*
Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is a slender annual climber with flowers of both sexes on the one plant. It has simple tendrils and vines can be 4 m long. It has bright green lobed leaves 5 to 12 cm long on thin leaf stalks 3-10 cm long. The flowers have a sweet smell and 5 small, yellow petals. Fruit are green when young and orange when ripe. The fruit has a lumpy appearance, with ridges along its length and when fully ripe burst open. There is a bright red covering on the seeds inside. The seeds are 10-16 mm long and 7 - 10 mm wide and pale brown. Considerable variation in the fruit occurs between varieties.

Distribution: A tropical plant that grows from sea level up to about 500 m and will probably grow to 1000 m altitude in tropical regions. It requires a well drained soil preferably rich in organic matter. Seeds do not germinate below 15°C. Plants grow best with temperatures of 18°C - 35°C. A soil pH of 6.5 is best. It suits hardiness zones 9-12. It grows in almost every tropical country.

Use: The young bitter fruit are cooked and eaten. They are boiled, stuffed, fried or pickled. They are used in soups, stews and stir-fried dishes. The seed mass of the ripe fruit is used as a food flavouring. The leaves are also cooked and eaten as a flavouring. The tender shoots and leaves are sometimes eaten. **Caution:** The leaves are considered to cause diarrhoea and vomiting.

Cultivation: Plants are grown from seed. For large scale plantings, 6-7 kg of seed are required to plant one hectare. Seeds are planted 2 cm deep at 50 cm spacing in the place where the plants are to grow and need a stick to climb up. Often plants are grown on raised beds 2 m apart with 0.5 m between plants. The seed has a hard seed coat and germinates slowly. Soaking seeds for 24 hours before sowing gives a quicker more even germination. Regular watering is required.

Production: Fruit are ready to harvest 45-55 days after planting. Fruit should be harvested when young and tender. Once fruit have begun to change colour to yellow they are past maturity for eating. Early removal of young fruit also ensures continuous fruit setting. This can allow 6-8 successive pickings of fruit. Fruit on the plant are sometimes wrapped in paper to prevent fruit fly damage. Seed well stored can remain viable for 4-5 years. The young bitter fruit are cooked and eaten. The fruit is blanched or soaked in salt water to reduce the bitter taste.

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	8.6	2020	18.6	-	-	-	-
leaves raw	84.7	252	5.0	44	170	7.1	0.3
leafy tips-boiled	88.7	146	3.6	173	57	1.0	0.3
fruit	93.6	105	1.2	-	-	0.2	-
pods-boiled	94.0	79	0.8	11	33	0.40	0.40
pods raw	94.0	71	1.0	380	84	0.4	0.4

Leafy greens

English: Watercress
Local:

Scientific name: *Nasturtium officinale*
Plant family: BRASSICACEAE

Description: A cabbage family herb. It is a small leafy plant that grows in water and lasts for several years. It grows 30 cm high and has runners 2.5 m long. It has hollow stems and roots freely from the nodes. It branches freely. The leaves consist of 3 to 7 pairs of small leaflets then a larger leaflet at the end. The flowers are small and white and grow grow in a cluster. Flowers are not always produced and need days with more than 12 hours of sunlight to form. A small narrow curved seed pod about 2 cm long can develop. It grows attached to the banks of streams.

Distribution: This is a temperate climate crop. It is common in tropical highland creeks especially those flowing off limestone hills with pH 6.5-7.5. It needs to be in running water. In the tropics it occurs from about 1000 m up to at least 2900 m altitude. It grows in streams, ditches, lakes, swamps, marshes from near sea level to 3700 m altitude in China. It suits plant hardiness zones 6-10.

Use: The leaves and stems are eaten raw or cooked and have a spicy flavour. Cooking should be used if the water in the stream is not pure and clean. The seed can be germinated to produce sprouts. The seeds can be ground to make a mustard flavouring.

Cultivation: It is grown from cuttings planted along the edges of clear running water. Cuttings of 10-15 cm long are suitable. The plant has roots along the stem at the node and cuttings quickly form roots in water. A spacing of 30 cm is suitable. This small plant keeps living for many years once established. It can also be grown from seeds. Plants can float on the water. It will not tolerate drying out. Watercress has a high phosphate requirement.

Production: Harvesting can occur 4 to 6 weeks after planting. Regular picking encourages branching and increases production. Tips 5-10 cm long are harvested. This can be repeated every 4-6 weeks.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaves	95.0	63	2.4	960	35	3.4	3.4

Leafy greens

English: Small knotweed
Local:

Scientific name: *Polygonum plebeium*
Plant family: POLYGONACEAE

Description: A small herb. It lays along the ground. It grows 15 cm high. The leaves are narrow. They do not have leaf stalks. There are leaf like structures at the base of the leaf stalk. The flowers are in the axils of leaves.

No picture available.

Distribution: A tropical plant. It grows in open and damp places. It grows in the northern drier parts of West Africa. In Africa it grows between 600-2400 m above sea level. It can grow in arid places. It grows in many African and Asian countries.

Use: The soft and tender parts are cooked as a vegetable. The leaves are bitter when grown in dry places. The seeds are crushed and cooked as damper.

Cultivation: Plants are grown from seed or root suckers.

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
leaf	-	-	17.0	-	-	-	-

Leafy greens

English: Jute, Bush okra
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 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 increases 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
leaves raw	80.4	244	4.5	6410	80	7.2	-
leaves cooked	87.2	155	3.4	519 RE	33.0	3.1	3.1

Leafy greens

English: Pumpkin, Winter squash
Local:

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 stalk thickened near where it joins the fruit.) There are a large number of cultivated varieties.

Distribution: A subtropical plant. They are grown throughout the country from sea level to 2400 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. It grows in most African and Asian countries.

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 kinds.

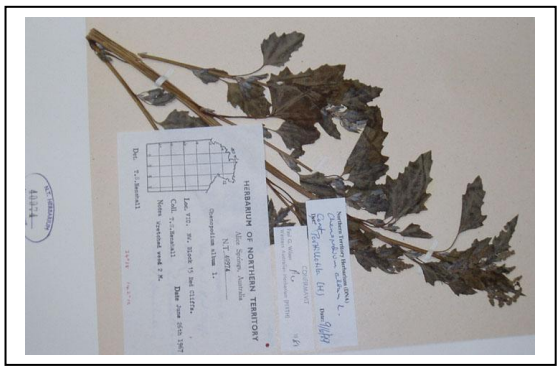
Production: Fruit are ready for harvest after about 3-4 months. Seed can be saved from fruit for re-sowing but as pumpkins cross pollinate different types become mixed.

Food Value: Per 100 g edible portion

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

Leafy greens

English: Fat hen, Lamb's quarters **Scientific name:** *Chenopodium album*
Local: **Plant family:** CHENOPODIACEAE



Description: An annual plant. It grows to 1 m high and spreads to 1 m across. The stem is erect. The stems are succulent and without hairs. They often have soft mealy lumps which can be rubbed off. The leaves are simple, with one at each node, and occurring alternately up the stem. The leaves are oval and wedge shaped with saw like edges. They are 5-12 cm long by 3-10 cm wide. The leaf stalk is usually shorter than the leaf blade. The under surface of the leaf often has a white mealy layer which can be rubbed off. The flowers occur in dense white spikes. The flowers occur at the tip and ends of branches. The fruit is a pod. It is small and roundish and papery. It opens around the tip. The pod contains a shiny black seed. Seed are 1.2-1.8 mm across. Seeds can occur in very large numbers.

Distribution: A temperate plant. It also grows in tropical places. It grows best on light to medium well drained soil. It suits an open sunny position but can tolerate shade. It is drought and frost resistant. It commonly occurs as a weed in old fields and waste places. In Papua New Guinea is only occurs in the high altitude zone (2500 m). In Zimbabwe it grows between 1,100-1,600 m above sea level. It can grow in arid places. It can tolerate temperatures between 5°C and 30°C. It grows in many African and Asian countries.

Use: The seeds can be ground into flour. They contain saponin which should be leached out. They are used for bread, pancakes, muffins and biscuits. The tender leaves are cooked and eaten as a vegetable. They are also used in stews. Young flowers are cooked and eaten. The sprouted seeds are edible.

Cultivation: Plants are grown from seed. Seedlings can be transplanted at a spacing of 30 cm. It does well in soils with lots of nitrogen. It is self sown and harvested from potato crops in India.

Production: The tops can be eaten before and after flowering. They are harvested after 40 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
seeds		1654	16	-	-	-	-
leaves - boiled	88.9	134	3.2	970 RE	37.0	0.7	0.7
leaves	87.7	113	5.3	33	108	-	-

Leafy greens

English: Silver spinach
Local:

Scientific name: *Celosia trigyna*
Plant family: AMARANTHACEAE

Description: herb. It is branched and straggling. It 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 flowers are crowded together in separate clusters. They are white or silvery. The fruit is a capsule which is almost round and has several seeds.

No picture available.

Distribution: A tropical plant. It grows in tropical Africa. It is often along the coast but grows from sea level to 1,960 m above sea level. It can grow in arid places. It needs a rainfall or up to 2,500 mm and an average temperature of 25-30°C. It is best on fertile, well drained soils. It grows in most African countries.

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

Cultivation: Plants are grown by seeds. Seeds 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.

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
leaves	89.0	139	2.7	1925	10	5.0	-
flowers	-	-	-	-	-	-	-
seeds	-	-	-	-	-	-	-

Leafy greens

English: Small flowered quickweed **Scientific name:** *Galinsoga parviflora*
Local: **Plant family:** ASTERACEAE

Description: An annual herb. It grows to 75 cm high and has a spread of 50 cm. The stem is erect and much branched. The stem is rather weak. The leaves are oval and opposite. The leaves have leaf stalks are the leaves are toothed around the edge. The flowers are small and daisy like. They occur in small clusters and have white rays and a yellow disk. The flowers are produced in the axils of the upper leaves.

Distribution: A tropical and subtropical plant. It will grow in most soils and under most conditions. It can tolerate drought and frost. In Papua New Guinea it grows from 900 to 2500 m altitude. It can grow in arid places but is best with medium to high rainfall. Seeds need a temperature between 10-35°C to germinate. They also need light to germinate. In Zimbabwe it grows between 1,370-1,660 m above sea level. It grows in many African and Asian countries.

Use: The leaves and the young stems can be eaten raw or cooked. They are used as a potherb or added to soups and stews. It is also dried and ground into a green powder and added to soups and stews especially with chicken. The fresh juice is drunk with other vegetable juices.

Cultivation: Plants are grown from seed. Often they are self sown. The seeds germinate quickly and young plants grow rapidly.

Production: The leaves should be picked before plants start to form seeds.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaves	88.4	653	3.3	-	-	5.3	-

Leafy greens

English: Chinese amaranth
Local:

Scientific name: *Amaranthus tricolor*
Plant family: AMARANTHACEAE

Description: A herb about 1 m high and spreads 45 cm wide. A small annual leafy green. An upright, much branched annual with a thin membrane covering the stems. Sometimes the plant lies over. The stems are angular. The plant branches in the upper part of the plant. It is smooth and grows from seed each year. Leaves have long leaf stalks which can be 5-10 cm long. Leaves vary in shape, size and colour. The leaf blade can be 5-25 cm long by 2-6 cm wide. Leaves are dull purplish and the top leaves can be yellow or red. Some types have coloured leaves or patterns on the leaves. It has a clumpy seed head at the top. The flower spike at the top can be 30 cm long. The seed are 1-1.2 mm across and black.

Distribution: A tropical and subtropical plant. It grows in many tropical and warm temperate places. Plants grow wild in waste places. Amaranths grow from sea level to 2400 m altitude in the equatorial tropics. For amaranth seeds to germinate they need a temperature above 15°-17°C. In the higher areas of the equatorial highlands above 1800 m., temperatures on the average are probably below this during the cooler months. It may be more difficult to get amaranths started during these months. It can grow in arid places. It suits hardiness zones 8-11. It is widespread in Africa and Asia.

Use: The young leaves and stems are cooked and eaten as a vegetable.

Cultivation: The very small seeds of these plants are scattered over the ashes or fine soil in fertile ground. The seed are normally spread by rubbing the dry seed heads between the hands. Some types are self sown. These plants grow in most tropical countries. The soil must be fertile. If they are put in an old garden they will only grow very poorly. So they are either put in a new garden site when it is cleared from bush, or in build up the old ground by adding compost. The small gardens close to a house can often be built up to a good fertility by using the scraps and ashes and things that are left over near houses. Amaranths need high amounts of two nutrients, nitrogen and potash. The ashes from fires are high in potash so farmers scatter seeds of amaranth over areas where they have burnt. Amaranths are tropical plants grown in most tropical countries. Normally the hotter it is the better they grow. They also like plenty of sunlight and do not suit shaded places. The more sunlight the better they grow. They need to have water most of the time they are growing. In areas with a high rainfall this is mostly not a big problem.

Production: Plants can be harvested when small due to thinning out closely spaced plants. These can be either transplanted or eaten cooked. Plants can be harvested whole or have top leaves harvested several times. Harvesting begins after 4-7 weeks and can continue 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
leaves	91.7	96	2.5	292	43.3	2.3	2.3
stems	-	-	-	-	-	-	-
seeds	-	-	-	-	-	-	-

Fruit

English: Surinam cherry, Pitanga
Local:

Scientific name: *Eugenia uniflora*
Plant family: MYRTACEAE

Description: A small tree up to 5-7.5 m high. It is often a much smaller shrub. Branches often develop close to the ground. The branches are thin and wiry. It has attractive oval and pointed leaves. They are dark green and shiny. The leaves are 2.5-6 cm long by 1.5-3 cm wide. New leaves are dark purple or red. The flowers are small and white and the fruit is lobed and red. There is a single large seed inside. The fruit is about 3 cm across. The tree is used as a hedge plant. The flesh of the fruit is edible. There are several named cultivated varieties.

Distribution: It is a tropical plant. It is native to South America. It grows in the tropical lowlands from sea level up to about 800 m or higher in Papua New Guinea. In south India it grows to 1700 m altitude. It is suited to a warm moist climate. Adequate moisture is needed during fruit development. It can be grown in the subtropics. It can stand some frost. Mature trees can withstand frosts down to -3°C. It does best with a pH of 5-7. It suits hardiness zones 10-12. It grows in a wide range of tropical countries.

Use: The ripe fruit is eaten fresh. It can be cooked or used for jams and other products. The leaves are used as a substitute for tea.

Cultivation: Trees are mostly grown from seeds but can be grown from cuttings. Seeds should be fresh. Seeds grow in 3-5 weeks. Seed which are extracted from the fruit then washed and dried can be stored for a month. Seed can be sun dried for 7 days then stored in cool open containers for a few months. Seed can be planted 1-2 cm deep in nursery beds than transplanted when 20-30 cm tall. Trees can be trimmed and pruned to form hedges. Ground layering and suckers could probably be used to produce new plants. Tips from trees with better fruit types can be grafted onto seedling root stocks. It can be trained as a hedge.

Production: It is a slow growing plant. Several crops of fruit are produced each year. Flowers or fruit can be on the tree throughout the year in tropical locations. Trees start to produce fruit after about 3-4 years. Fruit are mature 5-6 weeks after flowering.

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	90.8	138	0.8	150	26.3	0.2	-

Fruit

English: Red Coondoo, Spanish cherry **Scientific name:** *Mimusops elengi*
Local: **Plant family:** SAPOTACEAE

Description: A large tree. It grows 10-15 m high. It has a tall trunk. The crown is dense and umbrella shaped. It spreads to 5-15 m across. The bark is rough and hard and dark grey. The bark is cracked along its length or forms a checkered pattern. The leaves are produced alternately and are simple. They are smooth and crowded. They are oval and 5-14 cm long by 2.5-6 cm across. They are glossy and dark green on top and paler underneath. The midrib is easy to see. Leaves have a sharp pointed tip. The flowers are star-shaped and cream and hairy. They have a scent. The flowers are 0.5-1 cm long in clusters in the axils of the upper leaves. The fruit are softly hairy. They become smooth and are oval berries. They are 1.3-1.5 cm long by 1-1.2 cm wide. The outer ring of flowers form a spiky cup at the base of the fruit. The fruit are orange-red when ripe. They contain several orange red seeds. The seeds are wedge shaped.

Distribution: A tropical plant. It is native in Asia from India to the Pacific. Plants need well-drained soils. It grows naturally in coastal monsoon vine forests. It is often on sand dunes and cliffs near the beach. In tropical Australia it grows from sea level to 320 m altitude. It is drought resistant. Plants need a sunny position. Plants are damaged by frost. It suits hardiness zones 10-12. It grows in many tropical countries.

Use: Ripe fruit are eaten raw. They can be used in preserves or pickles. The kernels yield a fatty oil which can be used for edible purposes. It is used in cooking. The bark is used in the distillation of *arrack.*

Cultivation: Plants can be grown from seed. The seed should be sown fresh. They germinate in 6-14 days. They can be transplanted when the first true leaf appears. They can stand pruning.

Production: Plants are slow growing. In Australia, plants flower in November to January and fruit from April to June.

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	46.6	825	2.9	-	223	-	-

Fruit

English: Cape gooseberry
Local:

Scientific name: *Physalis peruviana*
Plant family: SOLANACEAE

Description: Perennial herbs which grow to 45-90 cm high. They are often grown as annuals. It is only slightly branched but is hairy. The branches are purplish and ribbed. They are spreading. 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. It grows in the tropical highlands. It suits warm climates. It does best in warm sunny conditions. It needs well drained soil. It is best free from severe frosts and strong winds. In Nepal it grows between 900-2200 m altitude. Plants are not killed by a slight frost. In Indonesia plants are found between 700-2300 m altitude but fruit best above 1500 m. It can grow in arid places. It suits hardiness zones 8-10. Tasmania Herbarium. It grows in most tropical countries.

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. They are broadcast over the soil. Seeds should be 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 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
mature fruit	84.2	201	2.0	1200	30	1.5	-

Fruit

English: Guava
Local:

Scientific name: *Psidium guajava*
Plant family: MYRTACEAE

Description: A small, shallow-rooted, evergreen tree or shrub 8-10 m high with smooth, mottled bark that peels off in smooth flakes. The plant branches close to the ground. The branches are four angled. Leaves are opposite, dull green and somewhat hairy. They are oval, somewhat pointed at both ends, 15 cm long by 2-5 cm wide, with short leaf stalks. Flowers are white and showy and borne in loose, irregular arrangements of one to three flowers. The petals are 1.5-2 cm long. Both self and cross pollination occurs due to insects. Flowers grow in the axils of leaves on new growth. 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 that contains many seeds. The skin and the seeds are edible in better selected varieties. Fruit can be very acid to very sweet.

Distribution: A tropical plant native to Central and South America. Guavas thrive in both humid and dry tropical climates and do best in sunny positions. They grow wild and are also cultivated. In Papua New Guinea it grows well from sea level up to 1600 m and occurs up to 1900 m. It is killed by frost. They fruit better where there is a cooler season. Temperatures near 30°C give best production. They are very widely distributed in open places and secondary forests throughout the islands of the Philippines and Papua New Guinea and can become weedy under some conditions. They produce better in soils with good organic matter. They prefer a well drained soil but can stand some water-logging. A pH of 5-7 is suitable, but can tolerate a pH of 4.6-8.9. Trees cannot tolerate salty conditions. It can grow in arid places and suits hardiness zones 9-12.

Use: Young leaves are eaten raw or cooked. Fruit are eaten raw and can be used for jams and jellies. Half ripe fruit are added to help the jelly set. Liquid from boiled guava seeds is used to flavour cheese. Seeds are the source of an edible oil.

Cultivation: They are mostly grown from seeds but seedling trees vary in quality. Seeds remain viable for a year or longer and 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. For stem cuttings, the tips are used and grown under mist at 28-30°C with bottom heat. Suckers can also be used. Vegetative methods of propagation preserve better varieties. In the lowland tropics, trees are self sown. Since fruit are produced on new season's growth, pruning does not greatly affect fruiting. Trees should be managed to give the maximum number of vigorous new shoots. Trees can be grown at 2.5 m within rows and 6 m apart between rows.

Production: Seedling trees 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 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	1.4

Fruit

English: Tamarind
Local:

Scientific name: *Tamarindus indica*
Plant family: FABACEAE

Description: A large spreading tree up to 24 m tall. It has a broad dense evergreen crown. In dry areas the tree can lose its leaves. The trunk can be 1 m across. The bark is rough and grey with a checkered pattern. 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 and 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. It is a legume. The pulp is date like and reddish brown. The seeds are shiny and hard. The pulp of the pods is edible.

Distribution: A tropical plant. 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. It cannot stand water-logging. It does well on coastal dunes above high water level. It suits semi-arid areas. It grows in the Sahel. It must be in frost free locations. In Nepal it grows up to about 1200 m altitude. In Kenya it grows from sea level to 1,600 m altitude. It can grow in arid places. It suits hardiness zones 11-12. It grows in almost every tropical country.

Use: The pulp of the fruit is edible. It is also used for drinks. The seeds are also edible, cooked. They can be roasted and ground into flour. The outer skin is removed. The young leaves, flowers and young pods are also edible. They 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 1400 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: It grows very slowly. Trees are long lived. Fruiting is seasonal. The season tends to be April to June. It is about 8-9 months from flowering to ripe fruit. It plants are grown for shoots, they are planted closely.

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	1.1
flowers	80.0	314	2.5	-	-	1.4	-
leaves	78.0	305	3.1	-	-	2.0	-

Fruit

English: Kudu-berry
Local:

Scientific name: *Pseudolachnostylis maprouneifolia*
Plant family: EUPHORBIACEAE

Description: An attractive rounded tree. It grows 4-6 m high. It can be 12 m high. The bark is light brown and cracked. The leaves are alternate and simple. The are roundly oval. They are 2.5-8 cm long by 2-6 cm wide. They are blue green and paler underneath. The leaf stalk is 1.5 cm long. The flowers are greenish-white in clusters of a few flowers in the axils of leaves. These are 2-3 cm long. The sexes are separate on different trees. The fruit is round and 2 cm across. They are pale yellow when mature. There are 3 varieties.

No picture available.

Distribution: A tropical plant. It grows in deciduous woodland and wooded grassland and on rocky outcrops. It will grow over a range of altitudes. It grows from 200-1,600 m altitude. It will re-grow after fire. It can grow in arid places. It grows in a number of African countries.

Use: The fruit are eaten raw. They are also used for alcoholic drinks.

Cultivation: Plants are grown from seed. Soaking seed in hot water and allowing it to cool for 24 hours improves germination. Plants can be pruned or cut back and allowed to re-grow.

Production:

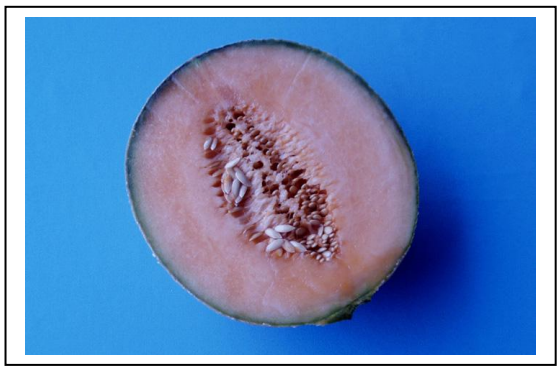
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	60.0	147	3.3	-	-	2.7	2.7

Fruit

English: Canteloupe, honey dew
Local:

Scientific name: *Cucumis melo*
Plant family: CUCURBITACEAE



Description: A pumpkin family plant. It is an annual climber with tendrils. It grows to 0.5 m high and spreads to 1.5 m across. The stems are soft and hairy and often angled. The leaves have lobes and often a wavy or toothed edge. They are on long leaf stalks. The leaves are often hairy underneath. The tendrils are not branched. The flowers are yellow and funnel shaped with expanded lobes. The male flowers occur in clusters and are produced before the female flowers. The fruit is round, mostly with a rough or streaky skin. It is green or yellow inside. The fruit is edible. Different kinds of melons occur. Some have a hard warty scaly skin. Others have a network of fine ridges over the surface.

Distribution: A tropical plant. It is not suited to places with high rainfall. They suit hot dry places with a fertile well drained soil. It needs a sheltered sunny position. It is drought and frost tender. A temperature range of 24-28°C is best but much higher temperatures is tolerated. Mostly they are grown below 500 m altitude in the tropics. A pH of 6-6.7 is best. Acid soils are not suitable. It can grow in arid places. It suits hardiness zones 9-12. It grows in most tropical, and many temperate, countries.

Use: The ripe fruit are eaten raw. They are also dried, candied and made into jams, jellies and preserves. The seeds are sometimes eaten. They are roasted. The seeds are blended with fruit juice to form a drink. Sometimes the immature fruit are cooked as a vegetable. The seeds contain an edible light oil. The young leaves are eaten as a potherb.

Cultivation: They are grown from seed. The seeds are planted about 1-4 cm deep. Plants need to be 1-2 m apart. Seedlings can be transplanted when about 10-15 cm high.

Production: Plants are ready 3-4 months after planting. Yields of 20 kg per10 sq m is 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
seed	7.0	2319	15.8	-	-	-	-
leaves	85.0	172	4.2	72	-	-	-
fruit	93.0	109	0.5	300	30	0.4	0.4

Fruit

English: Banana
Local:

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 2000 m altitude in the tropics. They are rarely an important food above about 1600 m. In Nepal they grow to about 1800 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 1000-3000 plants per hectare is used depending on variety. Suckers are usually put 30 cm deep.

Production: Time to maturity varies from 6 to 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	337	1.1	200	10	0.4	0.4
flower buds	91.3	109	1.6	-	-	1.0	-

Fruit

English: Indian jujube
Local:

Scientific name: *Ziziphus mauritiana*
Plant family: RHAMNACEAE

Description: A medium sized tree. It is thorny. It loses many of its leaves during the year. It grows up to 10-12 m high. The bark is grey, brown or pale red. Branches and the under surface of the leaves are densely hairy when young. The thorns arise from the base of the leaves. The leaves are alternate and simple. They are finely toothed. They can be oval or round and 8 cm long by 5 cm wide. The flowers are green and have a scent. They occur as 3-5 flowers together. The flowers are 1-2 cm long and on slender branches. The fruit are small, oval and yellow or brown. They are sweet. They are 2-5 cm long and 2.5 cm wide. The fruit are green when young and turn yellow or brown when ripe. The pulp is fleshy, acid and edible. The fruit have one seed imbedded in the flesh in a hard stone. The fruit wrinkle on drying. Many varieties exist.

Distribution: A tropical plant. It grows well on sandy soils. It can survive droughts. It grows rapidly in dry places such as the Sahel. It can tolerate temperatures up to 44°C as well as periodic frosts once the trees are mature. It does best when the mean annual temperature is 22-30°C. It thrives in hot dry climates. It grows in the Sahel. It needs adequate water during the fruiting season. It can grow at elevations up to 1000 m in the tropics but does best below 600 m. It grows in areas with rainfalls of 150-900 mm and is most common where rainfalls are 300-500 mm annually. It does not like excessive humidity for fruiting. It will grow on a range of soils but deep sandy loams with a pH of 7 or slightly higher are best. It can tolerate some salinity and waterlogging. It can grow in arid places. It grows in most tropical and sub-tropical countries.

Use: The fruit is eaten fresh, dried, in jelly or candied. They can be used in jellies, preserves, chutney, sauces, and drinks. The unripe fruit are pickled. Young leaves are cooked and eaten. They are also used in soups. Seed kernels are eaten. The roasted seeds are used as a coffee substitute. The fruit are used to make an alcoholic drink. **Caution:** Alcohol is a cause of cancer.

Cultivation: Plants are grown from seed. The hard seed coat makes them difficult to germinate. The shell can be carefully cracked and seed should be sown fresh. They can be soaked for 50 hours or put in concentrated sulphuric acid for 6 monutes to improve germination. Seed can be sown in plastic bags then transplanted after 18-24 weeks. It does not transplant easily so direct planting is best. Grafting and inarching can be used. It is also budded onto the rootstocks of wild species. Light pruning during the dry dormant season to train the tree is recommended. Regular pruning in the hot dry season encourages new growth. A spacing of 6-12 m is recommended. For larger fruit better varieties are grafted into rootstocks of *Ziziphus nummularia* or *Ziziphus jujuba*.

Production: A budded tree fruits after 4 years and produces for 50 years. Seedling trees take a year longer to fruit. Yields of 80-130 kg of fruit per tree per year occur. Fruit development takes 4-6 months. As fruit does not all ripen at once several harvests are needed. Unripe fruit do not ripen after picking.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron 0.4mg	Zinc mg
fruit	77.0	360	0.8	21	71		0.4

Vegetables

English: Yellow pea
Local:

Scientific name: *Sphenostylis marginata subsp. erecta*
Plant family: FABACEAE

Description: A herb. It has long roots 60-90 cm long. The leaves have 3 leaflets. The leaflets are narrowly oval and taper to the tip. The flowers are yellow and in clusters on the ends of long stalks.

No picture available.

Distribution: A tropical plant that grows between 330-1,800 m above sea level. It can grow in arid places and is found in many African countries.

Use: The flowers and occasionally the leaves are eaten cooked. The seeds or beans have been eaten in times of hunger. They are cooked in the pods.

Cultivation:

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
seeds	40.0	365	2.9	-	-	6.4	-
flowers	84.0	308	16.5	-	-	-	-

Vegetables

English: Carrot
Local:

Scientific name: *Daucus carota subsp. sativus*
Plant family: APIACEAE

Description: A root crop grown from seed. It normally grows a fattened root one year then forms a flower the next year. It can be 60 cm high and spread to 50 cm wide. The root is long in shape and orange in colour. The stem is erect, tough and furrowed. The leaves are feathery and divided 3 times. The leaves have a sheath clasping the stalk at the base. The flowers are white and lacy. They form a dense compound cluster at the top of the plant. Sometimes flowers are only produced into the second year of growth, depending on temperature.

Distribution: A temperate plant. In the tropics it is mostly grown in the highlands, but will grow from sea level to 2600 m altitude. Sometimes on the coast only leaves are produced. Carrots are frost resistant. In Nepal carrots are grown up to 1700 m altitude. It needs a deep loose soil. Seed germinate well in the temperature range 7-24°C. Plants grow well with a temperature about 15°C. It grows best with a pH of 6.0-7.0. It suits hardiness zones 3-9. There are about 22-25 Daucus species.

Use: Both the roots and the leaves are edible. The young leaves are used in soups. The roots can be eaten raw or cooked. They can be steamed, fried, pickled, made into jam, or used in stews. Carrot seed oil is used as a flavouring. The juice is used raw and fermented. The roots can be dried and the flour used to flavour and thicken soups.

Cultivation: They are grown from seeds sown directly. Because seed are very small, seed are mixed with sand before sowing to allow a more even distribution of plants. A spacing 5 cm apart in rows 15-20 cm apart is suitable. Often this spacing is achieved by thinning out plants. For seed production a low temperature of 4-9°C for 40-60 days is needed before flowering to break the dormancy.

Production: There are tropical varieties that mature within 90-110 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
root - raw	89.9	180	1.0	2813	6	0.6	0.6
root - boiled	91.5	79	0.6	2455	4	0.4	0.3
leaves	87.4	-	2.2	65	-	-	-

Vegetables

English: Yellow Nutsedge **Scientific name:** *Cyperus esculentus*
Local: **Plant family:** CYPERACEAE

Description: An upright grass like sedge. It continues to grow from year to year. It is usually 30-90 cm high. The leaves are long and narrow. They are shiny. The leaves are arranged on 3 rows around an angular stem. The leaves often have a pointed tip. The leaves are light green. The flowers are yellow spikes. They are 1-1.5 cm long. There are many creeping underground stems (rhizomes). These spread out then end in a swelling. This tuber is round and 5-20 mm long. It has a thin brown skin. They are crisp and nutty.

Distribution: A tropical plant. It grows throughout the tropics and warm temperate zone. It is common in seasonally dry grasslands. It does not tolerate shade. High temperatures (27-30°C) and low nitrogen favours tuber production. It grows best in sandy soils with pH 5.5-6.5. It can tolerate salty soils. Day lengths of 8-12 hours favours tuber production. Day lengths of over 16 hours favour vegetative growth. It can grow in arid places.

Use: The tubers are eaten raw or baked. Sometimes they are ground into flour and boiled into a porridge. The oil from the tubers can be used for cooking. It is edible. The roasted tubers are used as a coffee substitute. The tubers are used as a source of potash for softening and flavouring green leafy vegetables.

Cultivation: Plants are grown from tubers. Tubers are soaked in water for 24-36 hours before being planted out. Sometimes tubers remain dormant but if they are chilled they grow better and produce more tubers. A spacing of 10-15 cm apart along rows 60 to 90 cm apart are suitable. Tubers should be placed 2.5-4 cm deep. The tubers are dug, washed and dried for 1-3 days before being sold or used.

Production: Yields of 800-900 kg per hectare of tubers are achieved on sandy soils. Yields of 8000-14000 kg per hectare are possible. Tiger nuts take 90-120 days to reach maturity.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
rhizome	36.5	1262	3.5	-	-	8.0	-

Vegetables

English: African yam bean
Local: Ground squirrel's bean
Scientific name: *Sphenostylis stenocarpa*
Plant family: FABACEAE

Description: A vigorous climbing vine. It grows 1.5-2 m high. The leaves have 3 leaflets. They are 14 cm long and 5 cm wide. The flowers are pink, purple or greenish-white. They are 2.5 cm long. They are on stout stalks in the axils of leaves. The seed pods are smooth. They are flat but have both edges raised. They are 25-30 cm long by 1-1.5 cm wide. The seeds vary in shape, size and colour. They can be 1 cm long by 0.7 cm wide. They can be cream or brown. There are small narrow tubers under the ground. They can be 5-7.5 cm long and weigh 50-150 g. The flesh is white and watery.

No picture available.

Distribution: It is a tropical plant. It grows from sea level up to 1800 m altitude. It grows in grassland and woodland and sometimes in marshy sites. It can grow in arid places. It grows in many African countries. It is a commercially cultivated vegetable. The tubers are eaten especially by children.

Use: The pods, leaves, seeds and tubers are cooked and eaten. They are used in soups or with maize or rice. The hard seeds need to be soaked in water for 12 hours before cooking and being ground. The tubers are cooked and eaten.

Cultivation: It can be grown from seed or tubers.

Production: Tubers are ready for harvest about 8 months 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
seeds	9.0	1470	19.2	-	-	5.5	-
tubers	64.0	542	3.8	-	-	-	-

Vegetables

English: Indian spinach
Local:

Scientific name: *Basella alba*
Plant family: BASELLACEAE

Description: An annual or perennial climbing herb with thick fleshy leaves. The vine is smooth and juicy and can be 10 m long. It branches freely. The vine and leaves can be red or green. The leaves are fleshy and pointed at the tip. They can be 8-18 cm long and 8-10 cm across. They are carried alternately along the vine. Leaves can be heart shaped or oval. It has white, pink or red flowers in short spikes which are in the axils of the leaves. Flowers have both sexes. The fruit are round and soft. They can be red, white or black and are 6-8 mm across. The seeds are round and black. They are 3 mm across. (Often the ones with heart shaped leaves are called *Basella cordifolia*, the ones with a red stem *Basella rubra* and the short day flowering dark green kind called *Basella alba*.)

Distribution: A tropical plant. It occurs mostly in the tropical lowlands and is best below 500 m but will grow up to about 1600 m. in the equatorial tropics. It will grow quite well in the temperature range 15-35°C. It does not like water-logging but can survive 4-12 weeks drought once well established. It requires adequate water during the growing season. It grows well in a variety of soils. The best pH is 5.5-7.0. It cannot tolerate salty conditions. Flowering does not occur when day lengths are over 13 hours. It is found throughout the Philippines in waste places. It can grow in arid places.

Use: The young shoots and leaves are eaten cooked. They are somewhat slimy. In soups and stews the mucilage can be used as thickening. The purple colour of fruit is harmless and is used to colour vegetables and agar-agar. Some lemon juice added to the dye enhances the colour. The leaves can be eaten raw in salads or cooked like a vegetable. They are also dried and stored. When fresh they can be stored for 4-5 days. The seeds can be crushed to use as an edible dye for jellies. The leaves are used to make tea.

Cultivation: It can be sown from seeds or cuttings. Seeds germinate in a few days. Normally sticks are provided for support or it is allowed to grow over fences and stumps. If seeds are used, 3 kg of seed will sow one hectare and they are best sown in a nursery and transplanted. A spacing of 1 m is suitable. Plants grown from seed are more productive than from cuttings. When cuttings are used, 20-25 cm long cuttings are suitable. Where the plant grows over light soil it can root at the nodes and continue growing continually. Partial shade, rich fertile soil and adequate moisture favour abundant leaf production. It is responsive to nitrogen fertiliser. Light shade gives bigger leaves. It requires a trellis to climb over. Frequently picking off the bud encourages branching.

Production: It is 4-6 weeks until the first harvest. It grows reasonably well on poor soils and is fairly resistant to pest and disease. Leaves will only store for one day at 20-30°C. Yields of 40 kg of leaves from a 10 metre square bed is possible over 75 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
leaves	85.0	202	5.0	56	100	4.0	-

Vegetables

English: Chaya, Tree-spinach **Scientific name:** *Cnidoscolus aconitifolius subsp. aconitifolius*

Local: **Plant family:** EUPHORBIACEAE

No picture available.

Description: A shrub. It can grow 2 m tall. It can be a tree up to 7 m tall. It is a small densely shady, rounded tree. The central stem is about 10 cm across. The side branches are 2 cm thick and end abruptly. The cut stem exudes latex. Some varieties have stinging hairs on the leaves. The domesticated varieties need to be chosen. The leaves are large and dark green. They have deep lobes arranged like fingers on a hand. There are coarse teeth around the edge. The leaves can be 22 cm wide and 18 cm long. The leaves are not flat. The leaf stalks are 60 cm long. The flowers are small. The flowering stalks have 3-4 forks. The whole flower head is 2-10 cm across. The female flowers are near the lowest forks and the male flowers at the ends. The flowers have an unpleasant smell. Some varieties occur. The forms without stinging hairs are classified as Chayamansa group.

Distribution: A tropical plant. It needs moderate moisture. It needs an average well-drained soil. It can grow in full sun or light shade. It often grows in dry regions but is also adapted to the hot humid tropics. It normally grows at low altitudes.

Use: The leaves are boiled and eaten as a vegetable. Gloves are used in harvesting to avoid stinging hairs. The leaves are chopped and then boiled for about 20 minutes. They can be used in soups and stews. CAUTION: The leaves contain a toxin which is removed by boiling. This hydrocyanic acid is removed by boiling for at least 2 minutes.

Cultivation: Plants are grown from cuttings. Thick cuttings can be slow to root and thin cuttings can rot. It is best to allow the cutting to dry for a day or two before planting to avoid rotting. They can be planted at any time of the year. Cuttings from 10 cm to 1 m can be used. They can be planted directly into well drained soil that is not too wet. The plants can be used as a hedge.

Production: It is slow to establish. Sprouting can take 2-6 weeks. After the first year plants can be pruned regularly. The leaves can be harvested year round. From a well established plant, leaves can be harvested several times each week almost continually.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaves	79.0	-	7.8	8.0	210	12	-

Nuts, seeds, herbs and other foods

English: Cashew
Local:

Scientific name: *Anacardium occidentale*
Plant family: ANACARDIACEAE

Description: A spreading evergreen tree up to 7-14 m tall. It has spreading branches. The canopy can spread 12 m. The roots grow deeply and spread widely. The bark is rough. The trunk is 15-20 cm across. The shiny leaves are alternate and are pale green and large. They are 10-15 cm long by 6-8 cm wide. They have fine veins. They are narrow at the base. The leaf stalk is 1-2 cm long. Red flowers are produced on the ends of the branches. About 14 % of the flowers are both male and female and the remainder are male. Many of the flowers which contain female flower parts do not form fruit. The nut is borne below the "apple" which is really a fleshy stalk. The nut is kidney shaped and about 3 cm long.

Distribution: It is a tropical plant. It suits the lowland tropics but will grow up to about 1200 m altitude. It only bears well in dry areas because of blight of the flowers. It needs warm frost free locations. It grows with temperatures between 22-26°C. A rainfall of 1750 mm per year is considered suitable but good yields have been obtained with rainfall of 750 mm. Wider spacing is needed in drier areas. It can grow on poor soils. It needs good drainage. It is drought resistant. It grows in the Sahel. In South India it grows up to 1000 m altitude. It can grow in arid places. It suits hardiness zones 11-12. It grows in many countries around the world.

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 till 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. It can be propagated by air layering. For good production complete fertiliser or appropriate organic material should be applied. Pruning to shape the tree is often undertaken in the first 2 or 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.

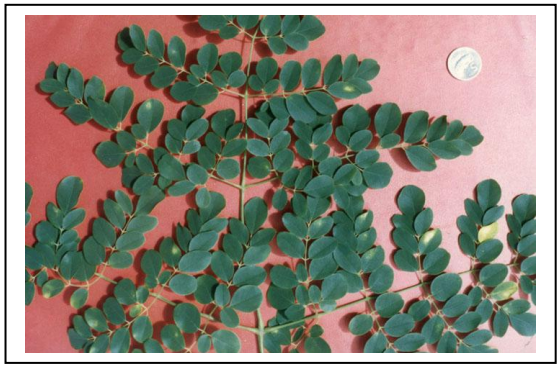
Production: Trees commence bearing after 3 years. Fruit production is seasonal, normally October to January. Mature nuts are produced in 2-3 months. Yields of 80-200 kg per hectare of nuts are normal. Trees reach maximum production after 10 years and last for about 100 years.

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	2.8
leaves	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: Drumstick tree
Local:
Scientific name: *Moringa oleifera*
Plant family: MORINGACEAE



Description: A small tree growing 9-12 m tall. The trunk is 60 cm across. The wood is soft. It has feather-like divided leaves. The tree loses its leaves during the year. The bark is grey and thick. It is 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 and contain both sexes. 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 flowers are sweet scented. 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. They split open when dry. There are 9 dark brown seeds inside. The seeds have 3 wings. Some kinds are better for edible fruit than others, while some are selected for leaves. 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. It grows in the Sahel. They are not hardy to frost and 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.

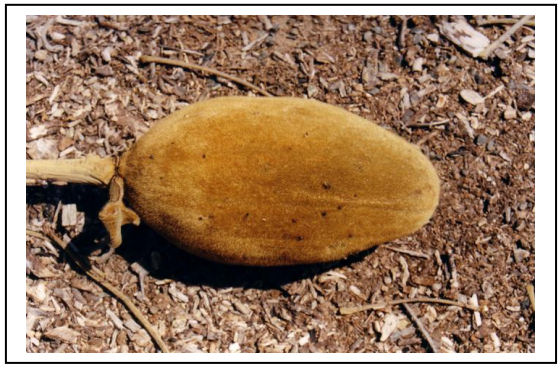
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaves	76.4	302	5.0	197	165	3.6	-
leaves - boiled	87	189	4.7	883	31.0	2.0	0.2
seed	6.5	-	46.6	-	-	-	-
pods - raw	88.2	155	2.1	7	141	0.4	0.4
flowers	84.2	205	3.3	-	-	5.2	-

Nuts, seeds, herbs and other foods

English: Boabab
Local:

Scientific name: *Adansonia digitata*
Plant family: BOMBACACEAE



Description: A large tree growing 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. On the outside of the fruit are green to brown hairs. 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 and grows in the hot dry regions of tropical Africa, such as the Sahel. It survives well in dry climates where rainfall is 100-1,000 mm a year. It can tolerate fire. It grows where the annual temperatures are between 20°C and 30°C. In most places it grows below 900 m altitude but occasionally grows to 1500 m altitude. It requires good drainage. It 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. The seeds can be eaten fresh or dried and ground into flour then added to soups. They yield a cooking oil. 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. The shoots of germinating seeds are eaten.

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. This can be done 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 by cuttings.

Production: Trees grow quickly reaching 2 m in 2 years. Trees produce fruit after 2 to 15 years. The plant is pollinated by bats, insects and winds. Trees can last 600 or more 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
nuts - dried	7.8	1832	33.7	-	-	13.9	-
fruit	16.0	1212	2.2	-	360	7.4	7.4
leaves	77.0	290	3.8	-	50	-	-

Nutritional values of food plants by plant Family

Plant Family	Botanical name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	*Amaranthus tricolor*	Chinese amaranth	leaf	91.7	96	2.5	292	43.3	2.3	2.3	36
AMARANTHACEAE	*Celosia trigyna*	Silver spinach	leaf	89.0	139	2.7	1925	10	5.0	-	34
ANACARDIACEAE	*Anacardium occidentale*	Cashew	nut	4.0	2478	17.5	-	-	2.8	2.8	52
APIACEAE	*Daucus carota subsp. sativus*	Carrot	root (raw)	89.9	180	1.0	2813	6	0.6	0.6	47
ARACEAE	*Colocasia esculenta*	Taro	root	66.8	1231	1.96	3	5	0.68	0.68	11
ASTERACEAE	*Galinsoga parviflora*	Small flowered quickweed	leaf	88.4	653	3.3	-	-	5.3	-	35
ASTERACEAE	*Helianthus annuus*	Sunflower	seed	5.4	2385	22.8	5	1.4	6.8	6.8	14
BASELLACEAE	*Basella alba*	Indian spinach	leaf	85.0	202	5.0	56	100	4.0	-	50
BOMBACACEAE	*Adansonia digitata*	Boabab	fruit	16.0	1212	2.2	-	360	7.4	7.4	54
BRASSICACEAE	*Nasturtium officinale*	Watercress	leaf	95.0	63	2.4	960	35	3.4	3.4	29
CHENOPODIACEAE	*Chenopodium album*	Fat hen	seed		1654	16	-	-	-	-	33
CONVOLVULACEAE	*Ipomoea batatas*	Sweet potato	tuber (baked)	72.9	431	1.7	2182	24.6	0.5	0.3	17
CUCURBITACEAE	*Cucumis melo*	Canteloupe	fruit	93.0	109	0.5	300	30	0.4	0.4	43
CUCURBITACEAE	*Cucurbita maxima*	Pumpkin	seed (dry)	6.9	2264	24.5	38	1.9	14.9	14.9	32
CUCURBITACEAE	*Momordica charantia*	Bitter cucumber	leaf (raw)	84.7	252	5.0	44	170	7.1	0.3	28
CYPERACEAE	*Cyperus esculentus*	Yellow Nutsedge	rhizome	36.5	1262	3.5	-	-	8.0	-	48
DIOSCOREACEAE	*Dioscorea schimperiana*		tuber	77.0	323	1.2-	-	-	-	-	15
EUPHORBIACEAE	*Cnidoscolus aconitifolius subsp. aconitifolius*	Tree-spinach	leaf	79.0	-	7.8	8.0	210	12	-	51
EUPHORBIACEAE	*Manihot esculenta*	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.23	19
EUPHORBIACEAE	*Pseudolachnostylis maprouneifolia*	Kudu-berry	fruit	60.0	147	3.3	-	-	2.7	2.7	42
FABACEAE	*Canavalia gladiata*	Sword bean	seed	15.0	1335	27.1	-	-	-	-	22
FABACEAE	*Cyamopsis tetragonolobus*	Guar bean	seed	9.9	1452	30.5	-	-	-	-	23
FABACEAE	*Parkia filicoidea*	African locust bean	seed (dry)	7.0	1780	32.3	-	-	-	-	25
FABACEAE	*Psophocarpus scandens*	African winged bean	leaf	-	-	7.1	-	-	-	-	24
FABACEAE	*Sphenostylis marginata subsp. erecta*	Yellow pea	seed	40.0	365	2.9	-	-	6.4	-	46
FABACEAE	*Sphenostylis stenocarpa*	African yam bean	seed	0	1578	1.8	-	-	5.5	-	49
FABACEAE	*Tamarindus indica*	Tamarind	fruit	38.7	995	2.3	20	60	1.1	1.1	41
FABACEAE	*Tylosema fassoglensis*	Mkulumu	seed	7.5	452	43.5	-	-	-	-	26

Plant Family	Botanical name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
FABACEAE	*Vigna unguiculata subsp. unguiculata*	Cowpea	seed (dry)	11.2	1189	23.5	-	1.5	6.4	-	21
MALVACEAE	*Corchorus olitorius*	Jute	leaf (raw)	80.4	244	4.5	6410	80	7.2	-	31
MALVACEAE	*Hibiscus cannabinus*	Vegetable kenaf	seed (dry)	8.1	1785	20.2	-	-	-	-	27
MORINGACEAE	*Moringa oleifera*	Drumstick tree	leaf	76.4	302	5.0	197	165	3.6	-	53
MUSACEAE	*Musa sp* (A &/or B genome) cv.	Banana	fruit	65.3	510	2.0	113	18.4	0.6	0.1	44
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	fruit	90.8	138	0.8	150	26.3	0.2	-	37
MYRTACEAE	*Psidium guajava*	Guava	fruit	77.1	238	1.1	60	184	1.4	1.4	40
POACEAE	*Eleusine coracana*	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	16
POLYGONACEAE	*Polygonum plebeium*	Small knotweed	leaf	-	-	17.0	-	-	-	-	30
RHAMNACEAE	*Ziziphus mauritiana*	Indian jujube	fruit	77.0	360	0.8	21	71	0.4	0.4	45
SAPOTACEAE	*Mimusops elengi*	Red Coondoo	fruit	46.6	825	2.9	-	223	-	-	38
SOLANACEAE	*Physalis peruviana*	Cape gooseberry	fruit	84.2	201	2.0	1200	30	1.5	-	39
SOLANACEAE	*Solanum tuberosum*	Potato	tuber (baked)	71.2	456	2.3	0	12.9	1.4	1.4	13