

# Potentially Important Food Plants of Guinea-Conakry



**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](http://www.foodplantsolutions.org)



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## **Dedication**

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

## **Preface**

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

The selection of plants included in this guide has been developed by Michael Goddard 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](http://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.

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## ***Introduction***

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

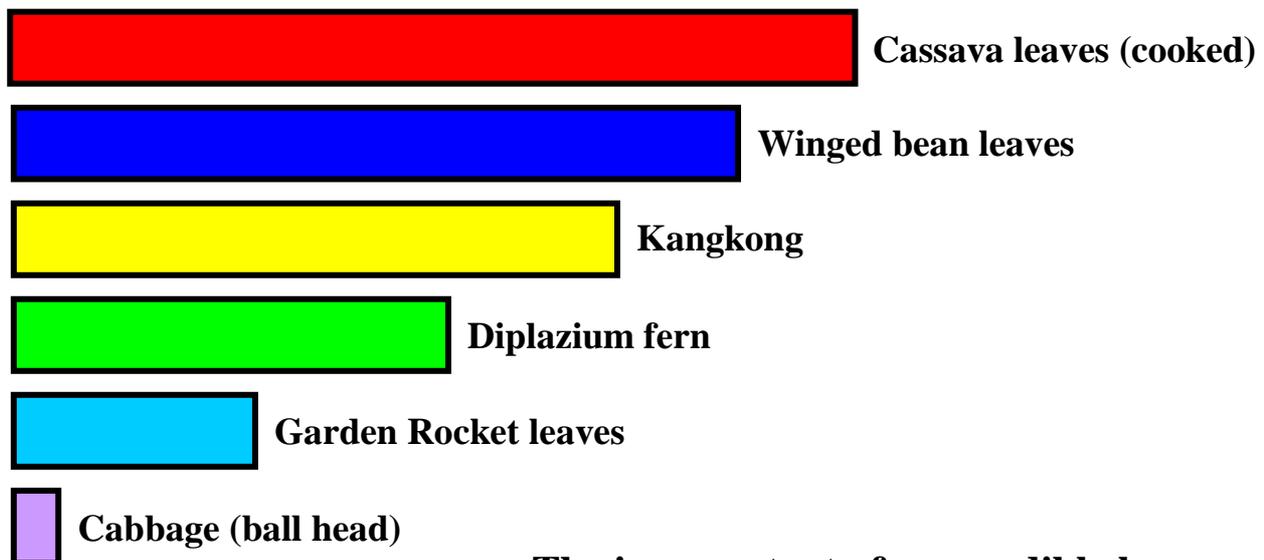
## Naming of plants

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 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 will not grow easily 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 cannot 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.

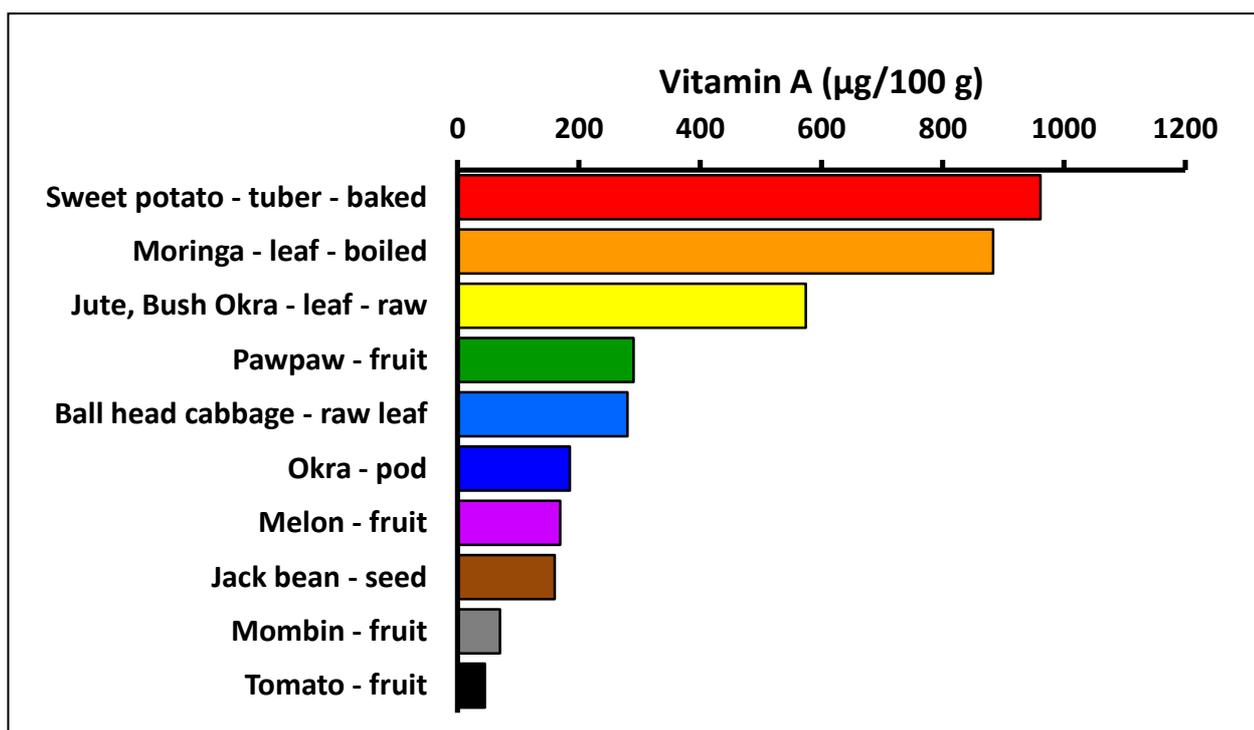
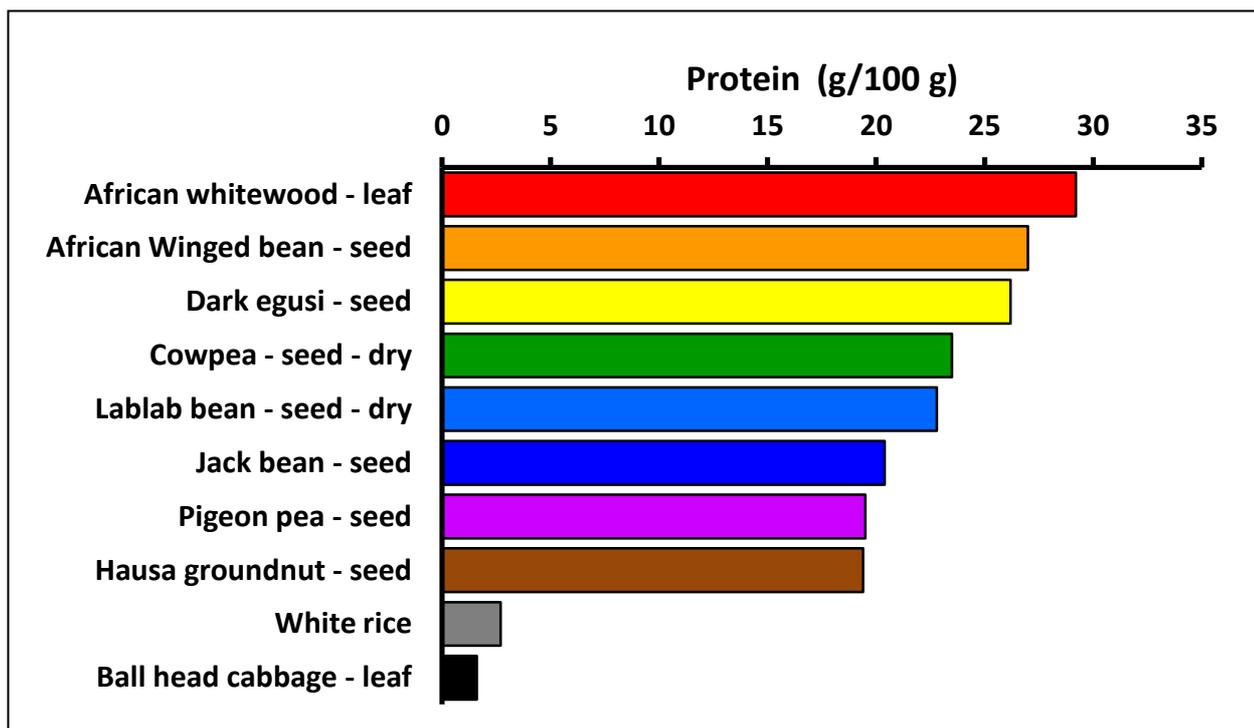
## **Pests**

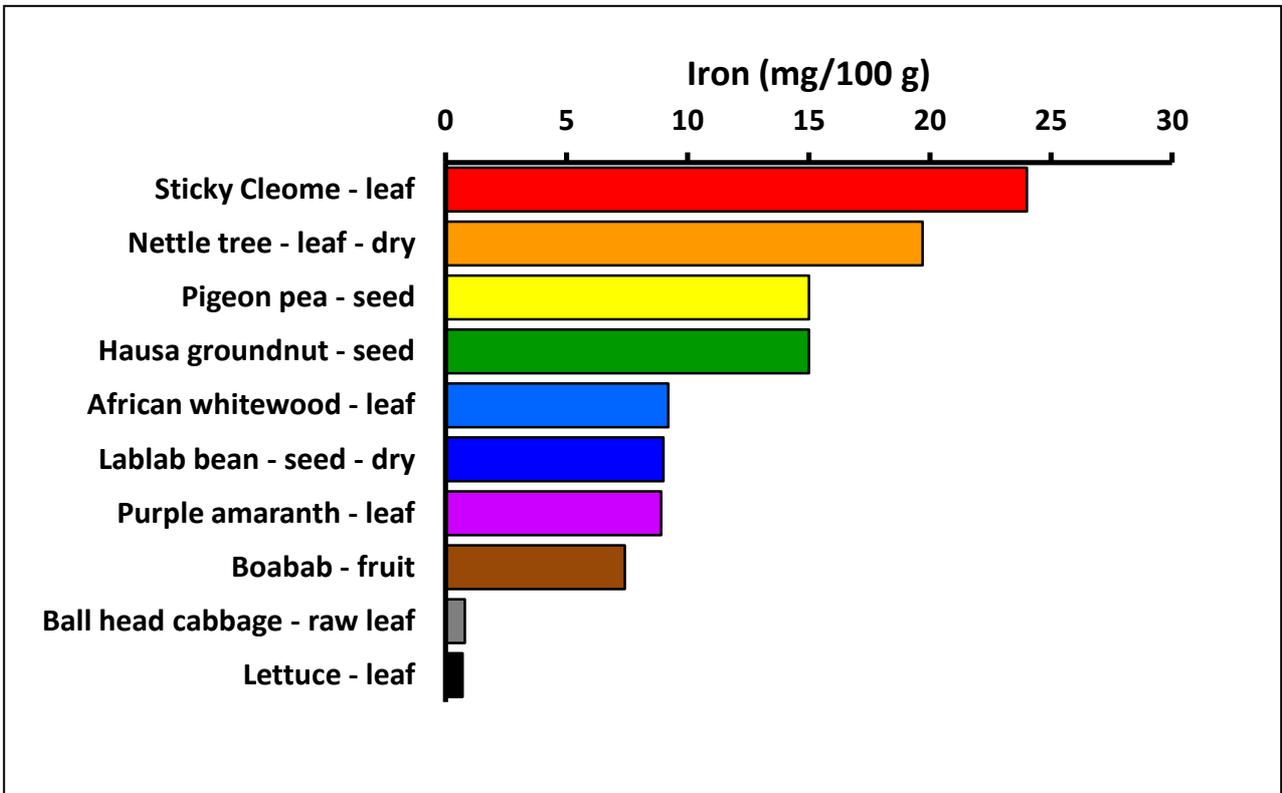
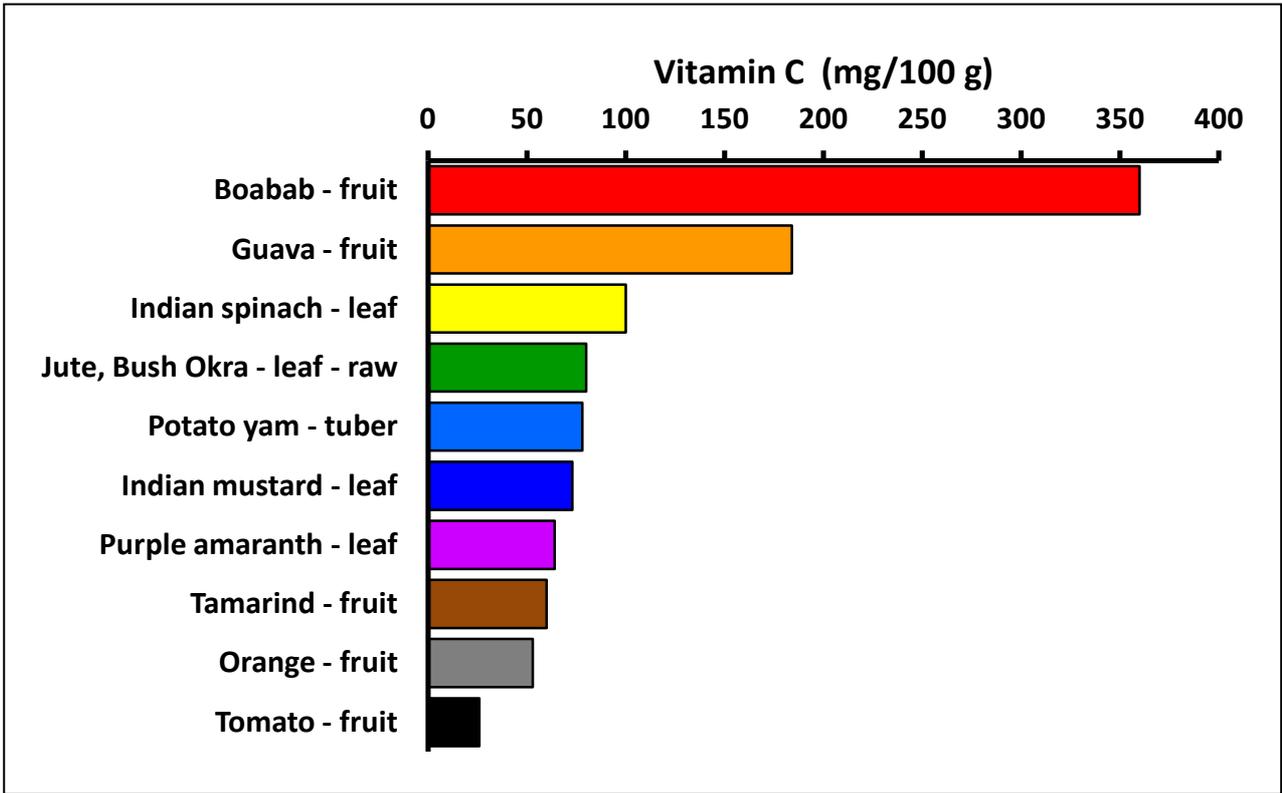
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects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

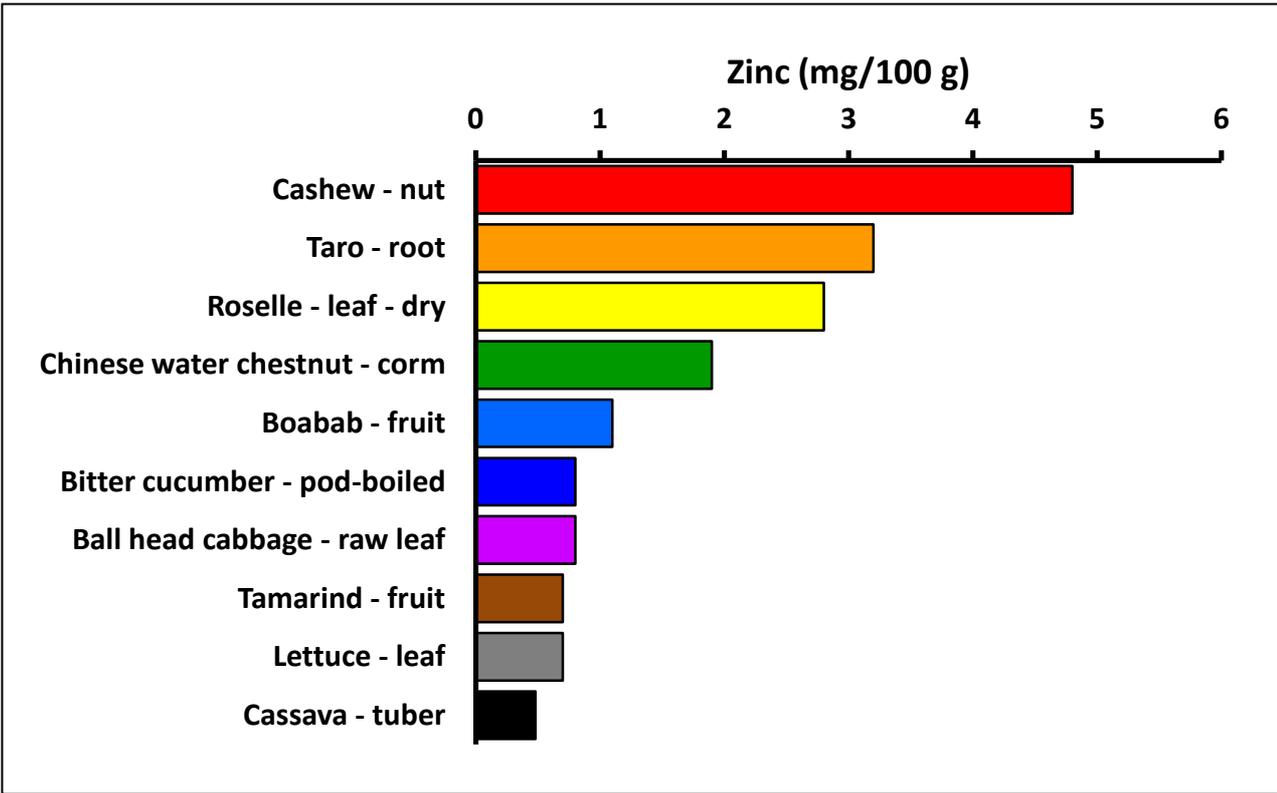
## **Diseases**

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 plants from Guinea-Conakry







## *Starchy staples*

**English:** Sandbur grass

**Local:**

**Scientific name:** *Cenchrus biflorus*

**Plant family:** POACEAE

**Description:** An annual grass that grows 10 - 60 cm tall. It forms tufts and has runners. The leaves are alternate and simple. They are 2 - 25 cm long and 2 - 7 cm wide. The flowers are green and occur in a spike-like panicle, 2 - 15 cm long with 1 - 3 spikelets.

**Distribution:** A tropical plant, found in many African countries. It grows on sand dunes and sandy plains. It is collected in the Sahel. It can grow in arid places and suits areas with 260 - 650 mm annual rainfall. It cannot tolerate frost. It can grow in salty or alkaline soils. It grows from sea level to 1,300 m above sea level.



**Cultivation:** It can be grown from seed. Seed germinate best at 35°C.

**Production:** The seeds fall from the plant and are swept up. They are pounded in a mortar then winnowed in the wind.

**Use:** Seeds are eaten raw, used in bread or for making porridge. It is also used to make a drink as a milk substitute.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.8	1547	17.8	-	-	-	-

## Starchy staples

**English:** Chinese water chestnut

**Local:**

**Scientific name:** *Eleocharis dulcis*

**Plant family:** CYPERACEAE

**Description:** A herb which grows in water. It is a tufted sedge with round green stems. The bases are covered with brown sheaths. The stem is about a metre high and 1 cm across. It grows 30 - 200 cm high. From the top of each planted corm, several slender horizontal rhizomes radiate out into the mud, each terminating in a corm. The edible part consists of a flattened corm. The rhizome is short. Under the ground there are stolons bearing tubers. The tubers are almost round and have 4 - 6 distinct rings. They are usually about 1 cm across but can be up to 4 cm



across. They are dark brown. The stems are tufted and slender. There are fine lines along the stems. The purplish leaves are reduced to thin tube like sheaths. Each plant produces these long tubular leaves that project above the water surface. The flower spike is on the end of the plant. There are many flowers, 1.5 - 6 cm long by 3 - 6 mm wide. The fruit is a nut 1.5 - 2 mm long.

**Distribution:** It suits humid, monsoonal, tropical and subtropical locations. It is found in open wet places and shallow water. It grows in fresh water swampy grounds or in shallow water. It is also found in rice fields. It needs at least 220 frost free days. It needs a soil temperature above 15.5°C for germination of the corms. It needs a pH of 6.9 - 7.3. It can be grown up to 1,200 m altitude and suits plant hardiness zones 9 - 12.

**Cultivation:** Plants can be grown by division or tubers. They are put in holes 20 - 30 cm deep. Fields are flooded after planting then allowed to drain. When top growth is 20 - 30 cm high fields are flooded to at least 10 - 12.5 cm. A spacing of 75 cm x 75 cm is suitable. 500 kg of corms per hectare are required for planting.

**Production:** Corms mature after 7 - 8 months. Yields of 20 - 40 t per ha are possible.

**Use:** The tubers are cooked and eaten. The corms can be eaten raw, roasted or boiled after they have been peeled. Normally, they are cut into small slices and added to soup or to fish and meat dishes. They can be sweetened for desserts.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
corm	50.8	635	3.7	-	52	15	1.9
fruit	79.6	268	1.4	0	5	0.7	0.5

## Starchy staples

**English:** Floating rice, African rice

**Local:**

**Scientific name:** *Oryza glaberrima*

**Plant family:** POACEAE

**Description:** An annual grass. Most varieties have a reddish colour. It grows to 1.5 m tall but can be up to 5 m in some floating kinds. Dryland types often form tufts and floating rice often branches. The leaves are alternate and simple. The leaf sheath is 25 cm long. The leaf blade is 20 - 25 cm long and 6 -9 mm wide. The flowers are in a compact group 25 cm long at the top of the plant. The fruit is a grain 9 mm long by 3 mm wide.



**Distribution:** It is a tropical plant that grows in swamps and on flood plains of savanna regions. It does best with temperatures of 30 - 35°C. It grows from sea level to 1,700 m altitude and can tolerate low soil fertility.

**Cultivation:** Plants are grown from seed. Usually seeds remain dormant for a few months after harvesting. Seed usually emerge after 4 - 5 days. Seed are usually broadcast without using a nursery. The juvenile stage lasts for 3 weeks then tillering occurs for 3 - 4 weeks.

**Production:**

**Use:** The grain can be cooked and eaten, or ground into flour. This is sweetened with rice flour and honey for bread. It is fermented for beer.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	11.3	1538	7.4	-	-	3.4	-

## Starchy staples

**English:** Bullrush millet, Pearl millet

**Local:**

**Scientific name:** *Pennisetum glaucum*

**Plant family:** POACEAE

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

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



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

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

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

**Food Value:** Per 100 g edible portion

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

## Starchy staples

**English:** 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 or petiole joins the leaf towards the centre of the leaf. The leaves are 20 - 50 cm long. A thickened rounded corm is produced near the ground. 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. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and *Colocasia esculenta* var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the Dasheen type needs to be maintained in a more or less continuously growing vegetative stage.



**Distribution:** It is a tropical plant. Taro grows from sea level up to about 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.

**Cultivation:** Taro can be planted from cormels or from the top of the central corm. Other sections of the corm could also be used but this is not commonly done. Flowering of taro and seed production can lead to new cultivars. Flowering can be promoted by the use of gibberellic acid. The general growth pattern is for an increase in top growth, in terms of leaf number, leaf area and petiole length, to continue for about 6 months under tropical lowland conditions then for each of these to decrease and tuber storage to continue to increase. Corm weight increases significantly from 5 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 the undug soil in a small hole that is prepared. Plants are put into a hole 5 - 7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth is beneficial.

Setts from corms normally give higher yield than that from cormels. The greater leaf area and root production may be responsible for this. Setts of about 150 g are optimum. The time of planting is primarily determined by the availability of moisture. Planting is done shortly after the rainfall has become regular, if seasonally distinct wet and dry 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 - 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 irrigation, or furrow irrigation. Increased suckering, giving greater leaf area, seems to be the reason for this.

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

Taro produces the highest dry matter yield under full sunlight, but it can still grow under moderate shade. Under shaded conditions it grows more slowly and develops less cormels. They require good moisture conditions and have little tolerance for drought.

Taro residue has an allelopathic factor which can reduce the germination and growth of other plants, for example, beans.

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

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

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

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

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	66.8	1231	1.96	3	5	0.68	3.2
leaf - cooked	92.2	100	2.7	424	35.5	1.2	0.2
leaf - stalk	93.0	101	0.5	180	13	0.9	-

## Starchy staples

**English:** Potato yam

**Local:**

**Scientific name:** *Dioscorea bulbifera*

**Plant family:** DIOSCOREACEAE

**Description:** A yam with a long smooth stemmed vine, round in cross-section, that winds to the left. The vine can climb up into trees. The leaves are large and round, pointed at the tip and round at the base. About 7 veins arise from the tip of the leaf stalk. Leaves can be 14 - 30 cm across and slightly longer than wide. The flowers are large. Male flowers are in spikes up to 20 cm long. Female spikes are usually in pairs. This yam produces bulbils (potatoes) in the angles of the leaves along the vine. These are often flattened and can be grey-brown or purple. A smaller tuber, normally covered with roots, grows underground. The fruit are winged and about 2.5 cm long by 1.5 cm across. The seeds have wings. Compared to some yams, the bulbils usually have few fibres through the tissue. The flesh of many varieties is yellow.



**Distribution:** A tropical plant that grows from the coast up to about 1700 m altitude in equatorial zones. It is common near the edge of grassland and forest at mid-altitudes. Both wild and cultivated forms occur. It is cultivated in Africa and the West Indies and suits hardiness zones 9 - 12.

**Cultivation:** Either the bulbils off the vine, or the underground tubers, are planted. Because the vines are long, training them up trees is convenient. The bulbils have to be stored for a period of time before they will sprout. The plant is annual and leaves die off for 1 - 4 months each year before re-sprouting from the tuber. Bulbils only grow shoots from one end unless the bulbil is cut into pieces. If the larger bulbils are cut, the cut surfaces should be dried and healed in a shady place for 2 - 3 days before planting. Bulbils are planted 8 - 12 cm below the surface and spacing can be 100 cm by 100 cm or variations of this. Normally nitrogen and potassium fertilisers give greater responses than phosphorus. Friable well drained soils are most suitable. Often very little cultivation or mounding is done. A high level of organic matter improves yield. Staking is normally required but often trees or living stakes are used. Branched stakes 2 m high are suitable. They need to be strongly erected as vine and tuber growth can be extensive and heavy.

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

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

**Food Value:** Per 100 g edible portion

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

## Starchy staples

**English:** Cassava

**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 3 metres high. Stalks have distinct scars where leaves have fallen. The leaves tend to be near the ends and are divided like the fingers on a hand. 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. 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. They can grow in poor soil. They can survive drought. It needs a rainfall above 750 mm.

**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. 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.

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. In very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

The critical period for weed control is 2 - 8 weeks after planting. Cassava tuber bulking is delayed under shaded conditions. Yields are also reduced. In mixed cropping situations using crops which mature early, allowing the cassava time to recover, is one possible strategy. For optimum production shading should be avoided.

Cassava takes about 10 - 12 months to produce mature tubers in the lowlands tropics although some varieties produce a smaller yield earlier. 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 - 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 and 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.

**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 and are sometimes dried and stored. The leaves provide a substantial amount of Vitamin A, Vitamin C and iron. **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.

**Food Value:** Per 100 g edible portion

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

## 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. At the end of the vine, trumpet shaped purple flowers grow. Tubers are produced under the ground.



**Distribution:** A tropical and subtropical plant. They grow from sea level up to about 2700 m altitude in the tropics. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow in soils with a pH between 5.2 - 6.8. Sweet potato tends to be responsive to potassium fertiliser.

**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. About 33,000 cuttings are required per hectare. These weigh about 500 kg. Vine lengths of about 30 cm are optimum. Ensure the vine is adequately inserted in the soil. 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. Some cultivars can be selected for increased production under mild shade. 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. Once the ground is covered by foliage, weed control is less of a problem. Reduced aeration in heavy clay soils, or waterlogged conditions can result in poor tuber production and are often grown on mounded beds. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage plants need to be hilled or have the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

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

**Use:** Tubers are boiled, baked, steamed, fried, mashed or dried. Sweet Potato is an excellent source of Vitamin A. The tuber can also be used in pies, cakes, puddings, candies and noodles. The chopped and dried tubers can be boiled with rice. Tubers can be fermented into alcoholic drinks.

**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 - boiled	72.0	363	1.1	787	15	0.6	0.3
tuber - baked	72.9	431	1.7	961	24.6	0.5	0.3
tuber - raw	70.0	387	1.2	709	25	0.7	0.4
leaf	86.3	168	3.9	105	58	2.9	-

## Legumes

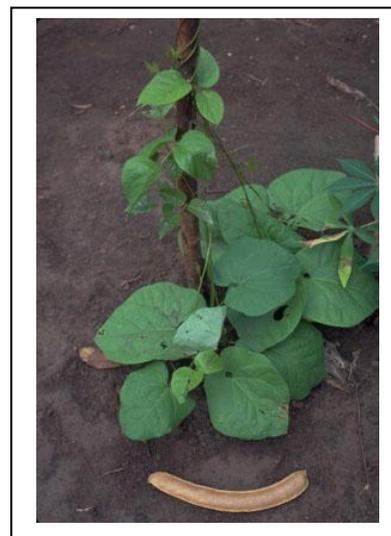
**English:** Jack bean

**Scientific name:** *Canavalia ensiformis*

**Local:**

**Plant family:** FABACEAE

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



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

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

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

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

**Food Value:** Per 100 g edible portion

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

## Legumes

**English:** Lablab bean

**Scientific name:** *Lablab purpureus*

**Local:**

**Plant family:** FABACEAE

**Description:** A climbing bean which can have vines 1 - 5 m long. It keeps growing from year to year. The stems can be smooth or hairy. Leaves are made up of 3 almost triangular leaflets. The leaflets are 5 - 15 cm long and 3 - 14 cm wide. The side leaflets are somewhat asymmetrical. Often the plants are flushed purple. The flowering clusters are 5 - 20 cm long. Flowers are often white but can vary from red to blue. The pods are flattened, pointed and up to 12 cm long and 2 cm wide. They can be green, purple or white. Inside there are 3 - 5 white or dark seeds. Seed pods have a wavy margin. The seeds are 0.5 - 1.5 cm long. (This bean is similar to Lima bean but the keel of the flower is not spirally twisted, the pod ends more bluntly with a long thin style at the end and the hilum on the seed is longer.)



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

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

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

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

**Food Value:** Per 100 g edible portion

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

## Legumes

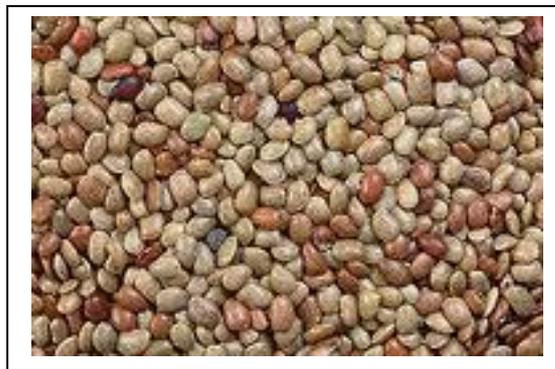
**English:** Hausa groundnut, Ground bean

**Local:**

**Scientific name:** *Macrotyloma geocarpum*

**Plant family:** FABACEAE

**Description:** A annual herb. The 10 cm long stems lie along the ground and form roots. The leaves are alternate and have 3 leaflets. The leaf stalk is erect and 25 cm long. The leaflets are 3 - 8 cm long by 2 - 2.5 cm wide. The flowers can be single or in pairs in the axils of leaves. The flowers are greenish white. The fruit are pods 0.5 - 2.5 cm long by 0.5 - 1 cm wide. These are forced into the ground as they develop. The pods contain 1 to 3 kidney shaped beans. The seeds are 5 - 10 mm long by 4 - 7 mm wide.



**Distribution:** A tropical plant that can grow in arid places. It grows in the drier regions of West Africa.

**Cultivation:** Plants are grown from seeds. Plants are often intercropped.

**Production:** Pods are harvested and then dried in the sun. The seeds are then thrashed from the pods. Yields of dry seeds can be 500 kg per hectare.

**Use:** The seeds are cooked and eaten. They are boiled with salt and eaten with palm oil. They are also boiled in soup. Dried seeds are ground into flour and made into cakes and other dishes. The leaves are also cooked and eaten.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1461	19.4	-	-	15.0	-

## Legumes

**English:** African yam bean

**Scientific name:** *Sphenostylis stenocarpa*

**Local:**

**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 occur on stout stalks in the axils of leaves. The seed pods are smooth and 25 - 30 cm long by 1 - 1.5 cm wide. They are flat but have both edges raised. 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. Small narrow tubers grow under the ground. They can be 5 - 7.5 cm long and weigh 50 - 150 g. The flesh is white and watery.



**Distribution:** It is a tropical plant that grows from sea level up to 1,800 m altitude. It grows in grassland and woodland and sometimes in marshy sites. It can grow in arid places.

**Cultivation:** It can be grown from seed or tubers.

**Production:** Tubers are ready for harvest about 8 months after planting.

**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.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1470	19.2	-	-	-	-
tuber	64.0	542	3.8	-	-	-	-

## Legumes

**English:** African Winged bean

**Scientific name:** *Psophocarpus palustris*

**Local:**

**Plant family:** FABACEAE

**Description:** A bean with leaflets that are more hairy underneath than *Psophocarpus scandens*. The pods are 2.5 - 5.5 cm long.

**Distribution:** A tropical plant widespread in tropical Africa.

**Cultivation:**

**Production:**

**Use:** The ripe seeds are eaten cooked. The young pods and rhizomes are cooked and eaten. The leaves are also eaten.



**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.7	1760	27	-	-	-	0.12

## Legumes

**English:** Pigeon pea

**Scientific name:** *Cajanus cajan*

**Local:**

**Plant family:** FABACEAE

**Description:** An upright perennial shrubby legume that lives for 3 - 4 years. They can be up to about 4 m tall and spread to 1.5 m wide. The stem is erect and branching. It has a bushy appearance and a strong deep taproot. The root nodules are round and sometimes lobed. Young stems are angled and hairy. A leaf consists of 3 leaflets. Leaflets are narrow and green with a silvery green underneath. Leaflet size can be 10 cm x 3 cm. The end leaflet is larger with a longer leaf stalk. Flowers are red and yellow. The large petal has red lines. They are pea shaped and on branched flower stalks which stick upwards in the axils of leaves. Pods are long, straight and narrow, often with 4 - 8 seeds. The pods are slightly hairy. Pods are often 4 - 8 cm long and have a beak at the end. Pods are constricted between the seeds. Many varieties of pigeon pea occur. Some are dwarf and day length neutral. Seeds vary in shape, size and colour.



**Distribution:** Plants require a tropical or subtropical climate. They grow from sea level up to about 1800 m in the tropics. They can tolerate drought and are suited to a drier climate. They can grow in places with less than 600 mm rainfall per year. They do less well in the wet tropics. It suffers in waterlogged soils and is damaged by frost. It can also tolerate heat. It will grow on poor soils but not on salty soils. It can grow in arid places. It suits hardiness zones 10 - 12.

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

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

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

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	10.0	1449	19.5	55	-	15.0	-
seed young - boiled	71.8	464	6.0	13	28.1	1.6	0.8
pod - young	64.4	477	8.7	-	-	2.0	-

## Legumes

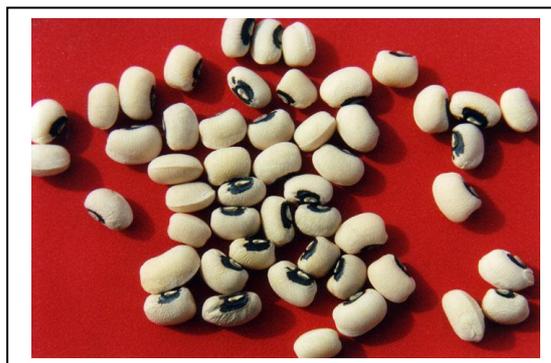
**English:** Cowpea

**Scientific name:** *Vigna unguiculata subsp. unguiculata*

**Local:**

**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 in temperatures 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.

**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 inbred giving pure lines.

### Production:

**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.

### Food Value: Per 100 g edible portion

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

## *Leafy greens*

**English:** Purple amaranth, Red amaranth

**Scientific name:** *Amaranthus cruentus*

**Local:**

**Plant family:** AMARANTHACEAE

**Description:** An annual erect plant. It grows to 2 m high. The stems are angular. It often branches in the upper section. It is smooth but may be hairy on younger plant parts. The young parts can be tinged purple. The leaves are oval to sword shaped and can be 10 - 15 cm long by 3 - 6 cm wide. They have a leaf stalk 1 - 7.5 cm long. The leaves often narrow towards the tip. They can also become thinner towards the base. There may be hairs on the midrib. The leaf may be tinged purple underneath. The flowers clusters are often branched and on side branches. The stiff branched flower arrangement at the top can be 15 - 25 cm long. The fruit is oval and the seed can be 1 - 1.3 mm across. The seed is dark brown but pale brown forms are used as grain in Central America.



**Distribution:** It grows in the tropics and more temperate regions. In the tropics it grows mainly in the highlands. In Papua New Guinea it occurs between 1,200 and 2,200 m altitude. It needs a night temperature above 15°C and preferably a day temperatures above 25°C. It grows best in fertile, well drained soil and suits hardiness zones 8 - 11.

**Cultivation:** Plants can be grown from seed if the soil is warm. Seeds are small and grow easily. They can be put in a nursery and then transplanted after 2 - 3 weeks. Cuttings of growing plants root easily.

**Production:** Yields of 800 - 1500 kg per hectare are achieved. Plants can be harvested by pulling up the entire plant or by removing leaves over several harvests.

**Use:** The leaves and young plant are eaten cooked. They are also dried and stored. The seeds are ground into flour and used to make bread. **CAUTION** This plant can accumulate nitrates if grown with high nitrogen inorganic fertilisers and these are poisonous.

**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	87.7	2006	14.7	-	0	3.8	-
leaf	84.0	176	4.6	-	64	8.9	-

## 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 soil pH of 5.5 - 7.0 is best, but they can grow in soils with pH up to 8.5. They also need adequate moisture for good leaf production. A rainfall of 1,000 mm is suitable. A high relative humidity (80 - 90%) is best. It produces seeds when day lengths are short. It grows in most African and Asian countries.

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

**Cultivation:** Plants grow from seed, and they can be transplanted. Seeds are often broadcast into fine seed beds at the beginning of the wet season. Mixing the small seeds with sand makes it easier to sow them evenly. Often seeds are slow to start growing. This can be overcome by soaking them in hot water. A spacing of 20 - 30 cm between plants is suitable. For vigorous varieties this could be 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
leaf - raw	80.4	244	4.5	574	80	7.2	-
leaf - cooked	87.2	155	3.4	156	33.0	3.1	0.8

## Leafy greens

**English:** Indian mustard, Leaf mustard

**Scientific name:** *Brassica juncea*

**Local:**

**Plant family:** BRASSICACEAE

**Description:** It is an erect leafy annual cabbage plant. It grows to about 1 m high. The plant can vary a lot. The dark green leaves are elliptical and deeply divided. The end segment of the leaves is oval. The leaves taper towards the stem and have a strong mustard flavour. The flowers are pale yellow. They have 4 petals. It produces a flower and seed pods at the top. The seed pod is 3 - 5 cm long and narrow. The seeds are reddish-brown.



**Distribution:** A warm temperate plant. It is grown in some highland areas in the tropics. It is often grown as a cool season crop. Most varieties are not frost tolerant. It needs a fertile, well drained soil. A pH of 5.5 - 6.8 is suitable. It can tolerate poor soils. It can grow in arid places. It suits hardiness zones 9 - 11.

**Cultivation:** The seed is broadcast. They can be put in a nursery and transplanted. A spacing of 25 cm x 25 cm is suitable. Seed germinate in 5 days at 20 - 25°C.

**Production:** Plants grow rapidly. Leaves can be harvested one month after planting. Leaves can be harvested several times. Whole plants can be harvested in about 45 days from transplanting.

**Use:** The leaves are cooked and eaten. They have a bitter taste, so the cooking water needs changing. They can be stir-fried, or added to soups and stews. They can be eaten crystallised in vinegar or salt. They can be used in salads. The seeds can be fried then used as a spice. They also yield an edible oil. They can be sprouted. The leaves are also pickled.

**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	6.9	1964	24.9	-	3	10.0	-
leaf	92.0	108	2.4	31	73	2.7	-

## Leafy greens

**English:** Sticky Cleome

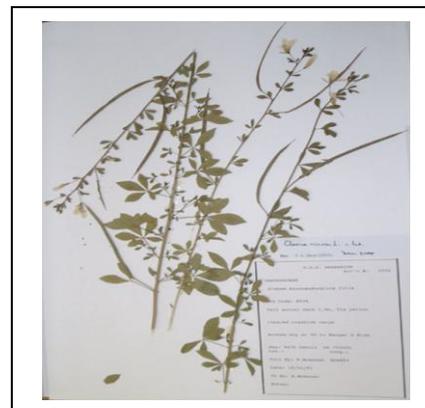
**Local:**

**Scientific name:** *Cleome viscosa*

**Plant family:** CLEOMACEAE

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

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



**Cultivation:** Plants are grown from seed.

**Production:**

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

**Food Value:** Per 100 g edible portion

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

## Leafy greens

**English:** Cat's-whiskers

**Local:**

**Scientific name:** *Cleome gynandra*

**Plant family:** CLEOMACEAE

**Description:** An annual herb with a long tap root that grows 60 – 90 cm tall. It is erect and somewhat hairy. It usually has purple stems. The leaves occur one after another along a long stalk. There are 5 - 7 leaflets which are unequal and spread out at the end. They are oblong and about 2.5 - 6 cm long by 1.4 - 3.2 cm wide. The leaflets are pointed at the base with a rounder point at the tip. There are fine teeth along the edges of the leaves. The flowers are white or purple and occur in long flower clusters at the end of branches. These are 30 cm long. The flower clusters are showy with a spidery like appearance. The fruit are a slender capsule with 2 valves and many small seeds. They are 5 - 10 cm long and very narrow. The seeds are kidney shaped and rough. They are brown and have fine lines along them. They are 1 - 1.5 mm across.



**Distribution:** A widespread tropical plant. It commonly occurs as a self sown weed on cultivated land. It grows in warm or tropical regions at a range of elevations but especially above 600 m altitude. It will grow from semi arid to wet humid climates. It will grow on many soil types, but needs fertile soil for good leaf production. A temperature of 18 - 25°C seems best. Plants need plenty of sunlight. They are not drought resistant but can produce a crop with short periods of rain. Plants cannot withstand flooding. It is often abundant near the sea. It can grow in arid places.

**Cultivation:** The plant is grown from seed that are broadcast. Fertile soil is needed to get plants with good leaf coverage. The seed germinate erratically, because the seed have a rest period after harvest. Seed germinate best 6 months after harvest. Once they are ready to grow, they germinate in 4 - 5 days. Leaves or whole plants can be harvested when 15 cm high. Picking out the tops encourages side growth and longer leaf production. Removing flowers extends the harvest period.

**Production:** Leaves can be harvested 4 - 5 weeks after planting. Seeds reach maturity about 5 months after sowing.

**Use:** The leaves are eaten. If they are cooked, the bitter taste is reduced. They are also used in flavouring sauces. The leaves are also blanched, dried and stored. The flowers can be eaten. Young pods are also eaten. The oil from the seeds is edible without needing to be refined. The leaves can be candied in vinegar or in salt water, then eaten with fish. The seeds are used as a spice in curries. **CAUTION:** Fresh plants can contain hydrocyanic acid and should be cooked.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	86.6	142	4.8	-	26	6.0	-

## Leafy greens

**English:** Roselle, Rosella

**Local:**

**Scientific name:** *Hibiscus sabdariffa*

**Plant family:** MALVACEAE

**Description:** A branched shrub up to 2 m tall. It has reddish stems, leaves and fruit. Different types vary in their height, shape and leafiness. The leaves are 7 - 10 cm across and lobed. The upper leaves often have more lobes than the lower leaves. The flowers are large and yellow and in the axils of the leaves. They are carried singly. The bracts at the base of the flower are enlarged and form a fleshy red fruit. This capsule is 3 cm long and contains 22 - 34 seeds. The seeds are dark brown and 4 - 6 mm long. 1000 seeds weigh about 25 g.



**Distribution:** A tropical plant that grows from sea level up to about 1,000 m altitude. It will tolerate a range of soils and requires short days for flowering. It will grow in semi arid locations. It grows best where average temperatures are in the range 25 - 30°C. It needs a temperature above 10°C. Plants will tolerate high temperatures. They grow up to 800 m altitude in Africa. A rainfall of 450 - 550 mm distributed over a 90 - 120 day growing period is required. It cannot tolerate waterlogged soils. It can grow in arid places. It suits hardiness zones 10 - 12.

**Cultivation:** Seeds are sown and the seedlings can be transplanted. They are transplanted when 15 - 20 cm high. Seed should be planted 1 - 2.5 cm deep. A spacing of 50 cm x 50 cm is suitable although a wider spacing is used for fruit and a closer one for leaves. Plants can be propagated by cuttings.

**Production:** Fruit are ready 12 - 15 weeks after sowing. The bracts are picked 15 - 20 days after flowering. They can produce about 1 kg per plant. The yield of leaves can be 10 tons per hectare.

**Use:** The swollen bases of the flowers are used for jams or drinks. The young leaves can be cooked and eaten. They can also be dried and used. The flowers can be used to flavour drinks. The seeds can be eaten. They can be dried and ground. They can be pressed for oil.

**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	8.2	1718	19.6	-	-	4.2	-
leaf	86.4	185	10.9	58	35	1.5	4.1
leaf - dry	9.0	1185	6.9	-	4.2	6.4	2.8
calyces	86.0	185	1.6	29	14	3.8	-

## Leafy greens

**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. 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. The best pH is 5.5 - 7.0. It cannot tolerate salty conditions. Flowering does not occur when day lengths are over 13 hours.

**Cultivation:** It can be sown from seeds or cuttings. Seeds germinate in a few days. Sticks can be provided for support, or it can grow over fences and stumps. If seeds are used, 3 kg of seed will sow one hectare. They are best sown in a nursery and transplanted. A spacing of 1 m is suitable. Plants grown from seed are more productive than those grown 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. 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 of 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.

**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. The leaves are used to make tea and can also be dried and stored. The seeds can be crushed to use as an edible dye for jellies.

**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	85.0	202	5.0	56	100	4.0	-

## ***Fruit***

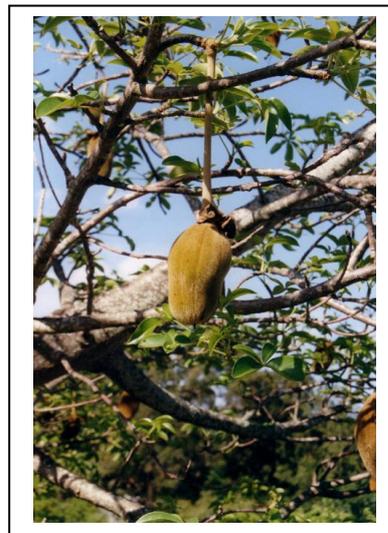
**English:** Boabab

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

**Cultivation:** Trees are grown from seed. The seed remain viable for several years but before planting they 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.

**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.

**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 - dried	7.8	1832	33.7	-	-	13.9	-
leaf	77.0	290	3.8	-	-	50	-
fruit	16.0	1212	2.2	-	360	7.4	1.1

## Fruit

**English:** Melon, Canteloupe, Honey-dew

**Scientific name:** *Cucumis melo*

**Local:**

**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, but not suited to places with high rainfall. It suits 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 are 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.

**Cultivation:** They are grown from seed 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 per 10 sq m is average.

**Use:** The ripe fruit are eaten raw. They are also dried, candied and made into jams, jellies and preserves. The seeds are sometimes eaten 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.

**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	-	-	-	-
leaf	85.0	172	4.2	72	-	-	-
fruit	93.0	109	0.5	169	30	0.4	0.2

## Fruit

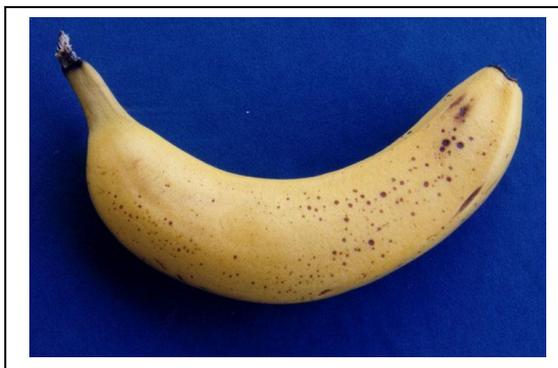
**English:** Banana

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

**Local:**

**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 that grows from sea level up to about 2,000 m altitude. They are rarely an important food above about 1600 m. 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 4.5 - 7.5. It suits hardiness zones 10 - 12.

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

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

**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.

**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	-	18.4	0.6	0.1
fruit - sweet	70.7	337	1.1	3	10	0.4	0.2
flower bud	91.3	109	1.6	-	-	1.0	-

## Fruit

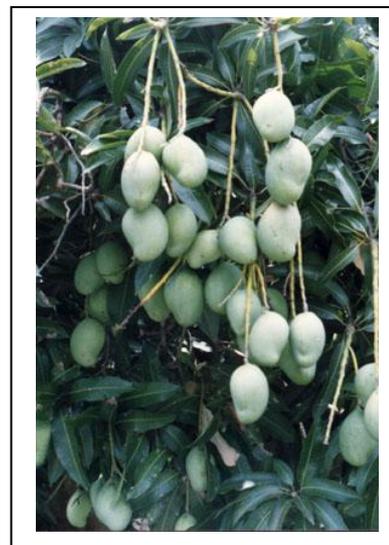
**English:** Mango

**Local:**

**Scientific name:** *Mangifera indica*

**Plant family:** ANACARDIACEAE

**Description:** An erect, branched evergreen tree. It can grow 10 - 40 m high and is long lived. Trees spread to 15 m across. Trees grown by vegetative means are smaller and more compact. It has strong deep roots. The trunk is thick and the bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10 - 30 cm long and 2 - 10 cm wide. They are arranged in spirals. The leaf stalk is 1 - 10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10 - 50 cm long and branching. Up to 6,000 flowers can occur on a stalk. Most of these are male and between up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5 - 30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside.



Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.

**Distribution:** A lowland tropical and subtropical plant. It grows from sea level up to 1,300 m altitude. It does best in areas below 700 m and with a dry season. Rain and high humidity at flowering reduces fruit set. It thrives best where temperatures are about 25°C but will grow with temperatures between 10 - 42°C. Temperatures of 0°C will damage young trees and flowers. Low temperatures (10 - 20°C) at flowering time will reduce fruiting. As temperatures get lower due to latitude or altitude, fruit maturity is later and trees become more likely to only have good crops every second year. Mangoes can grow on a range of soils. In wetter areas soils with less clay are better. They can withstand occasional flooding. A soil pH of 5.5 - 6.5 is best. Soils with pH above 7.5 cause plants to develop iron deficiency. It grows in the Sahel. It can grow in arid places. It suits hardiness zones 11 - 12.

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

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

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

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

**Food Value:** Per 100 g edible portion

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

## Fruit

**English:** Guava

**Scientific name:** *Psidium guajava*

**Local:**

**Plant family:** MYRTACEAE

**Description:** A small, evergreen tree or shrub growing 8 - 10 m tall with mottled, smooth bark that peels off in smooth flakes. Trees are shallow rooted. It branches close to the ground. The branches are four angled. The leaves are opposite, dull green and somewhat hairy. They are oval and somewhat pointed at both ends, and are 15 cm long by 2 - 5 cm wide. The leaves have short leaf stalks and grow in the axils of leaves on new growth. The flowers are white and showy and borne in loose irregular types of arrangements of one to three flowers. The petals are



1.5 - 2 cm long. Both self- and cross-pollination occurs due to insects. The fruit are rounded and 4 - 5 cm long. They are green but turn yellow when ripe. The outer covering is firm and encloses a pink or nearly white sweet smelling edible pulp that contains many seeds. In better selected varieties both the skin and the seeds are fully edible. Fruit vary from very acid to very sweet.

**Distribution:** A tropical plant native to C and S America. Guavas thrive in both humid and dry tropical climates. They do best in sunny positions. They grow wild and are also cultivated. It is killed by frost. They fruit better where there is a cooler season. Temperatures near 30°C give best production. They 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 it can tolerate a pH of 4.6 - 8.9. Trees cannot tolerate salty conditions. It can grow in arid places. It suits hardiness zones 9 - 12.

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

**Production:** Seedling trees may begin to bear 2 - 3 years after transplanting. Pruning back the tips slightly increases fruit production. Fruit taste best if ripened on the tree. Ripening 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.

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

**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	31	184	1.4	0.2

## Fruit

**English:** Mombin

**Local:**

**Scientific name:** *Spondias mombin*

**Plant family:** ANACARDIACEAE

**Description:** A medium sized tree growing 20 - 30 m high. The trunk can be 0.5 - 2 m across. Branches start after 10 - 15 m. They are widespread and sparse. The leaves are compound. They have leaflets along the stalk. The leaflets are in pairs with a leaflet at the end. There are 5 - 9 pairs. The flowers occur on stalks near the ends of the branches. The fruit are small and yellow. They are 2.5 - 4 cm long. They have one large seed. The flesh is sub-acid.



**Distribution:** It grows in the tropical lowlands in wet or dry zones. In Bolivia it grows where rainfall is 1,000 - 1,500 mm per year. It cannot tolerate frost. It can tolerate a range of soils.

**Cultivation:** Plants can be grown from seed or cuttings. The fresh fruit can be planted whole. The flesh can be removed and the seeds dried. Seeds only store well for about 3 months. Seeds germinate in 20 - 40 days. It is often used as a living fence or hedge.

**Production:** It is fast growing. Plants can be 3.5 m high in 2 years.

**Use:** The fruit are used fresh or cooked. They are acidic. They are also used for jams and jellies. Because it is sour it is often sweetened and used for drinks. The unripe fruit are pickled and eaten like olives. The young leaves are cooked and eaten.

**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	82.7	193	1.3	70	28	2.8	-

## Fruit

**English:** Pawpaw, Papaya

**Scientific name:** *Carica papaya*

**Local:**

**Plant family:** CARICACEAE

**Description:** Pawpaw is a well known tropical fruit that grows 3 - 5 m tall and only occasionally has branches. The stem is softly woody and has scars from fallen leaves along it. There is a clump of leaves at the top of the plant. The leaves are large (50 cm wide) deeply lobed and on leaf stalks up to 90 cm long. Trees can be male, female or bisexual. Male flowers are small and white and on long stalks. Female and bisexual flowers are on short stalks. These have no fruit, round fruit and long fruit respectively. There are three forms of long fruit. The seeds are black.



**Distribution:** It is a tropical plant that grows from sea level up to about 1700 m altitude in the equatorial tropics. In cooler regions they have to be planted but in humid tropical regions are commonly self-sown. Sunlight allows germination when forest is cleared. It cannot stand frost. It needs a night temperature above 12°C and don't tolerate water-logging. Plants die after 48 hours in standing water. It needs a pH between 5 – 8 and suits hardiness zones 11 - 12.

**Cultivation:** Pawpaw seeds grow easily and plants grow quickly. Fresh seeds can be used. If dry seeds are used they should be soaked before planting. Seeds should be sown when temperatures are 24 - 30°C. They need a reasonably fertile soil. Seeds can be sown directly or the seeds can be put in a nursery and the seedlings transplanted. Seeds in a nursery should be sown 1 - 2 cm deep. Seedlings can be transplanted when they are about 20 cm high. Plants should be about 3 m apart. Continuous fruit production depends on fertility, temperature and moisture being adequate to maintain active growth. The fruit is produced year round but the growth and development rate decreases with temperature. The size and quality of fruit declines at lower temperatures. Pollination is by wind and insects and is not normally limiting. Normally cross and self-pollination both occur. Seeds are dispersed by birds, bats and people and remain viable for a few months.

**Production:** Seeds emerge in 2 - 3 weeks. Vegetative growth before flowering is 4 - 8 months. One or more fruit grow per leaf axil, about every 1 - 2 weeks under good growing conditions. With good growth, 100 fruit can be produced from one plant in a year. Pollination to maturity is about 2 - 3 months. On the coast in tropical equatorial regions, pawpaws start producing fruit after about 4 - 5 months, but in the highlands this may take 12 - 18 months. The first fruit are ready 6 - 11 months from planting. Tree life is about 2 - 3 years, although they may live for 10 - 12 years.

**Use:** Fruit can be eaten ripe and raw. Green fruit can be cooked as a vegetable. The young leaves can be eaten cooked, but are bitter. The flowers and the middle of the stem can be eaten. Papayas contain papain which is a meat tenderiser. The dried seeds can be used as a spice.

**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	75.4	378	8.0	-	140	0.77	-
fruit	88.0	163	0.5	290	54	0.4	0.18
fruit - unripe	92.1	109	1.0	-	-	0.3	-

## Vegetables

**English:** Okra, Lady's fingers

**Local:**

**Scientific name:** *Abelmoschus esculentus*

**Plant family:** MALVACEAE

**Description:** A tropical annual herb that grows erect, often with hairy stems. It mostly grows about 1 m tall but can be 3.5 m tall. It becomes woody at the base. The leaves have long stalks up to 30 cm long. Leaves vary in shape but are roughly heart shaped with lobes and teeth along the edge. Upper leaves are more deeply divided than lower ones. The flowers are yellow with red hearts. The fruits are green, long and ribbed. They have 5 - 7 ribs. They are 7.5 - 15 cm long. The seeds are 4 - 5 mm across. They are round and dark green. Many varieties exist.



**Distribution:** A tropical plant that suits the hot humid tropical lowlands but is unsuited to the highlands. It cannot tolerate drought. It is very sensitive to frost. It can grow in salty soils. It grows best where temperatures are between 20 - 36°C. It can grow well in dry climates with irrigation. It suits hot humid environments. It does best on well drained well manured soils but will grow on many soils. A pH of 5.5 - 7.0 is best. It suits plant hardiness zones 8 - 12.

**Cultivation:** They are grown from seeds which are easy to collect. They need high temperatures for germination (over 20°C) and a sunny position. Often seeds are soaked for 24 hours before sowing to give quick germination. Seeds are sown 1.5 - 2.5 cm deep with 2 - 3 seeds per hole. Later these are thinned out to one plant. Seeds can be sown in nurseries and plants transplanted. Pinching out the tops of plants when 30 cm high encourages branching. A spacing of about 90 x 45 cm is suitable. About 8 - 10 kg of seed are required for one hectare. Most kinds respond to fertiliser. Seeds do not breed true and can cross with other kinds of okra growing nearby. This is not normally a problem but simply means plants and fruit are not all the same. To select seed of a particular variety seed plants must be separated 400 m from other varieties.

**Production:** Plants keep producing if the fruit are harvested regularly. Plants are ready to harvest 8 - 10 weeks after sowing. Seed yields of 500 - 800 kg per hectare are possible. Pod yields of 4 - 6 tons per hectare occur. For young pods it takes 2 - 4 months from sowing. Pods develop 5 - 10 days after flowering. Pod harvests can continue for 1 - 2 months. Leaving pods on the plants stops new pods developing.

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

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.2	1721	23.7	-	-	-	-
leaf	81.0	235	4.4	116	59	0.7	-
pod	88.0	151	2.1	185	47	1.2	-
fruit - cooked	90.0	134	1.9	58	16.3	0.5	0.6
fruit - raw	90.0	71	2.0	90	25	1.0	-

## Vegetables

**English:** False benniseed

**Scientific name:** *Ceratotheca sesamoides*

**Local:**

**Plant family:** PEDALIACEAE

**Description:** An erect, slender stemmed herb that grows 2 - 3 m tall. The leaves have stalks. The leaves at the top of the plant are arrowhead shaped and with teeth in their lower section. The lower leaves are wider and have teeth all around. The flowers are tube shaped. At the base of the flower stalk there is a pair of small purple glands on the stem. The fruit have 2 "horns" at the end.



**Distribution:** A lowland tropical plant that grows in tropical Africa. It grows on sandy soil and suits wet areas. In Malawi it grows below 900 m altitude. In West Africa it grows in open savannah woodland.

**Cultivation:** Plants are grown from seeds. Seeds are broadcast at the beginning of rains.

**Production:**

**Use:** The leaves are eaten as a vegetable. They can be added to soups. Leaves can be preserved by drying. The seeds are eaten like sesame seeds. They are also put into soups. The seeds yield an edible oil.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed - dry	7.0	2299	14.2	-	-	-	-
leaf	81.0	226	4.2	-	-	3.2	-

## Vegetables

**English:** Bitter cucumber

**Scientific name:** *Momordica charantia*

**Local:**

**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 - 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	-	-	-	-
leaf - raw	84.7	252	5.0	44	170	7.1	0.3
leaf tip - boiled	88.7	146	3.6	173	57	1.0	0.3
fruit	93.6	105	1.2	-	-	0.2	-
pod - boiled	94.0	79	0.8	11	33	0.4	0.8
pod - raw	94.0	71	1.0	380	84	0.4	0.8

## Vegetables

**English:** Pumpkin, Winter squash

**Scientific name:** *Cucurbita moschata*

**Local:**

**Plant family:** CUCURBITACEAE

**Description:** A pumpkin family plant. It is a creeping plant with long creeping stems and softly hairy but without prickly hairs. The stems are rounded or 5 angled and moderately hard. They can grow 15 - 20 m long. The leaves are large and shallowly lobed and divided like fingers on a hand. Occasionally the leaves have white blotches. They have rounded lobes. They are 20 cm by 30 cm. The leaf stalk is 12 - 30 cm long. The flowers have male and female flowers separately on the same plant. The fruit stalk is distinctly expanded where it joins the fruit. The fruit are not



hard shelled and are dull in colour. The flesh is yellow and often has fibres through it. The seeds are plump and white to brown. They separate easily from the pulp of the fruit. The edge of the seed is scalloped and irregular in outline. There are a large number of cultivated varieties.

**Distribution:** A tropical plant that suits the wet tropics. It will thrive in humid as well as in very hot climates. A temperature of 18 - 30°C is best. It can tolerate some shade. It can grow in soils with a pH of 5.5 - 6.9. It suits hardiness zones 8 - 11.

**Cultivation:** Plants are grown from seed. Seeds can be put in a nursery and transplanted.

**Production:** Fruit mature in 70 - 180 days after sowing depending on variety.

**Use:** The fruit are eaten cooked. They are boiled, fried or baked. They can be mashed and used in pies, soups, bread and cakes. They can be dried, ground into flour and used for bread. The young leaves and flowers are edible. They can also be dried and stored. The seeds are eaten roasted. They can also be roasted in salt.

**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	5.5	2331	23.4	-	-	2.8	-
leaf	93.6	88	3.0	95	10	2.1	-
fruit	95.0	35	0.7	-	14	0.4	-

## Vegetables

**English:** Smooth loofah

**Local:**

**Scientific name:** *Luffa cylindrica*

**Plant family:** CUCURBITACEAE

**Description:** A pumpkin family plant. It is an annual climber up to 10 m long. The stem is five angled and slightly hairy. The tendrils have 2 or 3 branches. Leaves are 10 - 20 cm across with 5 - 7 lobes. Male and female flowers are separate and yellow. The male flowers occur as 4 - 20 flowers together while female flowers are solitary in the leaf axils. Flowers open in the early morning. The fruit is fairly smooth and cylindrical and can be 30 - 60 cm long. The seeds are black, flat and smooth and 10 - 15 mm long.



**Distribution:** A tropical plant that grows well in the tropical lowlands but will also grow in more temperate places. It does best with temperatures of 25 - 30°C. It is better suited to the drier season as too much rainfall during flowering and fruiting is harmful. Soils should be well drained and moderately rich. It grows in areas with an annual rainfall of 1,000 - 1,800 mm. In Zimbabwe it grows up to 1,500 m above sea level. It can grow in arid places. It suits hardiness zones 9 - 12.

**Cultivation:** Plants are grown from seed which are collected from ripe fruit. Seed are sown 4 - 5 cm deep and plants are put 1 metre apart. They can be sown in seed boxes and transplanted when 15 cm high. It is best to have a trellis for the plant to climb on or be left to climb over trees. They are often pollinated by insects but can be hand pollinated in the early morning.

**Production:** Fruit are harvested for sponges when fully mature. Young fruit are ready 2 - 3 months after planting while fruit mature 4 - 5 months after planting.

**Use:** The young fruit are eaten as a vegetable. They are skinned and have the centre removed. They can also be sliced and dried for later use. They can be pickled or used in soups, stews and curries. The seeds yield an edible oil after extraction. The seeds are roasted with salt and eaten as a snack. The young leaves and flowers are edible. They are blanched by covering to make them white. **CAUTION** Older fruit are bitter and fibrous and contain poisonous substances.

**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	94.3	79	1.1	-	-	0.7	-

## *Nuts, seeds, herbs and other foods*

**English:** African whitewood

**Scientific name:** *Triplochiton scleroxylon*

**Local:**

**Plant family:** HELICTERACEAE

**Description:** A large tree growing to about 65 m tall. The trunk is 7 m around. It has large buttresses and grey, fairly smooth bark. It loses its leaves during the year. The leaves are 10 - 20 cm long with 5 - 7 lobes lobes arranged like fingers on a hand. The leaf stalk is 3.5 - 10 cm long. The saucer-shaped flowers are in short panicles. The hairy petals are white but reddish-purple at the base. The fruit are 6 cm long with 1 - 5 wings.



**Distribution:** It is a tropical plant that grows in lowland rainforests. It is common in drier disturbed forests.

**Cultivation:** Plants are usually grown from seed. Seeds germinate in 1 - 2 weeks. Many seed do not germinate. Seeds can be stored for several years. Plants can be grown from cuttings under mist. Air layering is possible.

**Production:**

**Use:** The leaves are cooked as a vegetable and are also used in sauces.

**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	74.7	668	29.2	-	-	9.2	-

## Nuts, seeds, herbs and other foods

**English:** Dark egusi

**Local:**

**Scientific name:** *Cucumeropsis mannii*

**Plant family:** CUCURBITACEAE

**Description:** A pumpkin family plant, like a cucumber, that lies along the ground. The vines can be 5 m or more long. The leaves are 9 - 18 cm long and 7 - 15 cm wide, alternate and simple. They are heart shaped at the base and have 3 - 5 lobes arranged like fingers on a hand. There are teeth around the edge. The flowers are yellow and are of separate sexes. The male flowers are in groups in the axils of leaves and female flowers occur singly. The fruit are about 25 cm long and 8 cm across. They are pale yellow and have many oval and flattened seeds. They are 1 - 2 cm long by 0.5 - 1 cm wide and are smooth and white.



**Distribution:** A tropical plant that grows in forests in tropical Africa. It grows up to 1,150 m altitude.

**Cultivation:** Plants are grown from seed. Often 3 - 4 seeds are planted in a hole. The seedlings appear within 6 - 8 days. It is often intercropped and allowed to climb stakes.

**Production:** Fruit are collected when the stems have dried and the fruit have changed from green to pale yellow or white. Seed yields can be 300 - 900 kg per hectare. After harvest, fruit are cracked or split open and allowed to rot for 14 - 20 days to help remove the seed from the pulp. (This creates a smell so is done away from houses.) The seeds are washed and covered with sand to prevent sticking. They are then dried and stored.

**Use:** The seeds are parched and pounded to remove the seed coat. The kernels are crushed and added to soups and stews. The seeds are roasted and eaten as a snack. The flesh of the fruit is edible but not commonly used.

**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	8.3	2278	26.2	-	-	-	-

## Nuts, seeds, herbs and other foods

**English:** Nettle tree

**Scientific name:** *Celtis integrifolia*

**Local:**

**Plant family:** ULMACEAE

**Description:** A large tree that grows to 25 m tall. The trunk is 1.5 m across and can have short buttresses. The branches occur low down. The bark is grey and smooth. The oval leaves are alternate and oblique, and taper to the tip. The twigs are green with white hairs. The flowers occur in clusters in the axils of leaves on one year old shoots. The fruit are oval, about 1 cm long, with one white seed.



**Distribution:** A tropical plant that grows in the Sahel in West Africa. It needs rainfall of 500 - 700 mm per year. It often grows in depressions and near waterholes. It can grow in arid places.

**Cultivation:**

**Production:**

**Use:** The leaves are used in soups. Sometimes they are used with boabab leaves. Young leaves can be eaten in salads. The fresh fruit are eaten.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf - dry	10.8	1058	8.0	-	-	19.7	-

## Nuts, seeds, herbs and other foods

**English:** Cashew

**Scientific name:** *Anacardium occidentale*

**Local:**

**Plant family:** ANACARDIACEAE

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



**Distribution:** It is a tropical plant that suits the lowland tropics but will grow up to about 1,200 m altitude. It only bears well in dry areas because of blight of the flowers. It grows with temperatures between 22 - 26°C. A rainfall of 1750 mm per year is considered suitable but good yields have been obtained with rainfall of 750 mm. It can grow on poor soils but needs good drainage.

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

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

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

**Food Value:** Per 100 g edible portion

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

## Nuts, seeds, herbs and other foods

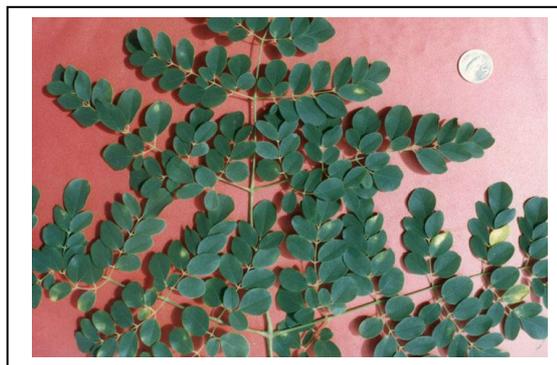
**English:** Drumstick Tree, Moringa

**Scientific name:** *Moringa oleifera*

**Local:**

**Plant family:** MORINGACEAE

**Description:** A small tree growing 9 - 12 m tall. The trunk is 60 cm across. The wood is soft and the bark is grey and thick. It is corky and peels off in patches. It has feather-like divided leaves. The tree loses its leaves during the year. The leaves are pale green and are divided 3 times. The whole leaf is 30 - 60 cm long and the leaflets are usually oval and 1 - 2 cm long. The flowers are pale yellow and contain both sexes. Each flower has 5 petals and of these, one is erect and 4 are bent backwards. The fruit is a long capsule 30 - 100 cm long by 2 cm wide. The seed capsules are up to 45 cm long. They are roughly triangular in shape. They split open when dry. 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 that suits the dry lowland areas and can grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable.

**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 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.

**Use:** The young tops and leaves are eaten cooked 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. Roots can be used as a horseradish substitute. A gum from the bark is used as seasoning. The oil expressed from the seeds is used in salads.

**Food Value:** Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf - boiled	87	189	4.7	883	31.0	2.0	0.2
pod - raw	88.2	155	2.1	7	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

## Nuts, seeds, herbs and other foods

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



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

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

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

**Food Value:** Per 100 g edible portion

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

## 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	<i>Amaranthus cruentus</i>	Purple amaranth	leaf	84	176	4.6	-	64	8.9	-	28
ANACARDIACEAE	<i>Anacardium occidentale</i>	Cashew	nut	4.0	2478	17.5	-	-	2.8	4.8	51
ANACARDIACEAE	<i>Mangifera indica</i>	Mango	fruit	83	253	0.5	54	30	0.5	0.04	38
ANACARDIACEAE	<i>Spondias mombin</i>	Mombin	fruit	82.7	193	1.3	70	28	2.8	-	41
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	15
BASELLACEAE	<i>Basella alba</i>	Indian spinach	leaf	85.0	202	5.0	56	100	4	-	34
BOMBACACEAE	<i>Adansonia digitata</i>	Boabab	fruit	16	1212	2.2	-	360	7.4	1.1	35
BRASSICACEAE	<i>Brassica juncea</i>	Indian mustard	leaf	92	108	2.4	31	73	2.7	-	30
CARICACEAE	<i>Carica papaya</i>	Pawpaw	fruit	88.0	163	0.5	290	54	0.4	0.18	42
CLEOMACEAE	<i>Cleome gynandra</i>	Cat's-whiskers	leaf	86.6	142	4.8	-	26	6	-	32
CLEOMACEAE	<i>Cleome viscosa</i>	Sticky Cleome	leaf	80.4	-	5.6	-	-	24	-	31
CONVOLVULACEAE	<i>Ipomoea batatas</i>	Sweet potato	tuber - baked	72.9	431	1.7	961	24.6	0.5	0.3	20
CUCURBITACEAE	<i>Cucumeropsis mannii</i>	Dark egusi	seed	8.3	2278	26.2	-	-	-	-	49
CUCURBITACEAE	<i>Cucumis melo</i>	Melon	fruit	93	109	0.5	169	30	0.4	0.2	36
CUCURBITACEAE	<i>Cucurbita moschata</i>	Pumpkin	fruit	95	35	0.7	-	14	0.4	-	46
CUCURBITACEAE	<i>Luffa cylindrica</i>	Smooth loofah	fruit	94.3	79	1.1	-	-	0.7	-	47
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	pod-boiled	94.0	79	0.8	11	33	0.4	0.8	45
CYPERACEAE	<i>Eleocharis dulcis</i>	Chinese water chestnut	corm	50.8	635	3.7	-	52	1.4	1.9	12
DIOSCOREACEAE	<i>Dioscorea bulbifera</i>	Potato yam	tuber	70.8	357	2.7	-	78	3.1	0.4	17
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	18
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed	10	1449	19.5	55	-	15	-	26
FABACEAE	<i>Canavalia ensiformis</i>	Jack bean	seed	10	1423	20.4	160	0	4.9	-	21
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	seed - dry	10	1428	22.8	-	-	9	-	22
FABACEAE	<i>Macrotyloma geocarpum</i>	Hausa groundnut	seed	9	1461	19.4	-	-	15	-	23
FABACEAE	<i>Psophocarpus palustris</i>	African Winged bean	seed	9.7	1760	27	-	-	-	0.12	25
FABACEAE	<i>Sphenostylis stenocarpa</i>	African yam bean	seed	9	1470	19.2	-	-	-	-	24
FABACEAE	<i>Tamarindus indica</i>	Tamarind	fruit	38.7	995	2.3	20	60	1.1	0.7	53
FABACEAE	<i>Vigna unguiculata</i> subsp. <i>unguiculata</i>	Cowpea	seed - dry	11.2	1189	23.5	-	1.5	6.4	-	27
HELICTERACEAE	<i>Triplochiton scleroxylon</i>	African whitewood	leaf	74.7	668	29.2	-	-	9.2	-	48
MALVACEAE	<i>Abelmoschus esculentus</i>	Okra	pod	88	151	2.1	185	47	1.2	-	43
MALVACEAE	<i>Corchorus olitorius</i>	Jute, Bush Okra	leaf - raw	80.4	244	4.5	574	80	7.2	-	29
MALVACEAE	<i>Hibiscus sabdariffa</i>	Roselle	leaf - dry	9.0	1185	6.9	-	4.2	6.4	2.8	33
MORINGACEAE	<i>Moringa oleifera</i>	Moringa	leaf - boiled	87	189	4.7	883	31	2	0.2	52
MUSACEAE	<i>Musa sp</i> (A &/or B genome) cv.	Banana	fruit - sweet	70.7	337	1.1	3	10	0.4	0.2	37

MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	31	184	1.4	0.2	40
PEDALIACEAE	<i>Ceratotheca sesamoides</i>	False benniseed	leaf	81	226	4.2	-	-	3.2	-	44
POACEAE	<i>Cenchrus biflorus</i>	Sandbur grass	seed	9.8	1547	17.8	-	-	-	-	11
POACEAE	<i>Oryza glaberrima</i>	Floating rice	seed	11.3	1538	7.4	-	-	3.4	-	13
POACEAE	<i>Pennisetum glaucum</i>	Bullrush millet	seed	13.5	1363	12.7	-	-	3.5	-	14
ULMACEAE	<i>Celtis integrifolia</i>	Nettle tree	leaf - dry	10.8	1058	8	-	-	19.7	-	50