

# Potentially Important Food Plants of Guinea-Bissau



FOOD PLANT SOLUTIONS  
ROTARY ACTION GROUP  
Solutions to Malnutrition and Food Security

A project of the Rotary Club of  
Devonport North and District 9830

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



# Potentially Important Food Plants of Guinea Bissau

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

Potentially Important Food Plants of Guinea Bissau has been produced to provide information on approximately 40 edible plants that are known to grow in Guinea Bissau. These plants come from all the major food groups and have been chosen because of their high nutritional value. Many of the plants in this book may be neglected and under-utilised plants. This means they may not be well known. However, because they are high in many beneficial nutrients, and they are already adapted to the environment, and therefore likely to require minimal inputs, they could be important food plants that are likely to be superior to imported foods and plants. Commercially grown plants may also be included in the book, but only if they are significant foods for household consumption. It is hoped people will become confident and informed about how to grow and use these plants as many local food plants provide very good quality food.

## **Growing food**

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

## **A country with very special plants**

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

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

## **Getting to know plants**

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

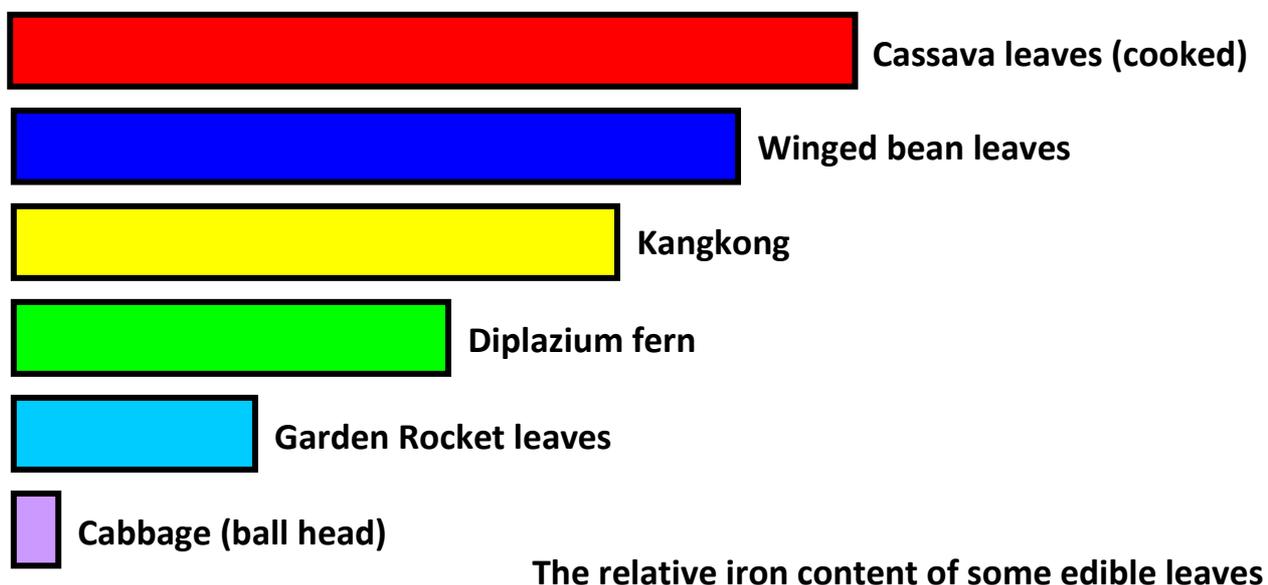
## **Naming of plants**

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

### Local food plants are often very good

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

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



### A healthy balanced diet

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

### Learning to cook well

Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Many plants in the tropics develop cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two

minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) only become available when food is cooked in oil.

### **Learning to grow “wild” food plants**

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

### **Saving better types of plants**

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

### **Growing from cuttings and suckers**

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

### **Saving seed**

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

### **Growing a garden of mixed plants**

In nature, one variety of one plant never grows alone. There are always lots of different plants of different kinds and sizes, all growing together. Anyone who has ever walked into a tropical jungle will know this very well. The reason people all over the world want to save the rainforest is because it has so many different kinds of plants all growing together. Growing plants in a food garden in a

way similar to how they grow in nature, as a mixed group of plants, is very good agriculture. Mixing plants in a garden usually gives more reliable food production, as any disease from one plant will wash off in the rain onto a different plant, where it cannot survive. Small plants fill the gaps and reduce the need for weeding.

### **Different types of plants for food security**

There is another reason for growing a range of food plants in a local garden or around a village. If something goes wrong, like extreme insect damage to plants, some disease occurring in the garden, or a poor growing season, some plants will be more damaged than others. With a variety of plants, there will still be some food to eat until the other plants recover and grow again. Also, a wide variety of plants will mean that different ones will be maturing at different times, which helps ensure a continuous supply of food. There are shrubs that can be planted as edible hedges around houses, and fruit and nut trees that need to be planted as a gift for your children, several years before they will be able to enjoy them. Some nuts can be stored and eaten when other foods are not available. Most yams will store well for a few months.

### **Looking after the soil**

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

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

### **Building up the soil**

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

### **Poor soils where crops won't grow**

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

## **Soil nutrients**

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

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

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

## **Making compost**

Compost is old plant material that has been allowed to rot down into a fine, sweet smelling mulch that is full of nutrients that can be put back on the soil to grow new plants. Making good compost is very simple. A simple heap of plant material can be made in the corner of a garden or near a house. The composting process is carried out by small bacteria that live in the soil and feed on decaying plants. They break down old plant material into compost. These bacteria are living, so they need air, water and food. A good compost heap must have air, so don't cover it with plastic or put it in a container. This makes a foul smelling compost, as different bacteria that don't need air turn it into an acid mixture that preserves it. Good compost must have moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off. As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil.

## **Pests**

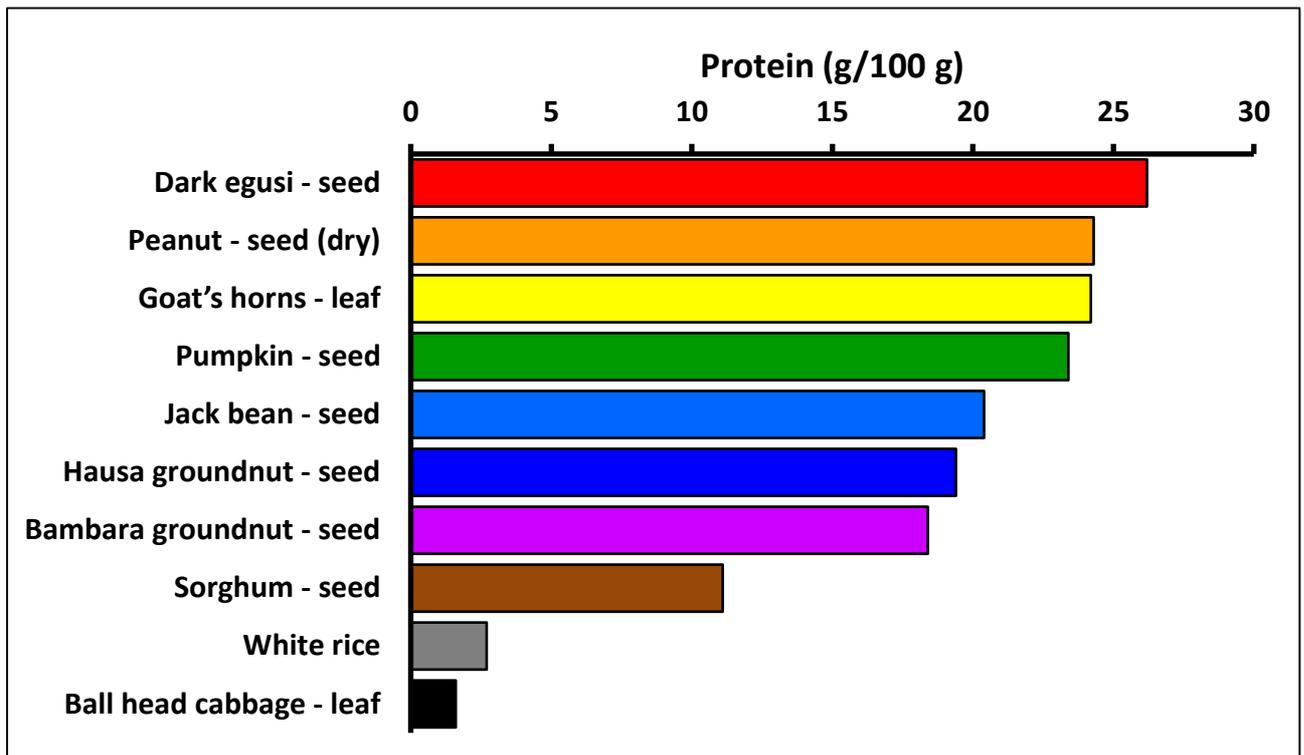
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move "like an army" into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a

serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth that damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage.

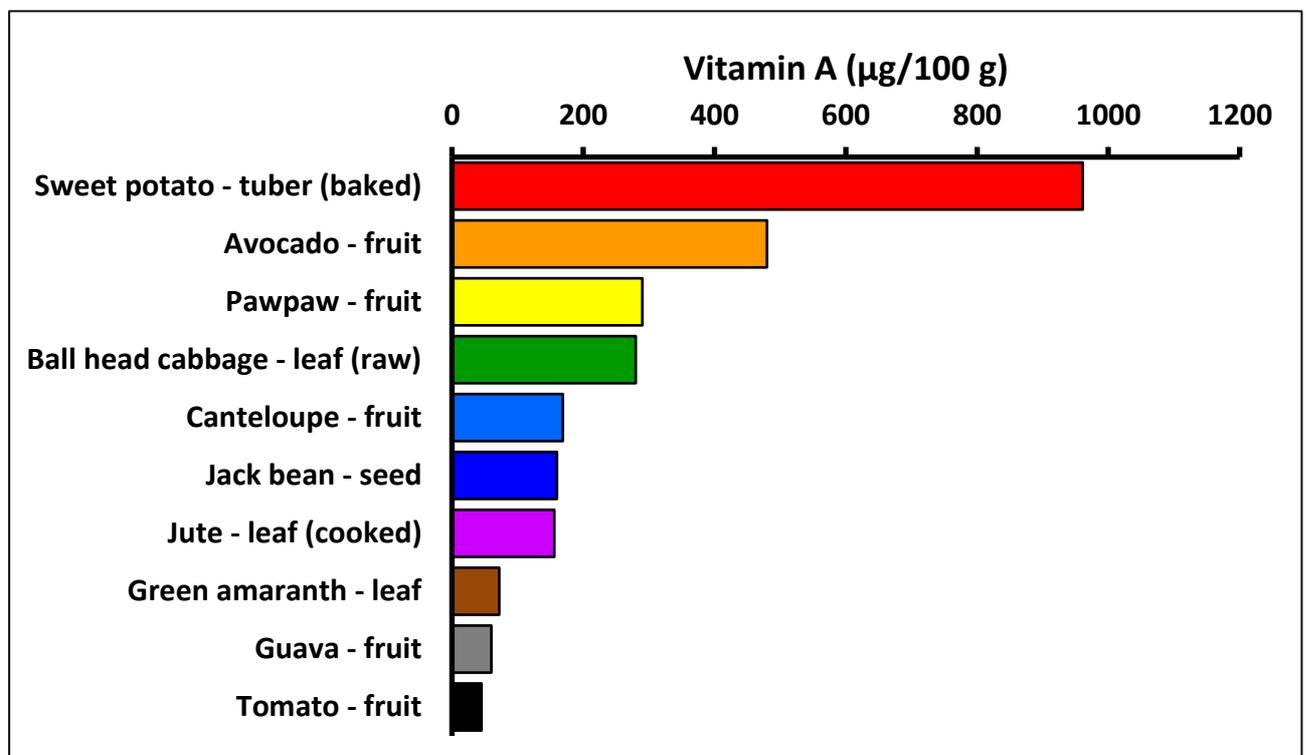
### **Diseases**

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

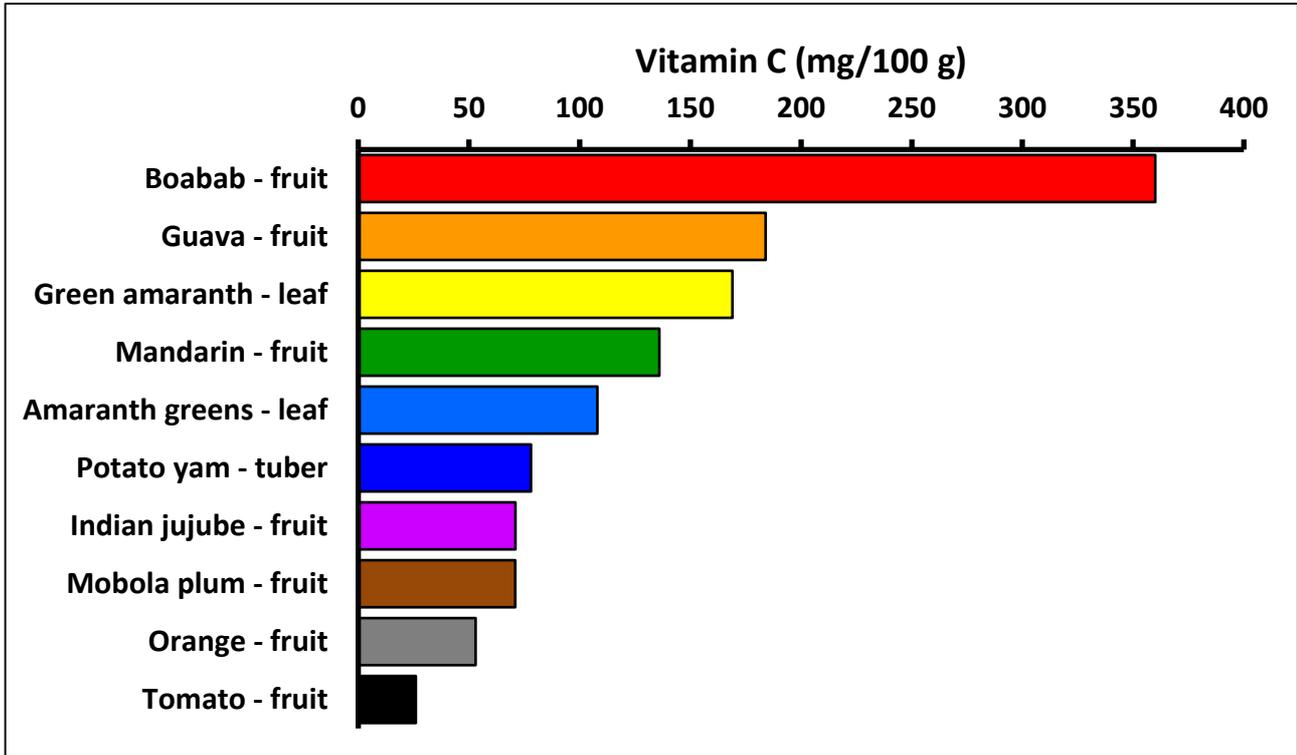
## Food value charts for a selection of plants from Guinea-Bissau



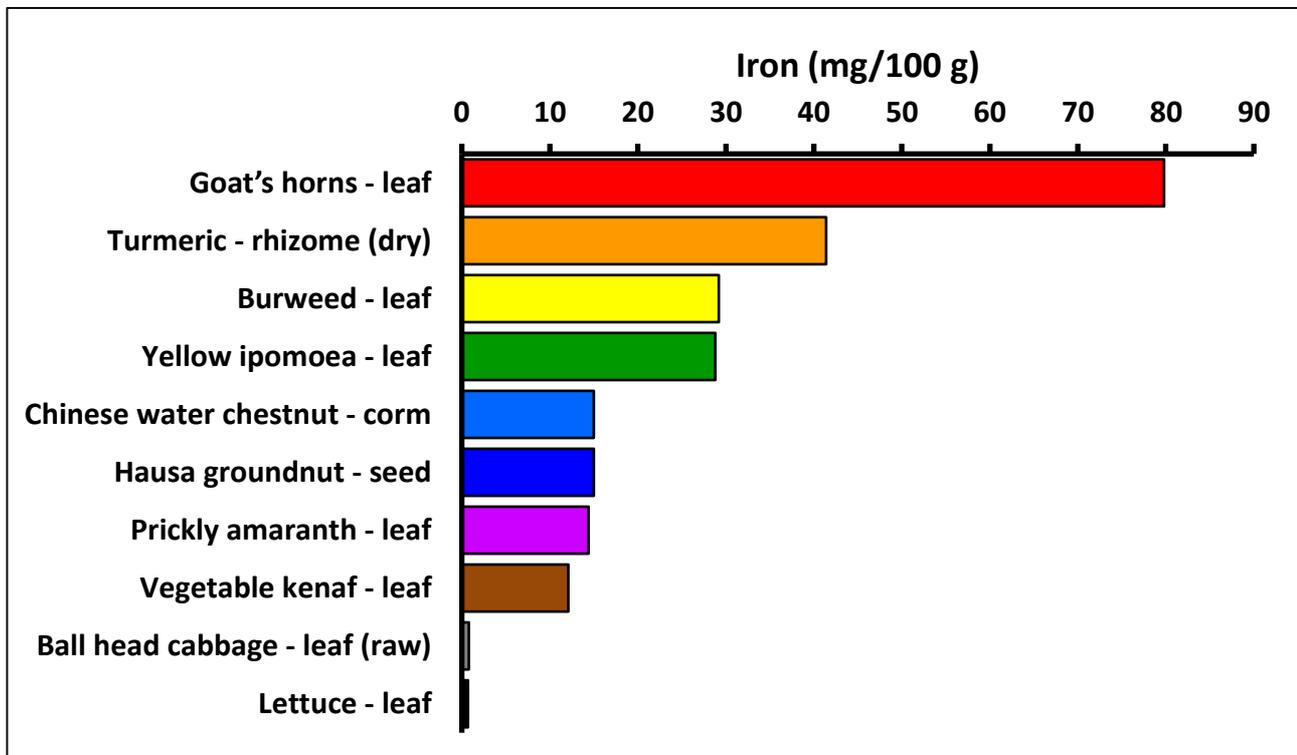
Protein helps the body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women. Symptoms of protein deficiency include wasting and shrinkage of muscle tissue, and slow growth (in children).



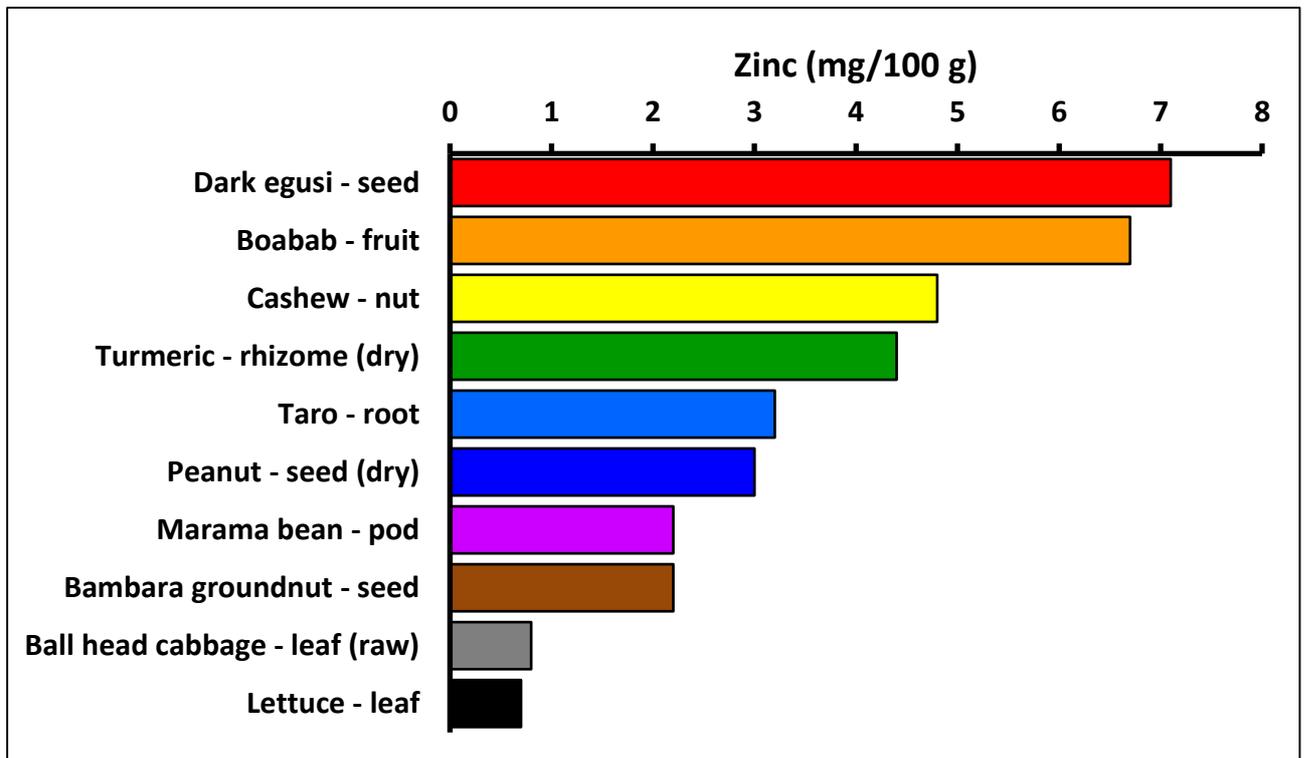
Vitamin A is very important for eyesight and fighting disease, particularly in infants, young children and pregnant women. People who are short of Vitamin A have trouble seeing at night.



Vitamin C helps us avoid sickness, heal wounds, prevent infections and absorb iron from food. Severe vitamin C deficiency increases the risk of scurvy with symptoms such as inflammation of the gums, scaly skin, nosebleed and painful joints.



Iron is important because it helps red blood cells carry oxygen from the lungs to the rest of the body. Low levels of iron cause anaemia, which makes us feel fatigued. Iron is also important to maintain healthy cells, skin, hair and nails. Iron is more available when Vitamin C is also present.



Zinc is particularly important for the health of young children and teenagers, and to help recovery from illness. It is needed for the body's immune system to work properly. It plays a role in cell division, cell growth, wound healing, and the breakdown of carbohydrates. Zinc is also needed for the senses of smell and taste. Zinc deficiency is characterized by stunted growth, loss of appetite, and impaired immune function.

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



## Starchy staples

**English:** Pumpkin

**Local:**

**Scientific name:** *Cucurbita moschata*

**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.

**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.

**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.

**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	-

## Starchy staples

**English:** Sorghum

**Local:**

**Scientific name:** *Sorghum bicolor*

**Plant family:** POACEAE

**Description:** Sorghum is a millet grass. A mature sorghum plant resembles maize in its stature. Plants vary in height from 45 cm to 4 m. It is an annual grass with erect solid stems. The stems can be 3 cm across at the base. Prop roots occur at the base of the plant. There are numerous sorghum varieties. Some have one main stem while others produce multiple tillers. More tillers are produced when plants are widely spaced. The nodes on the stem are slightly thickened. Short types have up to 7 leaves while tall late varieties may have up to 24 leaves. The leaf blade can be 30-135 cm long. Leaves are bluish green and waxy. They have a prominent midrib. The large flower panicle can be 20-40 cm long. The flower occurs at the top of the plant. It can stick upright or bend over. The flower can be open or compact. Over 1000 cultivated varieties occur in China.



**Distribution:** Sorghum is a tropical plant. It suits the savannah zones in the tropics and can tolerate heat and drought. It can recover from drought even as a seedling. It can tolerate water-logging. It can be grown on heavy or light soils. Sorghum requires short day lengths to flower. Many kinds are adapted to specific day length and rainfall patterns. It suits hardiness zones 9-12.

**Use:** Sorghum seeds are eaten as a cereal. Flour can be made from the grain and then used for porridge or other dishes. It is used for dumplings, fried cakes and drinks. It cannot be used for bread as it contains no gluten. The stems of some kinds are sweet and can be chewed. The grains can be popped and eaten. The sprouted seeds can also be eaten.

**Cultivation:** Sorghum seeds will germinate soon after harvest. The seeds also store well if kept dry and protected from insects.

**Production:** Grain is ready for harvest 4-8 weeks after flowering.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	-	1459	11.1	-	-	-	-

## Starchy staples

**English:** Yellow nutsedge

**Local:**

**Scientific name:** *Cyperus esculentus*

**Plant family:** CYPERACEAE

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



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

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
rhizome	36.5	1262	3.5	-	-	8.0	-
bulb	77.4	342	0.9	-	21	4.2	0.6

## 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. Near the ground a thickened rounded corm is produced. Around this plant there is normally a ring of small plants called suckers. Many different varieties occur. If left to maturity, a lily type flower is produced in the centre of the plant. It has a spathe 15-30 cm long which is rolled inwards. The flowers are yellow and fused along the stalk. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and *Colocasia esculenta* var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.



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

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

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

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

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

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

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

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

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

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	66.8	1231	1.96	3	5	0.68	3.2
leaf	85.0	210	5.0	57	90	0.62	0.7
leaf stalk	93.0	101	0.5	180	13	0.9	-
leaf (cooked)	92.2	100	2.7	424	35.5	1.2	0.2

## 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 1200 m altitude and suits plant hardiness zones 9-12.

**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.

**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.

**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

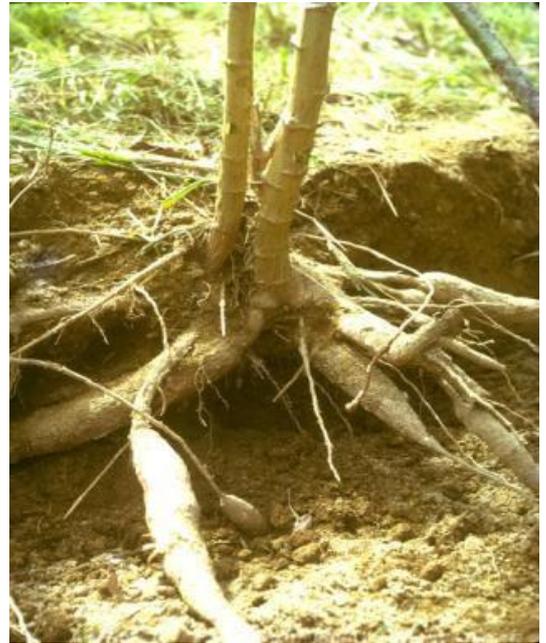
**English:** Cassava

**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 tall. Stalks have distinct scars where leaves have fallen. The leaves tend to be near the ends of branches. The leaves are divided like the fingers on a hand. The leaves have long leaf stalks. The leaves have 3-7 long lobes which can be 20 cm long. These are widest about 1/3 of the distance from the tip and taper towards the base. The colour varies. It produces several long tubers. These can be 50 cm long by 10 cm across. The flowers are on short stalks around a central stalk. They are produced near the ends of branches. The female flowers are near the base of the flower stalk and the male flowers higher up.



**Distribution:** A tropical plant. Plants grow from sea level up to about 1650 m. In Fiji they grow to 900 m. They can grow in poor soil and can survive drought. It is native to tropical America. It grows between 25°N and 25°S and needs a rainfall above 750 mm. It suits hardiness zones 10-12.

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

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

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

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

Because cassava can still grow satisfactorily in poorer soils it is often put last in a rotation after others crops have already been grown on the piece of land. Cassava is more responsive to nitrogen

and potassium than phosphorus under many field situations. Nitrogen can increase cyanide levels. Under very acid conditions with high soluble aluminium levels, cassava has been able to achieve and maintain top growth but with significantly reduce root yields. When drainage is good and soil moisture is adequate, cassava stalks can be planted at any orientation from horizontal to vertical, but in very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

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

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

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

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

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

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

## Starchy staples

**English:** Sweet potato

**Local:**

**Scientific name:** *Ipomoea batatas*

**Plant family:** CONVULVACEAE

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



**Distribution:** A tropical and subtropical plant. They grow from sea level up to about 2700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21-26°C. It can grow with a pH between 5.2-6.8. Sweet potato are not tolerant to shading. It suits hardiness zones 9-12.

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

**Cultivation:** Vine cuttings are used for planting. In grassland soils it is grown in mounds, ridges or other raised beds. In bush fallow, it is mostly planted in undug loose soils. It needs a sunny position. Tubers won't form if the ground is waterlogged when tubers start to develop. Sweet potato is grown by cuttings of the vine. About 33000 cuttings are required per hectare. These weigh about 500 kg. Vine lengths of about 30 cm are optimum. As long as the vine is adequately inserted in the soil, the length of vine inserted does not significantly affect yield. Fresh sweet potato seeds germinate relatively easily and lead to continuous production of new cultivars under tropical conditions. Excess nitrogen restricts storage root initiation and therefore excess leaves are produced without significant tuber yield. Dry matter percentage increases with increasing age of the crop. Higher dry matter tubers are normally preferred.

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

Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6-16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar, but once ground coverage has occurred, weed control is less of a problem. Sweet potato tuber initiation is subject to

aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason, sweet potatoes are often grown on mounded beds. In well drained or high organic matter soils, digging or mounding is not as essential. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage, plants need to be hilled or have the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

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

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

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

## Legumes

**Common name:** Marama bean

**Local:**

**Scientific name:** *Tylosema fassoglensis*

**Plant family:** FABACEAE

**Description:** A trailing or climbing plant. It is evergreen and shrubby. It can be 6 m long. It has a large tuberous root. This can be to a depth of 2.5 m. Young plant parts have rusty coloured hairs. The leaves are simple and almost round but with two lobes or divided at the tip. Leaves are 5-20 cm long by 6-23 cm wide. There are rusty hairs on the veins underneath the leaf. The flower clusters are 2-42 cm long on stalks 2-17 cm long. The flowers have 5 petals. Four of these are yellow and one is reduced to a green stub.



The petals are yellow. The outer layer or sepals have wings. Fruit are 7-12 cm long and 4-7 cm wide. The seeds are not quite round and are 1.7-2.8 cm long.

**Distribution:** It is a tropical plant. It does well in seasonally wet and dry climates. It needs well-drained soil. In Malawi it grows at 900-1200 m altitude, while in Tanzania it grows up to 1500 m above sea level and in areas with a rainfall between 1000-1600 mm. It needs full sun. It can grow in arid places. It suits hardiness zones 9-12.

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

**Cultivation:** Plants can be grown from seeds.

**Production:** Plants grow rapidly. Tubers up to 78 kg have been recorded. Seeds are collected at the end of the rainy season.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	7.5	452	43.5	-	-	-	-
pod	72.5	446	6.4	-	39	0.5	2.2
tuber	79.4	237	1.6	-	6.5	0.3	0.5

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## Legumes

**English:** Pigeon pea

**Local:**

**Scientific name:** *Cajanus cajan*

**Plant family:** FABACEAE

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



**Distribution:** A tropical plant that requires a tropical or subtropical climate. Plants grow from sea level up to about 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. They suffer in waterlogged soils and are damaged by frost. It can also tolerate heat. It will grow on poor soils cannot grow on salty soils. It can grow in arid places and suits hardiness zones 10-12.

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

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

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

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

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

## Legumes

**English:** Lablab bean

**Local:**

**Scientific name:** *Lablab purpureus*

**Plant family:** FABACEAE

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



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

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1428	22.8	-	-	9.0	-
seed (young)	86.9	209	3.0	14	5.1	0.8	0.4
pod (fresh)	86.7	203	3.9	-	1.0	2.4	-

## Legumes

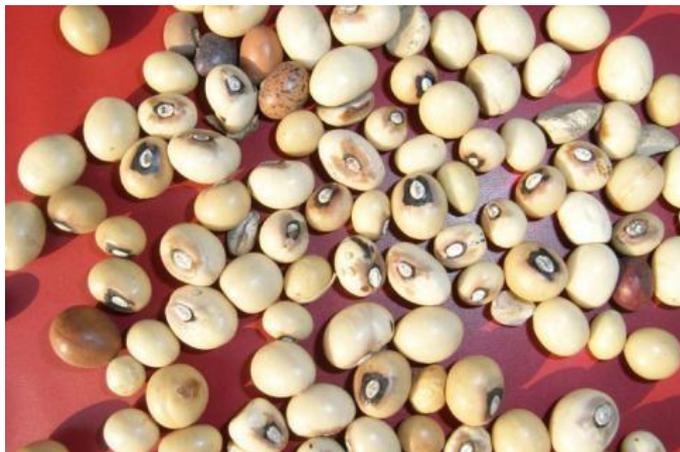
**English:** Bambara groundnut

**Local:**

**Scientific name:** *Vigna subterranea*

**Plant family:** FABACEAE

**Description:** An annual plant that can be either a bunchy bush or a trailing plant. Often the creeping stems are near ground level. It often appears as if bunched leaves arise from branched stems near ground level. It has a well-developed taproot. The leaves have 3 leaflets. The leaf stalk is erect and thickened near the base. The end leaflet is slightly larger than the side leaflets. Leaflets are about 6 cm long by 3 cm across. The flowers are yellowish-white and occur in pairs. The flower/fruit stalk elongates after being fertilised and pushes into the soil. The fruit



are pods which are round and have one seed. Some kinds have 3 seeds. This pod develops under the ground on a long stalk. The seeds are hard and are of many colours. Pods can be 3.7 cm long.

**Distribution:** It is a tropical plant that can grow in hot climates. It can also grow on poor soils. It does best with moderate rainfall and sunshine. It can tolerate drought. Long day-lengths can reduce or prevent pod development in some kinds.

**Use:** Seeds can be eaten fresh or roasted while immature. Mature seeds are hard so must be boiled before being used in cooking. Seeds can be dried and made into flour and used for baking. They can be popped like corn. The seeds are roasted as a coffee substitute. Young pods are cooked and used as a vegetable or in stews. The leaves can be eaten.

**Cultivation:** Plants are grown from seed. Plants are often put in rows 50 cm apart and with 15 cm spacing between plants. Ridges are formed to enable the pods to penetrate the soil. It is mostly grown intercropped with other plants. Soil should be light and friable and the seed bed loose and fine. Normally the whole plant is pulled up for harvesting. Any pods which become detached are harvested by hand. Pods are dried in the air before threshing.

**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	7.3	1572	18.4	-	-	4.6	2.2
seed (boiled)	66.4	578	7.7	-	-	1.4	1.1

## Legumes

**English:** Hausa groundnut

**Local:**

**Scientific name:** *Macrotyloma geocarpum*

**Plant family:** FABACEAE

**Description:** An 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.

**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.

**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.

**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	-

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## Legumes

**English:** Jack bean

**Local:**

**Scientific name:** *Canavalia ensiformis*

**Plant family:** FABACEAE

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

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



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

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

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

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

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

## Legumes

**English:** Lima bean

**Local:**

**Scientific name:** *Phaseolus lunatus*

**Plant family:** FABACEAE

**Description:** A perennial climbing bean. It is often a tall, vigorously climbing plant which can keep growing for some years. The leaves are slightly rounded at the base and pointed at the tip. The flower is white or yellow. The keel of the flower is twisted which helps tell the difference between this bean and Lablab bean. The pods are long (10 cm), flattened and curved and have 3-4 seeds which are highly variable in colour. The seeds are large. The seeds have a short round hilum where the seed is attached to the pod. The seeds also have lines going out from this point across the bean seed.



**Distribution:** It suits warm and subtropical areas. In the tropics it is common from 500-2100 m altitude but grows to the limit of cultivation (2700 m). For germination it must have a soil temperature above 15.5°C and cannot withstand frost. In very hot weather seeds often do not set. It does best in a temperature range 14-21°C. It is sensitive to a pH less than 6. It can grow in arid places.

**Use:** The leaves, young pods and seeds are all eaten. The seeds are eaten fresh or after drying. They are also fried in oil. Dried beans are boiled or baked. They can be used in soups and stews. The seeds are sometimes grown as bean sprouts then cooked and eaten. **Caution:** Some kinds have poison (hydrocyanic acid). This is destroyed by thorough cooking. The beans contain a protein inhibitor but this is also destroyed by cooking.

**Cultivation:** It is grown from seed. Coloured seeds are often hard to get to grow but white seeded kinds start growing easily. Sow 3-4 seeds in a hill and put a stick 2-3 m tall in the middle. Hills should be about 1 m apart. Seeds should be 2-4 cm deep.

**Production:** Harvesting can begin after about 100 days. Dried beans can be stored for several months. Yields of 0.12 kg of seed per square metre have been obtained. The yield of pods can be 1 kg per square metre.

**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	12.0	1407	19.8	-	-	5.6	-
seed (young, cooked)	67.2	515	6.8	37	10.1	2.5	0.8
seed (young, raw)	70.2	473	6.8	30	23.4	3.1	0.8

## Legumes

**English:** Cowpea

**Local:**

**Scientific name:** *Vigna unguiculata*

**Plant family:** FABACEAE

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



**Distribution:** It grows in tropical and subtropical climates. It grows from sea level to 1800 metres altitude in the tropics. Plants can stand high temperatures. Some kinds can tolerate drought. They are sensitive to cold and killed by frost. Plants germinate with a temperature between 11.5-15.5°C. The best growth occurs between 20-35°C. They can grow on a range of soils providing they are well drained. They are a short day plant. They do well in the semiarid tropics. It will not tolerate acid or alkaline soils. It grows in areas with an annual rainfall between 280-410 mm. It can grow in arid places.

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

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

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

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

## Leafy greens

**English:** Goat's horns

**Local:**

**Scientific name:** *Sida cordifolia*

**Plant family:** MALVACEAE

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



**Distribution:** A tropical plant that grows in open waste places in the tropics and sub-tropics. It is common and widely distributed in the Philippines. It grows in hot arid places with a marked dry season. It grows in places with an annual rainfall below 520 mm. It grows in dry sandy soils and can grow in salty soils. It grows below 1100 m altitude. It can tolerate shade and can grow in arid places.

**Use:** The leaves are edible when cooked.

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

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

Image accessed from

[http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida\\_cordifolia \(Bala\) in Hyderabad, AP W IMG 9420.jpg](http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_(Bala)_in_Hyderabad,_AP_W_IMG_9420.jpg)

## Leafy greens

**English:** Yellow ipomoea

**Local:**

**Scientific name:** *Ipomoea obscura*

**Plant family:** CONVOLVULACEAE

**Description:** A slender trailing herb that lies along the ground. It can be a climber or twining. It has a taproot and can keep growing from year to year. The leaf stalks are 1.5 cm long. The leaf blades vary but are long and tapering to the tip with a broadly heart shape base. They are 4 cm long. The flowers occur singly or as a few together in the axils of leaves. The flowers are funnel shaped and 4 cm long and 3 cm across. They are pale yellow or white.



**Distribution:** It is a tropical plant. It grows up to 1800 m above sea level. It grows in woodland, grassland, savannah and coastal sands. It can grow in arid places.

**Use:** The leaves are cooked and eaten as a relish. The leaves are added to soup.

**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	56.6	569	8.8	-	-	28.8	1.1

Image sourced from: [https://en.wikipedia.org/wiki/Ipomoea\\_obscura](https://en.wikipedia.org/wiki/Ipomoea_obscura)

## Leafy greens

**Common name:** Prickly amaranth

**Local:**

**Scientific name:** *Amaranthus spinosus*

**Plant family:** AMARANTHACEAE

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



**Distribution:** A tropical plant that grows world wide from the tropics to the warm temperate zone. It can grow in sun or light shade. In Tanzania it grows from sea level to 1800 m altitude, in areas with 800-1300 mm annual rainfall. It grows well in moist, damp soil and can also grow in arid places.

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

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

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

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

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

## Leafy greens

**English:** Vegetable kenaf

**Local:**

**Scientific name:** *Hibiscus cannabinus*

**Plant family:** MALVACEAE

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



**Distribution:** A tropical plant. It is cultivated in South China. It can grow in well-drained sandy soils and in dry but seasonally waterlogged places. It grows from 1500-2100 m above sea level. It grows in areas with an annual rainfall of 500-635 mm. It can grow in arid places and suits hardiness zones 10-12. It grows in many African and Asian countries.

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

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

**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)	8.1	1785	20.2	-	-	-	-
leaf	79.0	280	5.5	34	-	12.1	-

## Leafy greens

**Common name:** Coffee senna

**Local:**

**Scientific name:** *Senna occidentalis*

**Plant family:** FABACEAE

**Description:** An annual herb or small shrub. It can continue growing for a few years. It grows 1-2.5 m high. The stems have few hairs. The leaf stalk has a gland at the base but there is no gland along the leaf axis. The leaves are compound. There are 4-6 pairs of leaflets. The leaf stalk is 2-3 cm long. The leaflets are oval and 4-12 cm long by 1.5-4 cm wide. They taper to the top and are rounded at the base. The flower stalks are very short. The flower cluster is in the axils of leaves. The petals are yellow and 0.9-1.5 cm long. The fruit is a narrow, slightly curved pod. It is 5-10 cm long by 0.5-1 cm wide. It has pale edges. They are flattened. They usually dry with a brown area along the pod. The seeds are compressed. There are 28-32 seeds inside. They are green or brown and 5 mm long. There are small pits on each side.



**Distribution:** A tropical plant. It grows in monsoon forest as well as arid areas. In Africa it grows up to 2400 m altitude. It can grow in acid, neutral or alkaline soils. It can grow in arid places. Temperatures which average 12.5-28°C are suitable. It grows in areas with rainfalls between 500 and 4000 mm per year. A rainfall of 500 to 1000 mm is enough.

**Use:** The seeds are roasted and used for coffee. (They contain no caffeine). **Caution:** The seeds are poisonous unless roasted. Young leaves and young seeds are eaten cooked. The leaves are added to soups. The unripe pods are cooked and eaten with rice. The ashes of the pods are used as food salt.

**Cultivation:**

**Production:**

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (dry)	10.0	-	31.7	-	-	3.1	-
leaf	84.9	205	5	-	17.9	12.7	-

Image accessed from: <https://tse1.mm.bing.net/th?id=OIP.wjO-VnTA1RQnqZQ4llp9wHaFe&pid=Api>

## Leafy greens

**English:** Burweed

**Local:**

**Scientific name:** *Triumfetta rhomboidea*

**Plant family:** MALVACEAE

**Description:** A herb or small shrub that keeps growing from year to year. Plants can be 1.5 m tall. The bark is tough and fibrous. The younger stems and leaves and flowers are densely covered with hairs. The leaves are alternate and the edges of the leaves have teeth. The lower leaves have 3 lobes. The flowers occur in small clusters opposite the axils of leaves. The stalks carrying the flowers are 20-40 cm long. There are 5 yellow petals. The fruit are brown and hairy and covered with hooked spines. They are round and about 5 mm across. They contain 2-4 seeds. The fruit cling to clothing.



**Distribution:** A tropical plant. It grows naturally in grassland and re-growth situations. It is more common in tropical places with seasonal rainfall. It grows in savannah woodland and in palm groves. It grows up to 1280 m above sea level. It can grow in arid places.

**Use:** It is eaten as a pot-herb in times of scarcity. The roots are eaten 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	78.4	284	4.2	-	-	29.2	-

Image accessed from:

[http://www.phytoimages.siu.edu/users/paraman1/2\\_15\\_10/Upload15Feb10/077TriumfettaRhomboidea.jpg](http://www.phytoimages.siu.edu/users/paraman1/2_15_10/Upload15Feb10/077TriumfettaRhomboidea.jpg)

## Leafy greens

**English:** Quail grass

**Local:**

**Scientific name:** *Celosia argentea*

**Plant family:** AMARANTHACEAE

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



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

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

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

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

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

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

## Leafy greens

**Common name:** Green amaranth

**Local:**

**Scientific name:** *Amaranthus viridis*

**Plant family:** AMARANTHACEAE

**Description:** An erect smooth branched herb without thorns that grows 30-60 cm tall. It grows from seeds each year. The stems are slender. The leaves are broad near the base and narrow near the top. Usually the leaves have notches. Leaves are 1-3 cm long with exceptionally long petioles. The flowers occur in the angles of the leaves and the seeds are small and brown or black. The spikes are not bristly.



**Distribution:** It is a tropical plant but also grows in temperate places. It is common in open waste places and can grow in arid places.

**Use:** The young leaves and seeds are cooked and eaten. The harvested leaves can only be stored for 2-3 days.

**Cultivation:** It can be grown from seed or cuttings. Seeds grow easily.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A $\mu$ g	proVit C mg	Iron mg	Zinc mg
leaf	87.3	-	4.5	72	169	6.0	-

Image sourced from: [https://c2.staticflickr.com/8/7032/6410387909\\_045351f52d\\_b.jpg](https://c2.staticflickr.com/8/7032/6410387909_045351f52d_b.jpg)

## Fruit

**English:** Boabab

**Local:**

**Scientific name:** *Adansonia digitata*

**Plant family:** BOMBACACEAE

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



**Distribution:** It is a tropical plant that grows in the lowlands. It grows in the hot dry regions of tropical Africa, such as the Sahel. It survives well in dry climates. It grows where rainfall is 100-1000 mm a year. It can tolerate fire. It grows where the annual temperatures are 20-30°C. In most places it grows below 900 m altitude but occasionally grows to 1,500 m altitude. It requires good drainage. It can grow in arid places and suits hardiness zones 11-12.

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

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

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

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

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

## Fruit

**English:** Guava

**Local:**

**Scientific name:** *Psidium guajava*

**Plant family:** MYRTACEAE

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



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

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

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

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

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

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

## Fruit

**English:** Indian jujube

**Local:**

**Scientific name:** *Ziziphus mauritiana*

**Plant family:** RHAMNACEAE

**Description:** A medium sized thorny tree that loses many of its leaves during the year. It grows up to 12 m tall. The bark is grey, brown or pale red. Branches and the under surface of the leaves are densely hairy when young. The thorns arise from the base of the leaves. The leaves are alternate and simple. They are finely toothed. They can be oval or round and 8 cm long by 5 cm wide. The flowers are green and have a scent. They occur as 3-5 flowers together. The flowers are 1-2 cm long and on slender branches. The sweet fruit are small,



oval and yellow or brown. They are 2-5 cm long and 2.5 cm wide. The fruit are green when young and turn yellow or brown when ripe. The pulp is fleshy, acid and edible. The fruit have one seed imbedded in the flesh in a hard stone. The fruit wrinkle on drying. Many varieties exist.

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

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

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

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

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

<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	77.0	360	0.8	21	71	0.4	0.4
fruit (dry)	17.4	1201	4.3	-	-	-	-

## Fruit

**English:** Mandarin

**Local:**

**Scientific name:** *Citrus reticulata*

**Plant family:** RUTACEAE

**Description:** A small, evergreen tree that grows 4-8 m tall and 2 m across. The stem is erect, branching and thorny. The leaves are dark green, and long and narrow in shape. They are 3-4 cm long. There is only a narrow wing on the leaf stalk. It has a few or no spines. The flowers are white and star-shaped. They are 2.5-4 cm across and have a scent. Fruit are almost round and the skin peels off easily. The fruit are 4-8 cm long. The flesh is red, juicy and sweet.



**Distribution:** It is grown in many tropical countries. It is the hardiest of the citrus. It grows from sea level up to 2,300 m altitude in the tropics. It does best between 800 m and 1200 m altitude. A well-drained soil is needed. It also prefers a drier climate. It is drought and frost resistant. It needs a temperature above 3-5°C. It suits hardiness zones 9-11.

**Use:** The fruit are eaten fresh.

**Cultivation:** Trees are often grown from seed. Some breed true from seed. Seedling trees take a long time to start producing fruit. Budded trees are best. A spacing of about 8 m between trees is suitable. Several seedlings can grow from one seed. Using seedlings of seeds with three or more shoots helps produce trees true to type. Cuttings or layering can also be used.

**Production:** Fruit tend to be produced seasonally. The season is often from April to August in the southern hemisphere.

**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	87.6	184	1.5	42	136	0.8	-

## Fruit

**English:** Pawpaw

**Local:**

**Scientific name:** *Carica papaya*

**Plant family:** CARICACEAE

**Description:** Pawpaw is a tropical fruit that grows 3-5 m tall and only occasionally has branches. The stem is softly woody with 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.

**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.

**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.

**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>
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	-

## Fruit

**English:** Avocado

**Local:**

**Scientific name:** *Persea americana*

**Plant family:** LAURACEAE

**Description:** A small to medium sized tree that normally grows 8-10 m tall, but can reach 25 m. The leaf stalk is 1.5-5 cm long. Leaves are entire, oval and 5-40 cm long. Flowers are greenish, small and on the ends of branches. Clusters of flowers may contain 200-300 flowers. Normally only 1-3 fruit develop from each cluster. The fruit is round or pear shaped, and 7-20 cm long. The fruit are greenish-yellow with some red coloration. The fruit has greenish-yellow flesh and a large round seed. There are 3 named races-West Indian, Guatemalan and Mexican.



**Distribution:** A subtropical plant that grows from sea level up to 2250 m in the tropics. It cannot stand water-logging. Branches are easily damaged by wind. It needs a frost free location or where frosts are rare. West Indian varieties thrive in humid, tropical climates, freeze at or near 0°C and can stand some salinity. Mexican types come from dry subtropical plateaus and thrive in a Mediterranean climate. They are hardy to -7° C. They are salt sensitive, have the smallest fruits and the thinnest skin. The best daytime temperature is 25-33°C. Guatemalan types come from cool, high-altitude tropics and are hardy to -3° C. It does best with neutral or slightly acid and well aerated soil. Growth is disrupted when soil temperature is below 13°C. It needs high humidity at flowering and fruit set. It can grow in arid places.

**Use:** The fruit pulp is eaten raw or cooked. It is used in salads, soups, sandwiches, spreads, ice cream, and also in tortillas and wine. The fruit is mixed with sugar and water to make a drink. Oil is extracted from the flesh and is used in salad dressing. The leaves can be used for tea sweetened with sugarcane juice. Toasted leaves are used to season stews and bean dishes. **Caution:** Some people are allergic to avocado.

**Cultivation:** Plants are often grown from seed. Seeds remain viable for 2-3 weeks. Fresh seed held at 25°C day to 15°C night will germinate in 3 weeks. It is best to propagate vegetatively. Tip cuttings, layers and grafts can be used. Because different types have pollen at different times of day, a mixture of trees which have pollen and flowers receptive at different times gives best fruit set. Although trees will grow in shade, they need sun for fruiting. The leaves do not rot easily and can accumulate under trees. Other plants cannot be grown under avocado trees.

**Production:** Seedlings grow quickly and continuously in warm, moist conditions. Seedlings bear after 5-8 years. Grafted trees can fruit in 1-2 years. A good tree produces 400-600 fruit each year. A fruit can weigh 50 g-1 kg. In the subtropics, trees often produce 2 main flushes of fruit per year. From fruit set to maturity can take 6-12 months. Fruit ripen off the tree in 4-14 days. For the Mexican types, the fruit weigh less than 250 g and they ripen 6-8 months after flowering.

**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 <math>\mu</math>g</b>	<b>proVit C mg</b>	<b>Iron mg</b>	<b>Zinc mg</b>
fruit	74.4	805	1.8	480	11	0.7	0.4

## Fruit

**English:** Mango

**Local:**

**Scientific name:** *Mangifera indica*

**Plant family:** ANACARDIACEAE

**Description:** An erect, branched evergreen tree. It can grow to 10-40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10-30 cm long and 2-10 cm wide. They are arranged in spirals. The leaf stalk is 1-10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10-50 cm long and branching. Up to 6000 flowers can occur on a stalk. Most of these are male and up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5-30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.



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

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

**Cultivation:** Trees are grown by planting fresh seed and they can be transplanted. Mangoes vary in their ability to breed true from seed. When more than one seedling emerges from the seed some of these are asexual and breed true. Clean seed germinate best if they are treated at 50°C for 20 minutes, then planted on their edge with the round bulge upwards and near the soil surface. The husk around the seed should be removed. Seeds germinate in 3-6 weeks. The strongest growing seedlings from this seed are used and the others thrown away. The seedlings from the folds of the seed are vegetative while the seedling from the centre of the seedling near the stalk end may be sexual and show variation from type. Other seeds only produce one seedling and these normally

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

**Production:** Seeds germinate after about 20 days. Seedling trees produce after 4-6 years and increase in production up to 20 years. Trees often bear better each second year. Rain at flowering reduces fruit setting. Fruiting is at the end of the year. Fruit take 4-5 months to mature. Fruit vary in weight from 200-1000 g. Trees can produce one million flowers but only 500 fruit. Trees last for many years.

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

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

## Fruit

**English:** Canteloupe

**Local:**

**Scientific name:** *Cucumis melo*

**Plant family:** CUCURBITACEAE

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



**Distribution:** A tropical plant, 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.

**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.

**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.

**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

## Vegetables

**English:** Jute

**Local:**

**Scientific name:** *Corchorus olitorius*

**Plant family:** MALVACEAE

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



**Distribution:** A tropical plant. It is mostly coastal, below 250 m altitude. Temperatures of 22-35°C are suitable. It can stand both drought (2-3 weeks) and water-logging, except when young. A well-drained soil is best. They require humus-rich soils. A soil pH of 5.5-7.0 is best, but they can grow in soils with pH up to 8.5. They also need adequate moisture for good leaf production. A rainfall of 1000 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, and then stored for a long time.

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

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

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

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

## Vegetables

**English:** Horseradish tree

**Local:**

**Scientific name:** *Moringa oleifera*

**Plant family:** MORINGACEAE

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



**Distribution:** A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6-7.5 is suitable. It can grow in arid places. It suits hardiness zones 9-12.

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	7	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

## Vegetables

**English:** Bitter cucumber

**Local:**

**Scientific name:** *Momordica charantia*

**Plant family:** CUCURBITACEAE

**Description:** A pumpkin family plant. It is a slender annual climber with flowers of both sexes on the one plant. It has simple tendrils and vines can be 4 m long. It has bright green lobed leaves 5-12 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 have a lumpy appearance, with ridges along its length and when fully ripe burst open. It has bright red covering on the seeds inside. The seeds are pale brown and 10-16 mm long and 7-10 mm wide. 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. They require a well-drained soil preferably rich in organic matter. Seeds do not germinate below 15°C. Plants grow best with temperatures of 18-35°C. A soil pH of 6.5 is best. It suits hardiness zones 9-12.

**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 for planting one hectare. Seeds are planted 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:** Okra

**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. The seeds are 4-5 mm across. They are round and dark green.



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

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

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

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

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

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

## Vegetables

**English:** Potato yam

**Local:**

**Scientific name:** *Dioscorea bulbifera*

**Plant family:** DIOSCOREACEAE

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



**Distribution:** An annual tropical plant. It will grow from the coast up to about 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 common near secondary forest at low and medium altitudes.

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

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

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

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

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

## 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 1000-1800 mm. In Zimbabwe it grows up to 1500 m above sea level. It can grow in arid places. It suits hardiness zones 9-12.

**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.

**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.

**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	-
leaf	90	113	5.1	-	95	11.5	-

## Vegetables

**Common name:** Amaranth greens

**Local:**

**Scientific name:** *Amaranthus hybridus*

**Plant family:** AMARANTHACEAE

**Description:** An upright annual herb that grows 80 cm-2 m tall. It is often green but can be dark red. The leaves are simple and alternate, oval shaped and can be 15 cm long. The flowers can be red, yellow or white. They occur in spikes at the top of the plant and in the axils of leaves. The seeds are small, shiny and black.

**Distribution:** A tropical plant that grows well in fertile soil. It can grow in warm temperate places as well as the tropics. In Kenya it grows from 900-2600 m above sea level.

**Use:** The leaves and young shoots are cooked and eaten. They are also dried.

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

**Production:**

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	87.4	189	4.9	-	108	5.7	-

Image source from: [https://www.preservons-la-nature.fr/flore/images/59/DSC9724\\_1600.jpg](https://www.preservons-la-nature.fr/flore/images/59/DSC9724_1600.jpg)



## Vegetables

**English:** Okinawan spinach

**Local:**

**Scientific name:** *Crassocephalum crepidioides*

**Plant family:** ASTERACEAE

**Description:** An upright, annual herb that grows to about 1 m tall. The stem is thick and soft. The leaves are alternate and 16-18 cm long. The leaves have lobes, with teeth around the edge. Sometimes the young leaves have a purple edge. The leaves often droop. The flower is yellow and reddish, and develops at the top, bending over at first, then becoming upright. Fluffy seed heads develop after flowering. The fruit is dark brown, with long, silky hairs at the end. The seeds blow in the wind.



**Distribution:** A tropical plant that is a common weed in Papua New Guinea from sea level to over 2500 m. It is more common in wet areas and in garden sites. It grows in many other tropical countries. It prefers light shade.

**Use:** The young leaves are cooked as a vegetable. They have a sharp, but not bitter, taste. They are often eaten mixed with other foods. The leaves are blanched if used in salads. The leaves have a smell which does not disappear with cooking. The roots are eaten with chilli sauce or cooked in fish curry. They are also stir-fried. **Caution:** It contains some alkaloids that are possibly toxic.

**Cultivation:** It grows from seed and is often self-sown. Seedlings appear in about 9 days and can be transplanted when 8- 12 cm high. A spacing of 25 cm by 25 cm is suitable. Plants are topped when 20 cm high to increase branching. To collect seed, the entire bundle is pulled from the receptacle with one hand, and the hairs removed with the other hand, without letting them mix with the seed.

**Production:** The first leaf harvest can be made in 6-7 weeks. There can be 5-9 harvests over a 60 day period. Seed can be collected for re-sowing about 16 weeks after sowing.

**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	93.1	76	2.5	-	10	-	-

## Nuts, seeds, herbs and other foods

**English:** Peanut

**Local:**

**Scientific name:** *Arachis hypogea*

**Plant family:** FABACEAE

**Description:** Peanuts grow on spreading bushy plants up to about 40 cm high. The leaves are made up of 2 pairs of oppositely arranged leaflets. Flowers are produced in the axils of the leaves. Two main kinds of peanuts occur. The runner kind (Virginia peanut) has a vegetative or leafy branch between each fruiting branch and therefore produces a spreading bush. The bunch type (Spanish-Valencia peanuts) produces fruiting branches in a sequence one after the other along the branches. They grow as a more upright plant and grow more quickly. Pods



are produced on long stalks which extend under the ground and they contain between 2-6 seeds. The stalk or peg from the flower grows down into the soil and then produces the pod and seed under the ground. The flowers need to be no more than 18 cm from the soil surface for the seed pod to develop underground.

**Distribution:** Peanuts grow in tropical and subtropical areas. They grow well from sea level up to about 1650 metres in the equatorial tropics. They require temperatures of 24-33°C. Plants are killed by frost. They need a well-drained soil and cannot stand water-logging and often require raised garden beds. Peanuts need 300-500 mm of rain during the growing season. Dry weather is needed near harvest.

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

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

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

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

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

## Nuts, seeds, herbs and other foods

**English:** Cashew

**Local:**

**Scientific name:** *Anacardium occidentale*

**Plant family:** ANACARDIACEAE

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



**Distribution:** It is a tropical plant that suits the lowland tropics but will grow up to about 1200 m altitude. It only bears well in dry areas because of blight of the flowers. It grows best in temperatures of 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.

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

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

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

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

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

## Nuts, seeds, herbs and other foods

**English:** African wild mango

**Local:**

**Scientific name:** *Irvingia gabonensis*

**Plant family:** IRVINGIACEAE

**Description:** A tree that grows to 40 m high. The trunk grows to 1 m across. It has narrow buttresses. The bark is light grey and smooth. The leaves are simple and alternate, and are 3.5-16 cm long and 2-8 cm wide. The yellowish-green scented flowers are small and occur among the leaves. The fruit are 10-13 cm long and 3-4 cm wide. The fruit has a thick covering and one seed.



**Distribution:** A tropical plant that grows in the humid forest zone in central Africa. It grows below 1000 m altitude. It grows in areas with a rainfall of 1500-3000 mm per year and temperatures of 25°-32°C.

**Use:** The seed provides oil used in cooking. It is used to make Gabon chocolate or Dika bread. The kernels are ground and eaten in dishes of mixed vegetables. The kernels are extracted from the stones then roasted. They are then pounded and poured into a mould. This cheese is then scraped and added to boiling meat or vegetables. It is like a relish, especially for plantain bananas. The pulp of the fruit is eaten fresh.

**Cultivation:** Plants are grown from seed that germinate in about 14 days. It can be grown from stem cuttings under mist. Plants can also be budded.

**Production:** Young trees are slow growing. Fruit are usually harvested from the ground.

**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	2918	8.5	-	-	3.4	-
fruit	81.4	255	0.9	-	-	3.4	-

Image sourced from:

<https://www.researchgate.net/profile/Ebimieowei-Etebu/publication/270721748/figure/fig1/AS:295085292965893@1447365224580/Figure-1-Unripe-Irvingia-fruits-on-the-day-of-harvest.png>

## Nuts, seeds, herbs and other foods

**Common name:** Mobola plum

**Local:**

**Scientific name:** *Parinari curatellifolia*

**Plant family:** CHRYSOBALANACEAE

**Description:** A tree which grows up to 12-20 m tall. The trunk is clean. The bark is rough and fire resistant. The young branches are hairy. The leaves are simple and oblong. They are 4-11 cm long by 2-5 cm wide. They narrow towards the base. The upper surface is shiny dark green and the lower surface is dull and covered with felt. The veins are conspicuous and run straight to the edge of the leaf. The flower buds occur in sprays at the ends of the branches. The flowers are pale green and have a strong sweet scent. The fruit are 2.5-4 cm long. They are olive green covered with rough grey spots. They become yellowish-red when ripe. The flesh of the fruit clings to the kernel. The fruit are edible. There are 2 subspecies.



**Distribution:** A tropical plant native to tropical Africa. It is common on sandy soils and in open deciduous woodland. It is very sensitive to frost and cold. It grows in areas with an annual rainfall between 700-1500 mm. It is often in poorly drained soils with a high water table. Plants can re-grow after fire. It grows in areas between sea level and 2100 m above sea level. It can grow in arid places. It grows in Miombo woodland in Africa.

**Use:** The fruit are eaten. The fruit are gathered after they fall. The skin and seeds are discarded but the pulp eaten. The fruit are used to make drinks-both intoxicating and non-intoxicating. The seeds are used for flavouring and as raw nuts.

**Cultivation:** Plants can be grown from seeds. Seeds should be collected fresh from fruit on the tree. The flesh is removed and the seeds dried in the shade. The seeds are sown shallowly. The seedlings need to be transplanted carefully to avoid damage to the taproot. They can be transplanted after 2 years.

**Production:** Trees from seed can reach 3.9 m after 9 years. Fruit production often only occurs every second year. Fruit matures in 250 days.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut	2.6	2737	28.7	-	-	5.5	3.1
fruit	64.6	533	1.6	-	70.9	0.9	0.4

Image accessed from: <http://1.bp.blogspot.com/-4xS96YPSHms/VqrsB0ZAqpl/AAAAAAAAAWI/RIYLyPiX3JA/s1600/parinari1.jpg>

## Nuts, seeds, herbs and other foods

**English:** Turmeric

**Local:**

**Scientific name:** *Curcuma longa*

**Plant family:** ZINGIBERACEAE

**Description:** A herb in the ginger family which continues growing from year to year. For harvesting, it is grown as an annual crop. It grows up to 1 m high and spreads to 50 cm across. The stem is erect. It has a bright orange, sweet smelling, fattened stem (or rhizome) under the ground. The main fattened part is about 5-8 cm long by 1-5 cm across. It has thinner branches off it. These are thickened with secondary tubers. The leaves are in a cluster and have leaf stalks that clasp the stem. The leaves are sword-shaped and have long leaf stalks. Leaves are long, flat and bright green. The flowers are dull yellow. They occur in clusters of 3-5. The cultivated turmeric is normally a sterile triploid (three sets of chromosomes) plant that does not bear fruit.



**Distribution:** It is a tropical plant and is widespread in coastal areas up to 1000 m altitude in the Philippines. It needs a hot, moist climate and a well-drained soil. The soil needs to be loose for good rhizomes. Plants can grow in the shade but the yield is lower. Plants are drought and frost tender. It suits hardiness zones 10-11.

**Use:** The orange-coloured rhizome is used as seasoning, especially in curry. It is also used for food colouring and can be used fresh or boiled and dried. The young shoots are also eaten. It is a minor spice.

**Cultivation:** Plants are normally grown from pieces of the rhizome. Pieces with one or two buds are used. Larger side tubers are best. They are planted 6-8 cm deep. The distance between plants needs to be 30-40 cm. They can also be grown from seed where these occur. The roots are harvested as the leaves start to die back.

**Production:** Leaves appear above ground in about 4 weeks. The crop is harvested in about 9-10 months when the lower leaves turn yellow. When the roots are harvested, they are put in boiling water for an hour. This assists drying and avoids sprouting. They are then dried in the sun. The outer layer is removed by rubbing.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
rhizome (dry)	11.4	1481	7.8	0	25.9	41.4	4.4
root (fresh)	88.2	192	1.2	-	-	2.3	-

## Nuts, seeds, herbs and other foods

**English:** Climbing asparagus

**Local:**

**Scientific name:** *Asparagus racemosus*

**Plant family:** ASPARAGACEAE

**Description:** A creeping or climbing shrub. It has woody stems. It grows 2 m high and spreads 2 m wide. The stems are slender and trailing. The leaves are light green and narrow. They are 5 cm long. The flowers are very small. The fruit are small round red berries.



**Distribution:** It is a tropical plant that grows best in rich moist soils and filtered sunlight. It is damaged by frost and drought. It can grow in arid places.

**Use:** The tubers (rhizome) are cooked and eaten. The outer skin is removed and cut into small pieces then pounded. The young leaves are used as a green vegetable. They are eaten cooked or raw. They are also used for pickles. The fruit are eaten as a dessert fruit. The harvested shoots can be stored for 10 days.

**Cultivation:** It can be grown by seed or by division.

**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	78.4	1682	6.7			21.2	2.1

## 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 1600 m altitude. It suits hardiness zones 11-12.

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

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

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

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

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

## 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 1150 m altitude.

**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.

**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.

**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	-	-	6.1	7.1

Image sourced from: [https://live.staticflickr.com/3320/3620865165\\_471a9879d5\\_b.jpg](https://live.staticflickr.com/3320/3620865165_471a9879d5_b.jpg)

## Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	<i>Amaranthus spinosus</i>	Prickly amaranth	leaf	91.7	84	3.6	109	46	14.4	0.3	31
AMARANTHACEAE	<i>Celosia argentea</i>	Quail grass	leaf	84.0	185	4.7	-	33	7.8	-	35
AMARANTHACEAE	<i>Amaranthus viridis</i>	Green amaranth	leaf	87.3	-	4.5	72	169	6.0	-	36
AMARANTHACEAE	<i>Amaranthus hybridus</i>	Amaranth greens	leaf	87.4	189	4.9	-	108	5.7	-	55
ANACARDIACEAE	<i>Mangifera indica</i>	Mango	fruit	83.0	253	0.5	54	30	0.5	0.04	45
ANACARDIACEAE	<i>Anacardium occidentale</i>	Cashew	nut	4.0	2478	17.5	-	-	2.8	4.8	58
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	14
ASPARAGACEAE	<i>Asparagus racemosus</i>	Climbing asparagus	root	78.4	1682	6.7	-	-	21.2	2.1	62
ASTERACEAE	<i>Crassocephalum crepidioides</i>	Okinawan spinach	leaf	93.1	76	2.5	-	10	-	-	56
BOMBACACEAE	<i>Adansonia digitata</i>	Boabab	fruit	16.0	1212	2.2	-	360	7.4	6.7	37
CARICACEAE	<i>Carica papaya</i>	Pawpaw	fruit	88.0	163	0.5	290	54	0.4	0.18	42
CHRYSOBALANACEAE	<i>Parinari curatellifolia</i>	Mobola plum	fruit	64.6	533	1.6	-	70.9	0.9	0.4	60
CONVOLVULACEAE	<i>Ipomoea batatas</i>	Sweet potato	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	19
CONVOLVULACEAE	<i>Ipomoea obscura</i>	Yellow ipomoea	leaf	56.6	569	8.8	-	-	28.8	1.1	30
CUCURBITACEAE	<i>Cucurbita moschata</i>	Pumpkin	seed	5.5	2331	23.4	-	-	2.8	-	11
CUCURBITACEAE	<i>Cucumis melo</i>	Canteloupe	fruit	93.0	109	0.5	169	30	0.4	0.2	48
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	51
CUCURBITACEAE	<i>Luffa cylindrica</i>	Smooth loofah	fruit	94.3	79	1.1	-	-	0.7	-	54
CUCURBITACEAE	<i>Cucumeropsis mannii</i>	Dark egusi	seed	8.3	2278	26.2	-	-	6.1	7.1	64
CYPERACEAE	<i>Cyperus esculentus</i>	Yellow nutsedge	rhizome	36.5	1262	3.5	-	-	8.0	-	13
CYPERACEAE	<i>Eleocharis dulcis</i>	Chinese water chestnut	corm	50.8	635	3.7	-	52	15	1.9	16
DIOSCOREACEAE	<i>Dioscorea bulbifera</i>	Potato yam	tuber	70.8	357	2.7	-	78	3.1	0.4	53
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	17
FABACEAE	<i>Tylosema fassoglensis</i>	Marama bean	pod	72.5	446	6.4	-	39	0.5	2.2	21
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed (young, boiled)	71.8	464	6.0	2	28.1	1.6	0.8	22
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	seed (young)	86.9	209	3.0	14	5.1	0.8	0.4	23
FABACEAE	<i>Vigna subterranea</i>	Bambara groundnut	seed	7.3	1572	18.4	-	-	4.6	2.2	24
FABACEAE	<i>Macrotyloma geocarpum</i>	Hausa groundnut	seed	9.0	1461	19.4	-	-	15.0	-	25
FABACEAE	<i>Canavalia ensiformis</i>	Jack bean	seed	10.0	1423	20.4	160	-	4.9	-	26
FABACEAE	<i>Phaseolus lunatus</i>	Lima bean	seed (young, cooked)	67.2	515	6.8	37	10.1	2.5	0.8	27
FABACEAE	<i>Vigna unguiculata</i>	Cowpea	leaf	88.4	143	4.2	36	35	4.7	0.3	28
FABACEAE	<i>Senna occidentalis</i>	Coffee senna	leaf	84.9	205	5	-	17.9	12.7	-	33
FABACEAE	<i>Arachis hypogea</i>	Peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	57
FABACEAE	<i>Tamarindus indica</i>	Tamarind	fruit	38.7	995	2.3	20	60	1.1	0.7	63
IRVINGIACEAE	<i>Irvingia gabonensis</i>	African wild mango	nut	4.0	2918	8.5	-	-	3.4	-	59
LAURACEAE	<i>Persea americana</i>	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	44
MALVACEAE	<i>Sida cordifolia</i>	Goat's horns	leaf	6.6	1296	24.2	-	-	79.8	-	29
MALVACEAE	<i>Hibiscus cannabinus</i>	Vegetable kenaf	leaf	79.0	280	5.5	34	-	12.1	-	32
MALVACEAE	<i>Triumfetta rhomboidea</i>	Burweed	leaf	78.4	284	4.2	-	-	29.2	-	34

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
MALVACEAE	<i>Corchorus olitorius</i>	Jute	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	49
MALVACEAE	<i>Abelmoschus esculentus</i>	Okra	fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6	52
MORINGACEAE	<i>Moringa oleifera</i>	Horseradish tree	leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2	50
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	38
POACEAE	<i>Sorghum bicolor</i>	Sorghum	seed	-	1459	11.1	-	-	-	-	12
RHAMNACEAE	<i>Ziziphus mauritiana</i>	Indian jujube	fruit	77.0	360	0.8	21	71	0.4	0.4	39
RUTACEAE	<i>Citrus reticulata</i>	Mandarin	fruit	87.6	184	1.5	42	136	0.8	-	41
ZINGIBERACEAE	<i>Curcuma longa</i>	Turmeric	rhizome (dry)	11.4	1481	7.8	0	25.9	41.4	4.4	61









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