

# Potentially Important Food Plants of The Gambia



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 The Gambia

## **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.

Bruce French (AO), agricultural scientist, founder of Food Plants International and developer of the “Edible Plants of the World” database.

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## Preface

This guide is based on information from the Food Plants International (FPI) database, “Edible Plants of the World”, 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 Tom Goninon 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 an indicative guide 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 The Gambia. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of The Gambia, 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 in which they are to be grown, 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:** Unless otherwise indicated, the information and images in this Field Guide have been obtained from the Food Plants International “Edible Plants of the World” database under the provisions of the Creative Commons Attribution 3.0 Licence ([Creative Commons — Attribution-NonCommercial-NoDerivs 3.0 Unported — CC BY-NC-ND 3.0](https://creativecommons.org/licenses/by-nc-nd/3.0/)). Minor editing may have occurred to meet the requirements of page formatting. 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 The Gambia has been produced to provide information on approximately 40 edible plants that are known to grow in The Gambia. 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.

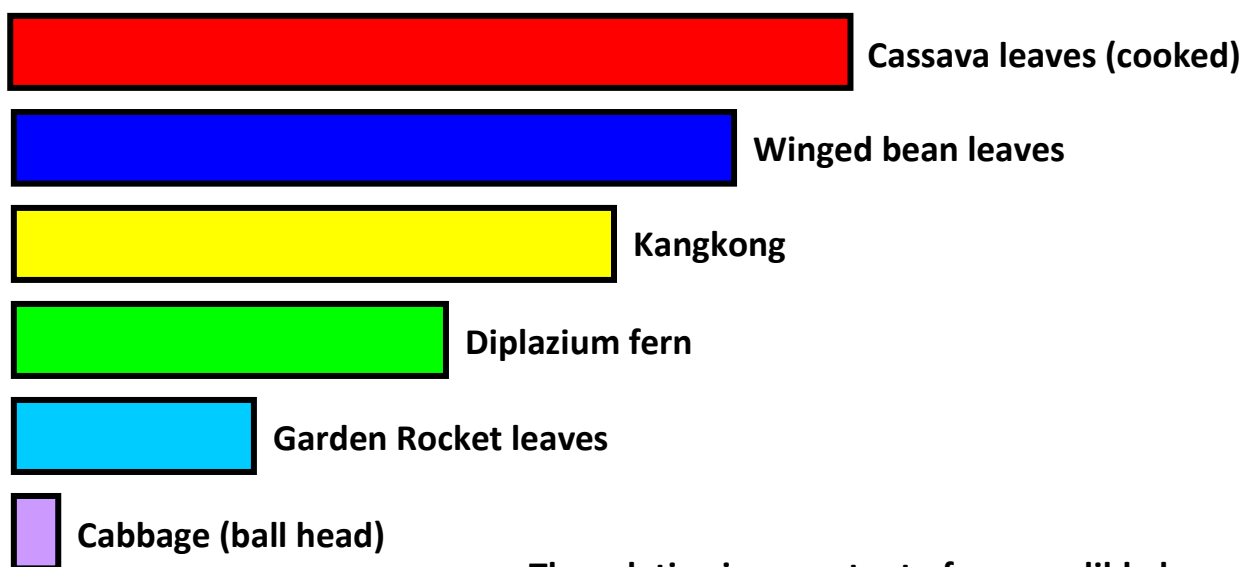
### **Naming of plants**

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.



The relative iron content of some edible leaves

### A healthy balanced diet

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

### Learning to cook well

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



(tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) only become available when food is cooked in oil.

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

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

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

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

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

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

### **Saving seed**

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

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

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

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

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

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

### **Looking after the soil**

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

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

### **Building up the soil**

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

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

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

them less acid, but will keep the plant nutrients in the soil in a more readily available form that plants can use.

### **Soil nutrients**

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

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

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

### **Making compost**

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

### **Pests**

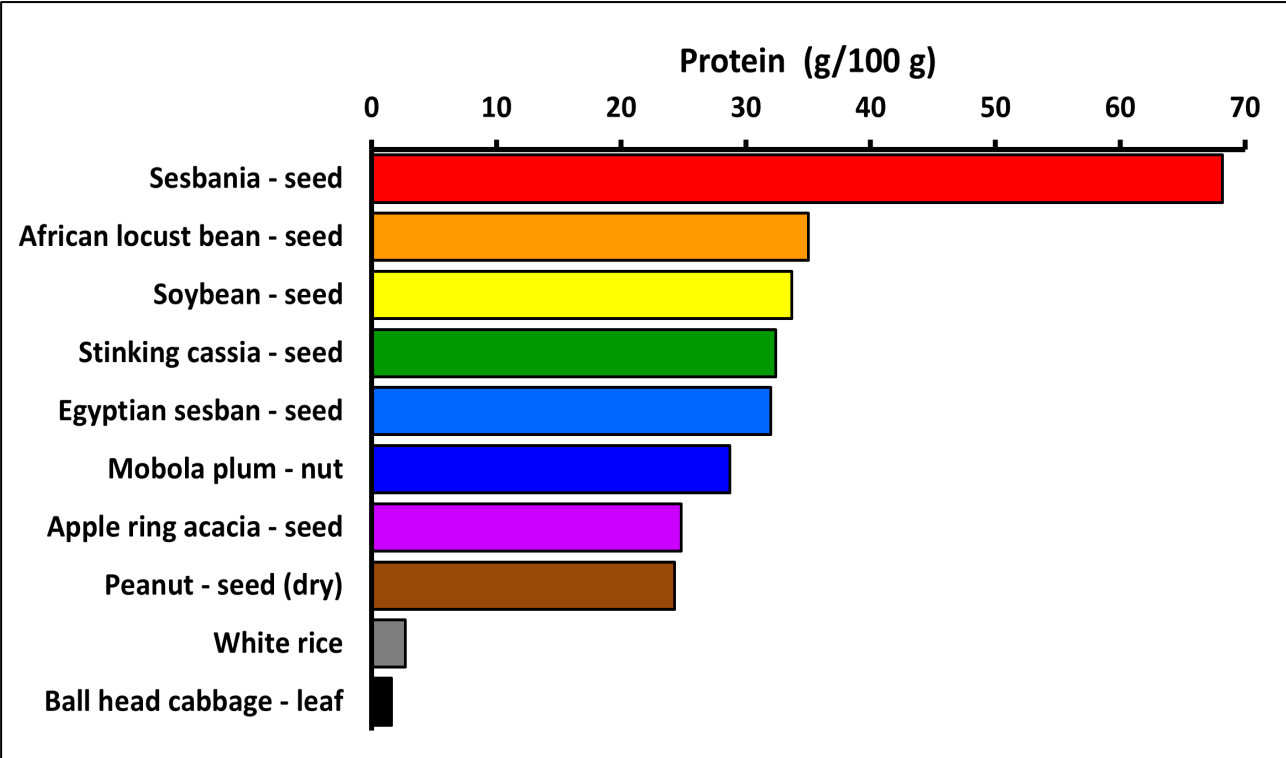
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade

trees of cacao and then move “like an army” into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth 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.

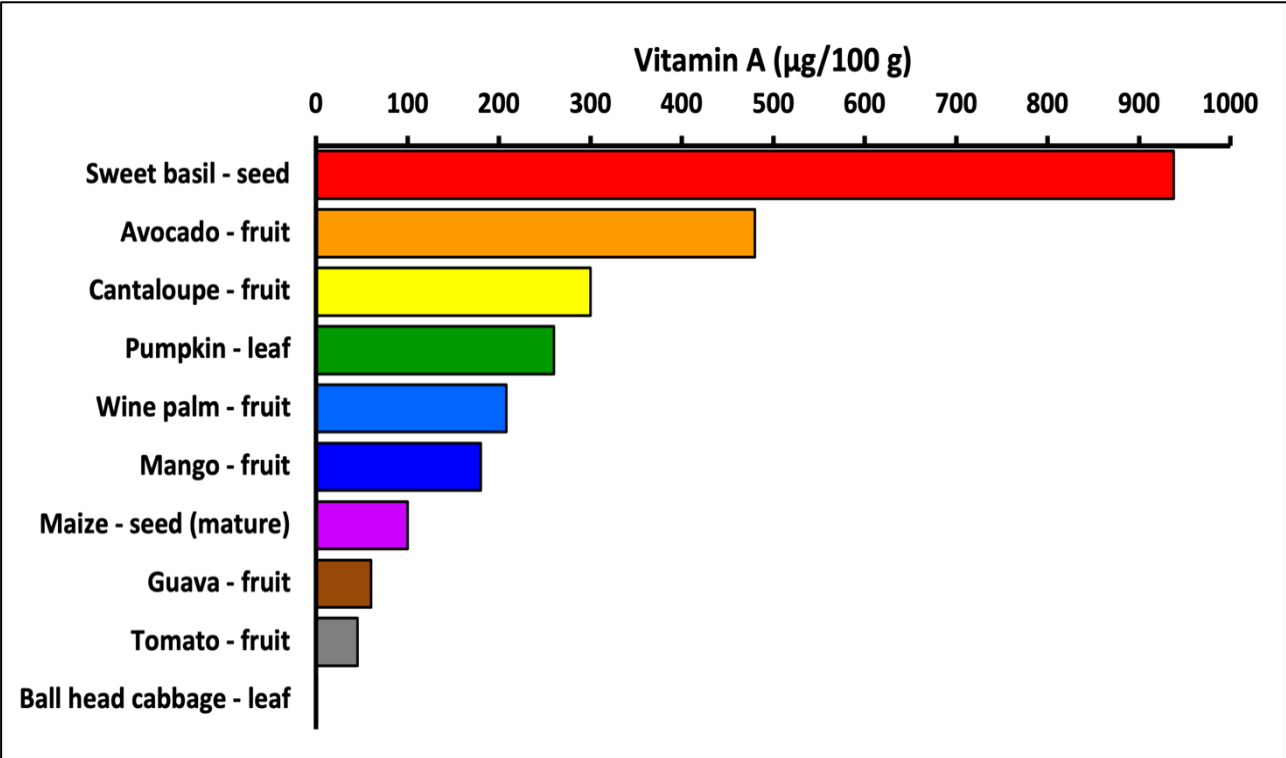
### **Diseases**

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.

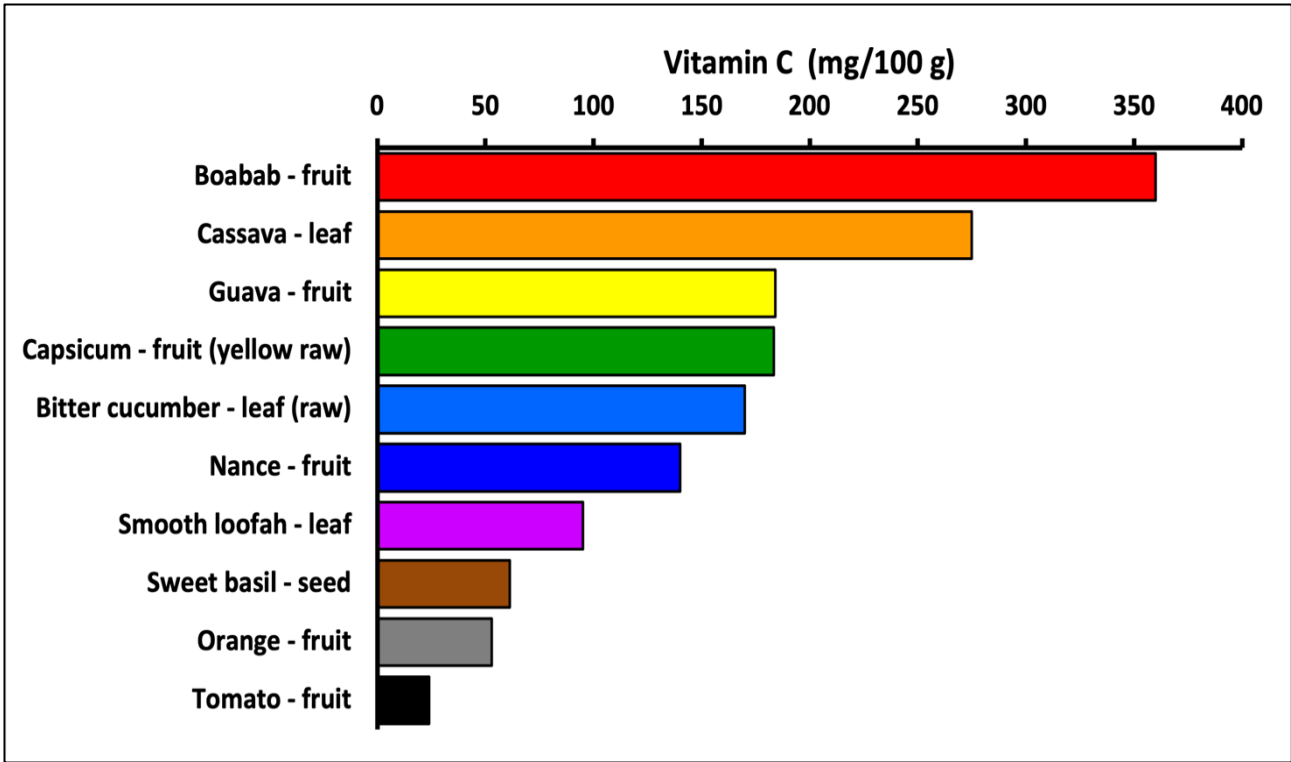
**Food value charts for a selection of plants from The Gambia**



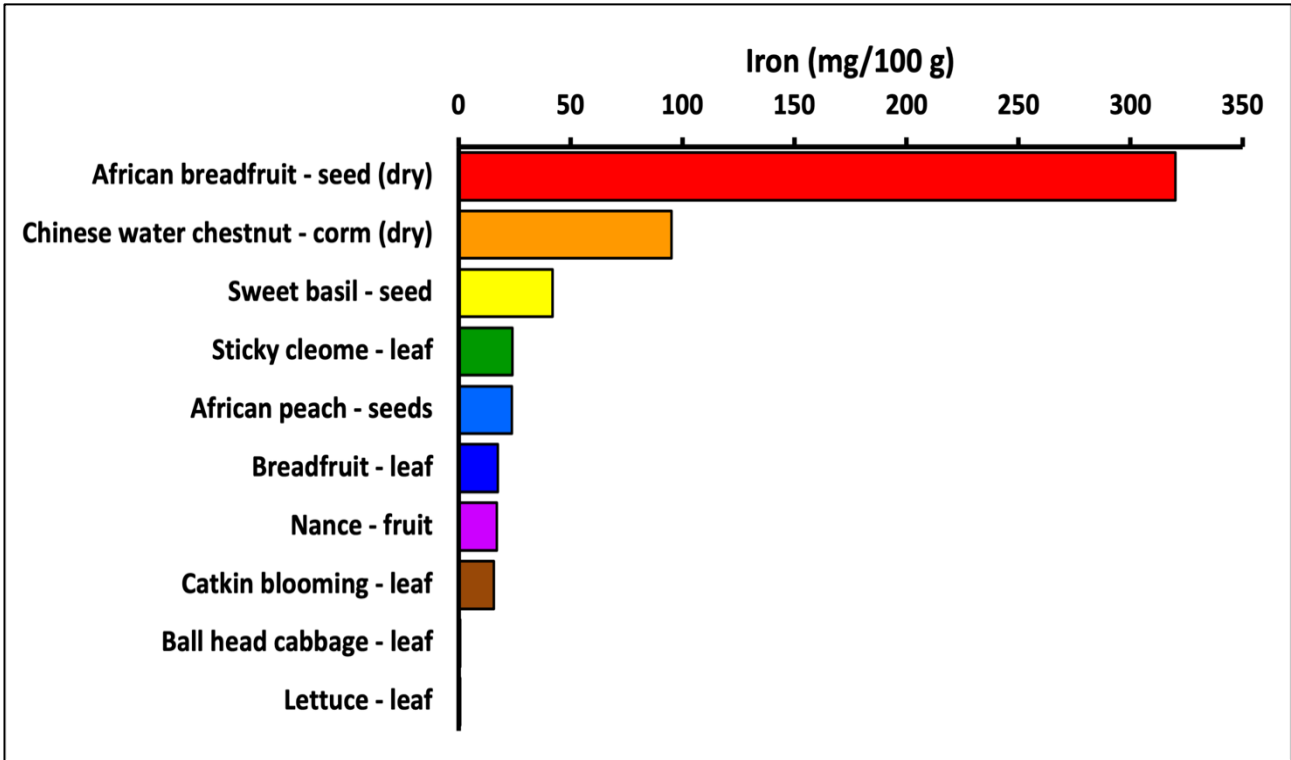
Protein helps the body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women. Symptoms of protein deficiency include wasting and shrinkage of muscle tissue, and slow growth (in children).



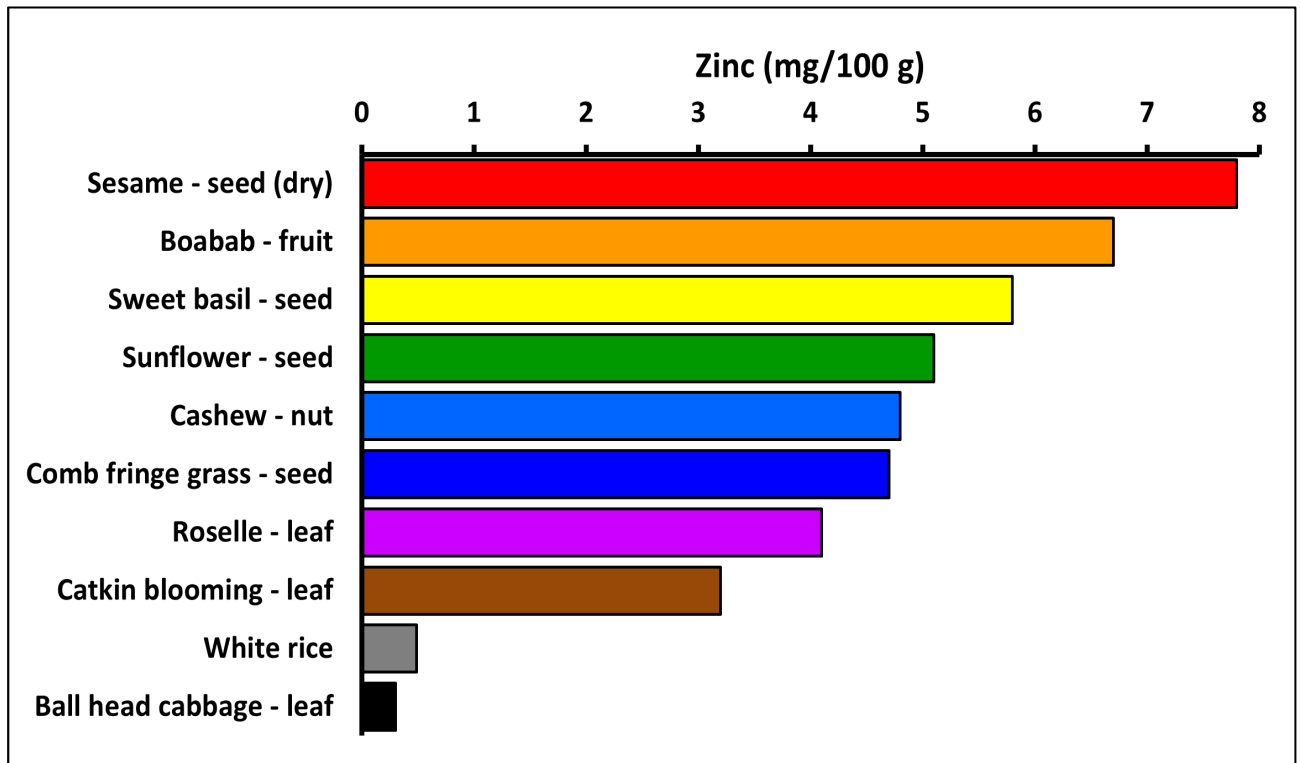
Vitamin A is very important for eyesight and fighting disease, particularly in infants, young children and pregnant women. People who are short of Vitamin A have trouble seeing at night.



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

**Common name:** Jajeo

**Scientific name:** *Acroceras amplexens*

**Local:**

**Plant family:** POACEAE

**Description:** A grass that is a scrambling annual plant. It grows 60-90 cm tall. The lower stems can form roots at the nodes.

**Distribution:** It is a tropical plant that grows in marshy places and shallow water. It grows in palm groves and wet grass savannah.

**Use:**

**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
seed	10.4	1388	6.5			4.0	

Image sourced from: <https://portal.wiktrop.org/files-api/api/get/raw/img/Acroceras%20amplectens/210.jpg>

## Starchy staples

**Common name:** Sandbur grass

**Local:**

**Scientific name:** *Cenchrus biflorus*

**Plant family:** POACEAE

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

**Distribution:** A tropical plant, found in many African countries. It grows on sand dunes and sandy plains. It is collected in the Sahel. It can grow in arid places and suits areas with 260-650 mm annual rainfall. It cannot tolerate frost. It can grow in salty or alkaline soils. It grows from sea level to 1300 m above sea level.

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

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



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

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

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

Image sourced from: [https://commons.wikimedia.org/wiki/File:Cenchrus\\_biflorus\\_MS6631.jpg](https://commons.wikimedia.org/wiki/File:Cenchrus_biflorus_MS6631.jpg)

**Common name:** Comb fringe grass

**Local:**

**Scientific name:** *Dactyloctenium aegyptium*

**Plant family:** POACEAE

**Description:** An annual grass. The stems are slender. They can lie along the ground. These can form roots at the nodes. They can have runners and form mats. It is 15-60 cm high. The edges of the leaf sheaths have small hairs. The leaf blades are flat and 5-20 cm long by 0.2-0.6 cm wide. The surfaces are lumpy/hairy. It tapers to the tip. The flowers spread like fingers on a hand. There are 2-9 flower stalks. They are long and narrow. They often spread out horizontally. The spikes are on one side of the stalk. The tip is bare. The seed grains are about 1 mm across.



**Distribution:** A tropical plant. It grows in disturbed weedy places especially on sandy soils in S China. It grows in tropical to warm temperate regions. It grows on clayey, sandy or black soil along the borders of ponds, swamps and bogs. In West Africa it grows from sea level up to 2000 m altitude. It grows in alkaline and salty soils. It grows in areas with an annual rainfall between 100-1580 mm. It can grow in arid places.

**Use:** The seeds are husked then boiled into a porridge. They are also roasted in a hot pot to soften them. It is then pounded into flour and cooked into porridge. The rhizome or runners are eaten raw.

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

**Production:** The seeds are collected during the dry season. The seeds can be stored for several months.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	7.5	1234	9.8	-	-	6.9	4.7

Image sourced from: <https://www.feedipedia.org/node/465>

## Starchy staples

**Common name:** Hungry rice

**Local:**

**Scientific name:** *Digitaria exilis*

**Plant family:** POACEAE

**Description:** An erect millet grass that grows from seed every year. It grows about 50 cm high. It forms tillers or new shoots are the base of the stem. The leaves are narrow. They can be 15 cm long. It has 2-4 racemes per inflorescence. These are 15 cm long. The grains are very small and usually yellow. They are about 1.5 mm across.



**Distribution:** A tropical plant that can grow on poor, shallow soils. It grows on the edge of the Sahel and in the savannah. It can tolerate drought and grows in arid locations. It can grow with 400 mm average rainfall. It can grow in acidic soils with a high aluminium content. It grows in areas with a temperature between 20°C-30°C. In West Africa it grows between sea level and 1500 m above sea level.

**Use:** The grain can be cooked for porridge or used in couscous. It can also be popped over a hot fire. It is ground into flour and used for bread and as a base for semolina.

**Cultivation:** Plants are grown from seed. Seed are sown very close together. They probably need a temperature above 25°C to germinate.

**Production:** The growing period is 3-4 months. The plants are harvested with a sickle and tied into sheaths. These are dried then threshed and hulled with a mortar. Yields of 600-800 kg per hectare are average. Some varieties reach maturity in 40 days.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (raw)	11.2	1470	7.1	0	-	8.5	0.82
seed (cooked)	63.0	613	2.9	0	-	3.5	0.61

Image sourced from:

[https://www.feedipedia.org/sites/default/files/images/Grains%20de%20fonio%20d%C3%A9cortiqu%C3%A9%20\(JF%20Cruz%2C%20Cirad\).jpg](https://www.feedipedia.org/sites/default/files/images/Grains%20de%20fonio%20d%C3%A9cortiqu%C3%A9%20(JF%20Cruz%2C%20Cirad).jpg)

## Starchy staples

**Common name:** Floating rice

**Local:**

**Scientific name:** *Oryza glaberrima*

**Plant family:** POACEAE

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

**Distribution:** It is a tropical plant that grows in swamps and on flood plains of savanna regions. It does best with temperatures of 30-35°C. It grows from sea level to 1700 m altitude and can tolerate low soil fertility.

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



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

**Production:**

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

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

Image sourced from: <https://i.pinimg.com/474x/77/48/1f/77481fb8134243595c851b56ac63ea4c--natural-resources-mali.jpg>

## Starchy staples

**Common name:** Rice

**Local:**

**Scientific name:** *Oryza sativa*

**Plant family:** POACEAE

**Description:** An annual grass with hollow stems. The stems can be 30-150 cm tall. (Floating varieties can be 5 m long.) The nodes are solid and swollen. The stem is protected by a skin layer which can often be high in silicon. A clump of shoots are produced as tillers from buds in the lower leaf axils. The leaves are narrow and hairy. They taper towards the tip. Each stem produces 10-20 leaves and the seeds hang from the flower stalk at the top. Some varieties are glutinous and cling together when cooked.



**Distribution:** A tropical plant. It grows in tropical and subtropical countries. Plants are grown in both flooded and dryland sites. It will grow over a range of conditions but is normally between sea level and 900 m altitude in the tropics. Occasionally it is grown up to 1600 m. It needs a frost free period of over 130 days.

**Use:** The grains are boiled and eaten after the husks are removed by pounding and winnowing. It is also made into flour, desserts, puddings, starch and noodles. Rice paper can be made from the flour. Rice bran is used for pickling vegetables. The sprouted seeds are eaten in salads. Young seedlings can be used as a vegetable. Rice can be used to make alcohol and milk like drinks.

**Cultivation:** Plants are grown from seed. Seed can be sown direct or in a nursery and transplanted. For dryland crops, sow 5-10 seeds in holes 20-25 cm apart. For transplanting, 2 or 3 plants as a 20 x 20 cm spacing is suitable. Weed control is a problem in the early stages. Flooding can be used for weed control.

**Production:** The glumes are removed to produce husked rice. Polishing removes the integument giving polished rice. Rice development takes 90-200 days 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 (white)	11.4	1530	6.4	-	0	1.9	-
seed (brown)	13.5	1480	7.6	-	-	2.8	-

## Starchy staples

**Common name:** Bullrush millet

**Local:**

**Scientific name:** *Pennisetum glaucum*

**Plant family:** POACEAE

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



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

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	11.6	1442	10.5	-	-	6.5	1.7

## Starchy staples

**Common name:** Maize

**Local:**

**Scientific name:** *Zea mays*

**Plant family:** POACEAE

**Description:** A single stemmed annual plant that grows 2-3 m tall. The stem is solid and 2-3 cm across. It is a large grass family plant with prop roots near the base. Some forms produce tillers near the base. Seed roots feed the plant initially then casual side roots develop from the lowest node on the plant and continue supplying nutrients. Roots can go sideways for 1 m or downwards for 2-3 m. Leaves are produced one after another along opposite sides of the stem and there are 8-21 leaves. The leaf sheath wraps around the stem but opens towards the top of the sheath. The leaf blade is 30-150 cm long and 5-15 cm wide. The leaf blade has a pronounced midrib and is often wavy along the edge. The male flower or tassel is at the top. The female flower is called the ear. It is on a short stalk in the axils of one of the largest leaves about half way down the stem. It produces a large cob wrapped in leaves. Cobs commonly have 300-1000 grains. Normally only one or two cobs develop per plant.



**Distribution:** A warm temperate plant. Seeds need a soil temperature of more than 10°C to germinate. It grows best at less than 1800 m altitude in the equatorial tropics. It is grown in most areas of Asia and has been grown from sea level to 3300 m in the Americas. It tends to be grown in areas too dry for rice but wetter than for millets. Maize must have over 120 days frost free.

**Use:** The cobs are eaten cooked. The dried grains can be crushed and the meal can be used for breads, cake, soups, stews etc. Pancake like tortillas from corn have been a staple food in Central America. Maize is cooked and prepared in many different ways-boiled, roasted, dried, steamed and other ways. Corn oil is used in salads and cooking. Young tassels are cooked and eaten. The pollen is used in soups. The fresh silks are used in tortillas. The pith of the stem can be chewed or made into syrup. Sprouted seeds can be eaten.

**Cultivation:** It is grown from seeds. It is normal to plant one seed per hole at 1-2 cm depth. A spacing of about 30 cm between plants is suitable. Seed should be saved from gardens of over 200 plants and the seed from several cobs mixed to avoid inbreeding depression.

**Production:** In warm, moist soil, seeds germinate in 2-3 days after planting. Cobs are harvested when the grains are full and the tassel is just starting to turn brown. This is normally about 50 days after fertilization. It is sweetest eaten soon after harvesting. Drought and unfavorable weather can result in the silks of the female flowers emerging after the pollen has been shed. This results in poorly pollinated cobs.

**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 (mature)	10.4	1528	10.0	100	4	4.9	2.2



Legumes

**Common name:** Peanut

**Local:**

**Scientific name:** *Arachis hypogaea*

**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 underground 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	0	-	2.0	3.0
seed (fresh)	45	1394	15	-	10	1.5	-
leaf	78.5	228	4.4	-	-	4.2	-

## Legumes

**Common name:** Soybean

**Local:**

**Scientific name:** *Glycine max*

**Plant family:** FABACEAE

**Description:** A small erect bean growing up to 60 cm tall. It grows each year from seed. Straggling kinds can occur. Stems, leaves and pods are softly hairy. The leaves have 3 leaflets. The leaflets have stalks. Flowers are small and white or blue. They occur in groups in the axils of leaves. The pods are broad, flat and hairy. Pods have 2-4 seeds. The seeds can be yellow to black.



**Distribution:** It is a temperate plant that suits lowland areas. It can be grown from sea level to 2000 m altitude. Many varieties will not flower in the tropics (short days). It needs fertile soil. The best soil acidity is pH 5.5-7.0. It is damaged by frost.

**Use:** The young pods and ripe seeds are eaten. They are used for flour. The dried seeds are boiled or baked and used in soups, stews and casseroles. The seeds are used for oil. Toasted seeds are eaten like a snack. Strongly roasted seeds are used for coffee. Soy flour is used for noodles, and confectionary. The beans are fermented and used in a range of foods. Sometimes the young leaves are eaten. The seeds are also used for sprouts and for making cooking oil and soya sauce etc. Because soybean contains a trypsin inhibitor they should be cooked and even the sprouts should be lightly cooked.

**Cultivation:** It is grown from seed. Seeds need to be inoculated with bacteria before planting. Plants need to be about 20 cm apart.

**Production:** Plants flower about 8 weeks after sowing and pods mature about 16 weeks after sowing. Often plants are pulled up and hung up before threshing out the seed.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1701	33.7	55	-	6.1	-
seed (immature)	68.0	584	13.0	16	27	3.8	0.9
sprout	79.5	339	8.5	1.0	8.3	1.3	1.0

## Legumes

**Common name:** African locust bean

**Local:**

**Scientific name:** *Parkia biglobosa*

**Plant family:** FABACEAE

**Description:** A large tree that grows to 20 m tall. The trunk is 1 m across. The crown is spreading. The bark is scaly. The leaves are dark green and twice divided. There are 50-70 pairs of leaflets along 14-30 pairs of leaflet stalks. The flower clusters are pink or red. These are in round balls on stalks 30 cm long. The fruit are pods 50 cm long. A cluster of pods occur together. The ripe seeds develop a yellowish tinge when ripe. There is pink, dry, powdery flesh around them. The fruit are edible.

**Distribution:** It is a tropical plant that often grows near water. It grows in the Sahel and in savannah. It grows in areas with a rainfall between 500-700 mm per year. It grows best on deep loamy sands. It can grow in arid places.

**Use:** The seeds are normally roasted. They are then bruised and allowed to ferment in water. They are then washed and ground into powder that can be stored for long periods. The seeds can be processed into a vegetable cheese. This is used as a spice to season sauces and soups. The flesh of the fruit is edible. A drink is also made from the flesh of the fruit. The bark is used in relishes and chutneys as a flavouring.

**Cultivation:** Plants can be grown from seeds. The seeds are put into boiling water then allowed to cool to improve their germination. They can be transplanted after 10-14 weeks. Plants can be grown from root suckers or be budded.

**Production:** Initial plant growth is slow. First fruit develop after about 8 years. Flowers and fruit develop during the dry season.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed			35				
fruit	4.0		5.3		29		

Image sourced from: [https://www.feedipedia.org/sites/default/files/images/african%20locust bean flower.jpg](https://www.feedipedia.org/sites/default/files/images/african%20locust%20bean%20flower.jpg)



## Legumes

**Common name:** Stinking cassia

**Local:**

**Scientific name:** *Senna tora*

**Plant family:** FABACEAE

**Description:** An erect, branched herb or shrub growing 0.3-2 m high. It usually has a bad smell. It has a sparse covering of small hairs. The stems do not have hairs. The leaves are compound and alternate. They are 5-6 cm long. The leaflets are in 3 pairs, are oval and 2.5-5 cm long by 1.5-2.5 cm wide. They are broadly rounded at the top and can be wedge shaped at the base. The leaf stalk does not have a gland but the leaf axis has a gland between the lower two pairs of leaflets. The flowers are in the axils of leaves on branched stalks. The flower clusters are short and 2 flowered. There are 5 yellow petals. The petals are 8-10 mm long. The fruit are pods which are 4 angled. They are 10-15 cm long by 4-6 mm wide. They fall without splitting open to release their seeds. The seeds are dark brown and shiny. They are 5 mm long by 2.7 mm wide. The pit on the seed covers much of the seed face.



**Distribution:** A tropical plant. It often grows on the edges of mangrove and coconut plantations. Plants grow near sea level in the tropics. In Nepal it grows to about 1400 m altitude. It grows in rich soil and near river banks. In Indonesia it grows up to 1000 m above sea level. In tropical Queensland it grows from sea level to 300 m altitude. It can grow in arid places.

**Use:** The ripe seeds are roasted and ground and used for coffee. The seeds, roasted or cooked in the pod, are eaten with rice. The young leaves are cooked and eaten as a vegetable. They are often cooked with pork or fish. The harvested leaves can be stored for 4-5 days. The flowers are also cooked and eaten. The young stems are cooked in curry. The seeds are used in the preparation of sweets.

**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	82.1	113	3.6	-	124	-	-
seed	11.64		32.4			1.4	

Image sourced from: <http://www.cnseed.org/chinese-senna-cassia-tora.html>

## Legumes

**Common name:** Sesbania

**Local:**

**Scientific name:** *Sesbania grandiflora*

**Plant family:** FABACEAE

**Description:** A shrub or small tree up to 5-10 m tall. The trunk has rough bark and the branches often droop. The trunk is thick. The branches are hairy when young. The leaves are made up of 41-61 leaflets. These are narrow and oblong. They are 2.5-4 cm long by 0.5-1.4 cm wide. They have a sharp point at the tip. The flowers are large and white to red. The flower petals can be 5-10 cm long. They are produced as 2-4 flowers on flowering branches 2-5 cm long. It has long narrow pods with up to 30-50 small brownish seeds. The seeds with their stalk can be 2.5-4.5 cm long in pods 20-25 cm long by 7-9 mm wide.



**Distribution:** A tropical plant. It grows in tropical and subtropical climates. It grows in places with an average rainfall of 900-1200 mm and a temperature range of 17-25°C minimum and 25-37°C maximum. It is cultivated in coastal towns. It does well in both dry and moist areas. It probably grows up to about 1500 m altitude in tropical places. It does best in rich moist soils. It needs a sunny location. It is damaged by frost. It can grow in arid places. It suits hardiness zones 10-12.

**Use:** The leaves and flowers are used as a vegetable. The young pods are also eaten. The young leaves are stripped from the stalks and lightly boiled or steamed or served as a vegetable in curries. The edible flowers of the white variety contain a considerable amount of sugar and iron and are said to taste like mushrooms. Flowers of the red-flowered variety are bitter and hence, are only used as an ornamental. The flowers are boiled, fried or used in curries, soups and stews. **Caution:** The seeds are toxic and need to be fermented before use.

**Cultivation:** Trees are grown from seed. The seed often need seed treatment to break the hard seed coat. Seeds germinate best with temperatures above 19°C. It can be grown from cuttings.

**Production:** It is a quick growing, short-lived, tree. Trees flower in their second year. A tree can provide 6-9 kg of leaves per year. The leaves can be harvested 120-150 days after sowing. Repeat harvests can be made each 30 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
leaf	82.3	323	8.7	66	60	4.0	-
flower	89.0	92	1.8	-	59	0.6	-
seed	10.4	-	68.2	-	-	-	-

Image sourced from: [http://academic.uprm.edu/eschroder/Sesbania\\_gradiflora3.JPG](http://academic.uprm.edu/eschroder/Sesbania_gradiflora3.JPG)

## Legumes

**Common name:** Mung bean

**Local:**

**Scientific name:** *Vigna radiata*

**Plant family:** FABACEAE

**Description:** An upright hairy bean plant which can grow to 1 m tall. It has many branches. The leaves have 3 leaflets, are dark green and grow on long leaf stalks. There are oval stipules at the base of the leaf. Flowers are pale yellow and small. They occur in bunches of 10-20 on the ends of long hairy flower stalks. Pods are black and straight. They do not have a beak. Pods contain 10-20 seeds which are usually green or golden yellow. They are smaller than black gram. The beans can be black. They have a flat white hilum. There are 2000 varieties.



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

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

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

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

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

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

## Legumes

**Common name:** Apple ring acacia

**Local:**

**Scientific name:** *Faidherbia albida*

**Plant family:** FABACEAE

**Description:** A very large spreading tree that grows 20-31 m tall. The trunk is light grey and can be 1 m across. The leaves are fine and drooping and can be light green or blue-green. The twigs are white and smooth. It has thorns which are straight and 4 cm long. They are white at the base and brown at the tips. They occur in pairs. Each leaf has 4-8 side branches although there can be 2-12 branches. These carry 6-23 pairs of small oblong leaflets. The leaf stalk does not have glands. It is leafless during the rainy season and has leaves during the dry season. The flowers are long cream spikes. The pods are large, about 10 cm long by 2.5 cm wide. They are red brown and twisted or almost curled into a ring. The pods do not burst open. The pods contain several hard shiny seeds. These are edible after processing. The seeds are 9-11 mm long by 6-8 mm wide.



**Distribution:** A tropical plant that mostly grows on river banks and river flats and can grow on sandy soils. It can be damaged by frost. It grows in dry savannah but prefers damp sites and river banks. In southern Africa it grows from 40-1070 m altitude. It grows in areas with an annual rainfall between 20-1800 mm. It can grow in arid places.

**Use:** The seeds are boiled, then re-boiled and the skins removed then eaten in times of food scarcity. This is done to remove toxic components. The pods are sometimes eaten. The pods are used for flavouring. **Caution:** The seeds can contain hydrogen cyanide and would need to be cooked.

**Cultivation:** Plants can be grown from seeds. The seeds are put in boiling water and soaked overnight then planted. It can be cut back and will re-grow.

**Production:** Trees grow quickly. They can be 7 m tall in 3 years. It develops its first fruit after 2-15 years. A large tree can yield a ton of pods.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	6.5	1437	24.8	-	-	6.8	2.6

## Legumes

**Common name:** Egyptian sesban

**Local:**

**Scientific name:** *Sesbania sesban*

**Plant family:** FABACEAE

**Description:** A shrub that grows to 6 m tall. The bark is reddish-brown. The leaves are made up of 10-25 pairs of opposite oblong leaflets. They can be 15 mm long by 3 mm wide. The flowers are yellow and pea shaped. The standard petal is often speckled with finely veined dark maroon. They occur in many flowered sprays that are up to 15 cm long. The fruit are long slender pods, 30 cm long by 0.3 cm wide. They are often slightly curved.



**Distribution:** A tropical plant that grows in low lying areas, usually near water. It can survive water-logging and salty soils. It grows in areas 350-1500 m above sea level. It grows in savannah woodland and can grow in arid places.

**Use:** The leaves and young flowers are eaten. They are often fried or pounded with rice and beans. The seeds are used for food in times of scarcity. (They have a protein inhibitor preventing the protein being well used.) The seeds are also fermented into a flavouring paste.

**Cultivation:** It can be grown as a hedge. It can be cut back and will re-grow.

**Production:** It is fast growing and only lives for short time.

**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	1446	32.0	-	-	-	-



Leafy greens

**Common name:** Breadfruit

**Local:**

**Scientific name:** *Artocarpus altilis*

**Plant family:** MORACEAE

**Description:** A large tree that grows 20-26 m in height. The trunk can be 6 m tall before branching, and up to 1 m across. It is an evergreen tree but can lose its leaves in dry weather. The leaves are large and vary from rough to smooth and shiny, and from entire to deeply lobed. They can be entire or divided into 5 to 11 lobes. The leaves are bright green on the upper surface with yellow veins and are pale and dull on the under surface. They have very small stiff hairs underneath. Male and female flowers



grow separately on the same tree and normally appear at the same time. The flowers are in the axils of leaves. Male flowers form a drooping, oblong catkin 12-30 cm long. Female flowers form a globular head. The flower head develops into the compound fruit. The fruit are large and green and vary from round to oblong. They can be 12-22 cm long and 9-17 cm wide. Seeded fruit have projecting tubercles on the surface of the fruit. Seedless kinds are smoother with rounded or 5 to 6 sided processes on the surface. Seeded, small-seeded, and non-seeded types occur. There are a number of cultivars of each. Seeded fruit have 30-90 seeds per fruit. Seed can be 2 cm across and with darker lines.

**Distribution:** A tropical plant that grows in the hot, humid, tropical lowlands. The plant is purely tropical and normally grows below about 650 m altitude, but they can grow from sea level up to about 1150 m. Seeded types are more dominant in the west of Papua New Guinea. Trees are killed by temperatures below 5°C. It tends to grow in the temperature range 16°C to 38°C and probably requires an average temperature over 22°C to grow well. It grows on a range of soils providing they are well drained. There is some cultivar difference in drought and salt tolerance. Uniformly warm humid climates suit it best. An annual rainfall of 200-250 cm and a relative humidity of 70-80% suits. It suits hardiness zone 11-12.

**Use:** The large seeds are boiled in salted water or roasted before eating. The flesh of the fruit is eaten cooked. It can be boiled, baked, steamed, mashed, or turned into soups, puddings, cakes and pies. Dried fruit are made into flour. Young leaves and flowers are edible. The central core and the skin are not eaten.

**Cultivation:** Seeded forms are self-sown by birds or bats. The presence or absence of seeds significantly affects the production. Seeded trees are mostly propagated by seed which needs to be sown fresh, without seed drying out. Seedless trees are propagated by root cuttings. Cuttings of roots 1.5-4 cm across and 25 cm long are suitable. Cuttings can be rooted in sand during the wet season. They should be placed horizontally and kept moist and shaded. Using intermittent mist improves root formation and cutting establishment. Rooting hormones also assist. This process takes 10 weeks or more and then rooted cuttings should be hardened off in a sunny position for up to 3 more months before planting out into the field. Young plants do best with adequate sun and no shade. Root suckers produced naturally, or by damaging the roots, are a common method of production of new material. Marcottage or budding can also be used for propagation. The

vegetatively propagated trees are therefore clones and the variation is presumably therefore somatic.

Fruit set can be improved by dusting male flowers onto female flowers 3 days after they emerge. Artificial pollination has resulted in increased yields in some places. This is both an increase in fruit size and more fruit retained on the tree to maturity. The pollen in the male flower is available 10-15 days after emergence. It is about 3 months from flowering to fruit maturity.

Because trees often occur from natural seed dispersal by fruit bats and marsupials, trees are often randomly spaced and common in secondary forest. A spacing of 10-13m is suitable between cultivated trees.

Trees rarely receive much attention after establishment but pruning of branches to allow easier access to fruit is sometimes undertaken. Seedless fruit are picked before maturity when the fruit is eaten by boiling. Mature fruit can be sweeter but they need to be cooked by baking or roasting. Seeded fruit are normally allowed to drop and are then harvested. The seeds are about 20 % dry matter as protein with a good nutritional balance. The essential amino acid levels are high for vegetable protein. Fresh fruit are highly perishable and need to be handled carefully.

Pit preservation of breadfruit involves lactic acid fermentation. The fermentation needs to be last for 2-3 months to produce a palatable product. Breadfruit slices can be stored under refrigeration in a fresh marketable state at 14°C for up to 10 days. Segments can be boiled for 2-5 minutes then frozen at minus 15°C for at least 11 weeks.

**Production:** Trees begin to bear after 3-6 years. Growth of the trees is vigorous, with fruiting starting after about 3 years. Trees grow to 10-15 m in 10-12 years. Fruiting can occur over 5-8 months in some locations and this is partly due to varieties with overlapping fruiting seasons. A tree can produce 50-150 fruit, weighing 1-1.6 kg each, per year. Large trees can give 700 fruit per year of 1-4 kg each. An average seed weighs 5 g. Fruit are harvested 65-95 days after flowering.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	74.4	506	1.5	4	25	0.4	0.2
leaf	75.5	314	5.0	-	-	17.5	-
fruit & seed	87.1	192	2.0	-	-	-	-

## Leafy greens

**Common name:** Hogweed

**Local:**

**Scientific name:** *Boerhavia diffusa*

**Plant family:** NYCTAGINACEAE

**Description:** A weedy evergreen vine or shrub which lays over. It grows to 70 cm high. It spreads about 50-200 cm wide. The stem is slender, creeping and twining. It has a large root system. The leaves are dull green and in opposite unequal pairs. They are 1-2.5 cm long by 1-2 cm wide. The lower leaves are broadly oval while the upper leaves are narrower. The edges of the leaves are wavy. The flowers are yellow and white or pink. They occur in groups of 3 at the ends of branches. They are 0.5 cm long. The fruit are about 0.4 cm long. They have glands that make them sticky. In a similar plant, *Boerhavia erecta*, the fruit are smooth and not sticky.



**Distribution:** It is a warm region or tropical plant. It will grow on most soils. It is drought and frost resistant and very hardy. It does best in an open sunny position. It forms a good ground cover in dry regions. It grows throughout Nepal to about 2300 m altitude. It grows in areas with an annual rainfall above 300 mm. It can grow in arid places.

**Use:** The tender leaves are eaten cooked as a vegetable. The harvested leaves can be stored for 6-7 days. The fleshy taproot is baked and eaten. The seeds are added to cereals. **Caution:** It may cause diarrhoea if eaten in large amounts.

**Cultivation:** Plants can be grown from seed or cuttings. Cuttings strike easily.

**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 (dry)	10.2	1363	8.3	-	-	-	-
root	50.0	678	4.6	-	-	0.3	-
leaf	82.0	218	4.5	-	-	7.8	0.4

Image sourced from: <https://www.indiamart.com/proddetail/boerhaavia-diffusa-7619651062.html>

## Leafy greens

**Common name:** 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:** Catkin blooming

**Local:**

**Scientific name:** *Opilia amentacea*

**Plant family:** OPILIACEAE

**Description:** A shrub or woody climber. It grows off other trees and plants. It grows to 4-10 m tall and has stems 20 cm across. The bark is rough and light grey. It has furrows along it and is corky. The aerial branches often hang downwards. The leaves are fairly smooth and leathery. They are 5-14 cm long by 2-5 cm wide. The midrib is prominent underneath the leaf. The leaf has a pointed tip. The leaf stalk is 0.3-0.7 cm long. The new leaves are bright shiny green. The base of the leaves is slightly curved backwards. The flowers are very small and yellow green. They are star shaped. They have a sweet scent. Many flowers occur together on short stalks around a central stem. These occur



in the axils of leaves and are 2-3.5 cm long. The white-fleshed, edible fruit can occur singly or in clusters and are oval and fleshy. They are 1.5-3 cm long by 1.2-1.8 cm wide. They are pale yellow or orange when ripe. They have one seed inside. The seed is 21 mm long by 15 mm wide.

**Distribution:** A tropical plant that grows in tropical Asia. They occur near the beach in monsoon areas. They are often on sandy soil. They need fresh water so are often near streams. It can grow in arid places.

**Use:** The fruit are eaten fresh. **Caution.** If eaten in large quantities, the fruit can irritate the lips and tongue. Leaves are cooked as a vegetable.

**Cultivation:** It can be grown from fresh seed. The seed need to be placed on the ground surface, not buried.

**Production:** It fruits in the wet season. In Tanzania, leaves are collected from April to November.

**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	9.2	-	14.8	-	3.9	15.7	3.2

Image sourced from:

[http://www.westafricanplants.senckenberg.de/images/pictures/opil\\_opilia\\_amentacea\\_rvbli\\_4\\_1163\\_e5e841.jpg](http://www.westafricanplants.senckenberg.de/images/pictures/opil_opilia_amentacea_rvbli_4_1163_e5e841.jpg)

## 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 sourced from: <https://tse1.mm.bing.net/th?id=OIP.wjO-VnTA1RQngZQ4Illp9wHaFe&pid=Api>

## Leafy greens

**Common name:** Sticky cleome

**Local:**

**Scientific name:** *Cleome viscosa*

**Plant family:** CLEOMACEAE

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



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

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

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

**Production:**

**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	80.4	-	5.6	-	-	24	-

Image sourced from: [https://live.staticflickr.com/2232/2205182171\\_3fece152a5\\_b.jpg](https://live.staticflickr.com/2232/2205182171_3fece152a5_b.jpg)

## Leafy greens

**Common name:** 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	-



## Leafy greens

**Common name:** 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 10000 to 30000 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	-

Fruit

**Common name:** 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 1500 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 (boiled)	77.0	290	3.8	-	50	-	-

## Fruit

**Common name:** Wine palm

**Local:**

**Scientific name:** *Borassus flabellifer*

**Plant family:** ARECACEAE

**Description:** A small evergreen palm that usually grows 10-20 m tall, but can grow to 40 m. It spreads to 5 m across. The stem is stout and may be 1 m across. It is often swollen at the base. It has a crown of leaves shaped like the fingers on a hand or spreading out like a fan. There can be 30-40 of the fan like leaves at the crown. The leaves are large with short stout leaf stalks. There can be 80 slender leaflets which are pointed, folded and rich green. Younger trees are covered with dead leaves or leaf bases. Leaves can be 1-2 m across. The flowers occur in flower stalks up to 1.5 m long. The male and female flowers occur in different trees. The females spikes are larger and have a boat shaped spathe. The fruit are borne in bunches like coconuts. The fruit are 10-12.5 cm across and slightly flattened at the ends. They have dark, purple skin. Green bracts occur at the base. Each fruit has 3 seeds. The flesh resembles the flesh of a coconut.



**Distribution:** A tropical plant that prefers a well-drained soil. It needs a protected sunny position. It is drought and frost tender. Seed need to have a temperature of 24-29°C to grow. Trees need a temperature above 15-18°C. It does better in the drier tropics than the humid tropics. It grows in seasonally wet and dry areas up to 500 m above sea level. Trees are very sensitive to cold. It suits hardiness zones 11-12.

**Use:** The flesh and water of the fruit are edible. They can be eaten fresh or made into ice-cream. Edible starch can be extracted from the stem. The palm heart is edible. The palm can be tapped for sugary sap. This can be drunk, boiled and concentrated or fermented. The seeds are germinated and the young shoots eaten. The swollen storage leaf is eaten either as flour or boiled and dried.

**Caution:** The palm hearts have been shown to be toxic to rats even when cooked.

**Cultivation:** Plants are grown from seed that take 2-6 months to germinate. Seedlings are difficult to transplant so seed should be sown where they are to grow.

**Production:** Male flower stalks give more sap than female. To extract the sap, the unopened flower stalk is tied with a string then banged with a mallet for short times over 3 days before the end is sliced off and the sap collected. A small slither is cut off the end each day to keep the sap flowing. One flower stalk can yield 2 litres per day of sap. One person can tap 30 trees per day. Each flowering stalk will yield for about 3 months. Tapping normally begins when a palm is 20 years old but then may continue for 30 years. A single palm can yield 100,000 litres of palm wine over a 40 year lifespan. The fruit matures in 120 days.

**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>
sap (thickened)	5.5	1594	0.7	-	-	1.6	0.3
palm heart	69.5	431	2.7	-	-	-	-
seed (sprouts)	69.5	431	2.7	-	-	-	-
seed (immature)	82.3	297	0.9	-	-	-	-
fruit	89.4	139	0.7	208	35.1	1.7	0.3

## Fruit

**Common name:** Nance

**Local:**

**Scientific name:** *Byrsonima crassifolia*

**Plant family:** MALPIGHIACEAE

**Description:** A medium sized evergreen tree the grows 2-10 m tall. The bark is cracked. The leaves are simple and opposite. They are 7-15 cm long by 3-7 cm wide. They are rich green and shiny but paler underneath. The veins and leaf stalks are a rusty red colour. The flowers are rich yellow and have a crumpled appearance. The flowers are held in erect, hairy racemes. These are 6-15 cm long. The fruit are small, sweet and green when young but orange-yellow when ripe. They are 1-5 cm across. They have an aroma. They have a thin skin and white, juicy pulp.



**Distribution:** A tropical plant. It suits hot tropical lowlands. It is native to Central and South America. In the Amazon, it grows to 2000 m altitude. It can tolerate some drought and has wind resistance. It suits subtropical climates but is not very hardy. It will grow on poor soils. It can tolerate salty soils. It can grow in arid places. It suits hardiness zones 9-12.

**Use:** The fruit are eaten fresh. They are also used in desserts, jams, soups, and stuffings for meat. They are also used in drinks. In Panama they are fermented to make a drink called *Chica*. An edible fat is extracted from the fruit with boiling water. **Caution:** There has been some concern about the fruit causing gastrointestinal disorders.

**Cultivation:** Plants are grown from seed. The seeds are collected from ripe fruit and the flesh is removed by allowing them to partly decompose in a plastic bag. The pulp is removed under running water. Seeds need to be planted fresh. They grow best in light shade. Seedlings emerge in 25-35 days.

**Production:** It is a slow growing tree.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	82.8	276	0.1	50	140	17	

## Fruit

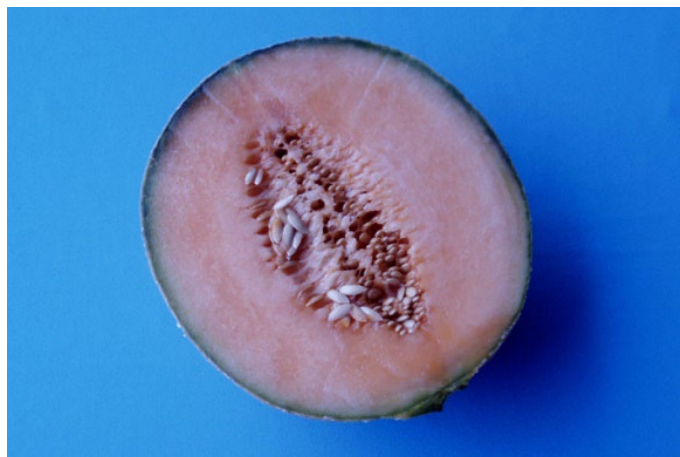
**Common name:** Cantaloupe

**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	300	30	0.4	0.2

## Fruit

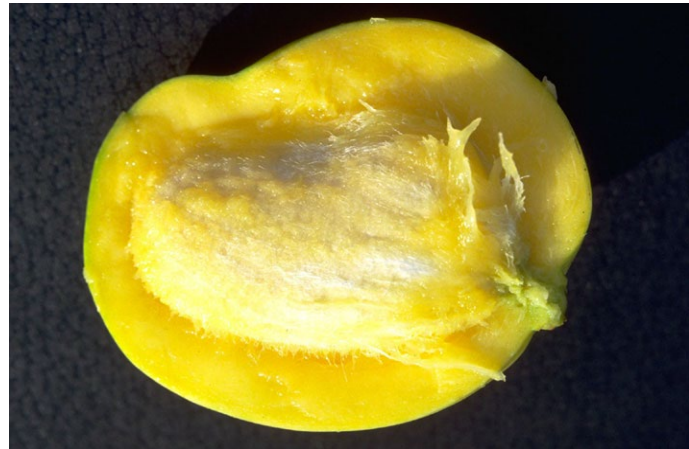
**Common name:** Mango

**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 µg	proVit C mg	Iron mg	Zinc mg
fruit	83.0	253	0.5	180	30	0.5	0.04
leaf	82.1	226	3.9	-	60	2.8	-

## Fruit

**Common name:** 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, 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.

**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 µg</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

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## Fruit

**Common name:** 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

**Common name:** 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 1400 seeds per kg. Seed should be soaked in hot water or the seed coat nicked before sowing. Seed can be stored for 2 years if kept dry, cool and away from insects. Trees can be topped or cut back and allowed to re-grow. Nothing grows under the trees due to the acidity of the leaves. Trees can be grown by air layering or cuttings.

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

**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	-

**Common name:** Capsicum

**Local:**

**Scientific name:** *Capsicum annuum*

**Plant family:** SOLANACEAE

**Description:** An annual plant that grows up to 1.5 m tall. The leaves can be long and sword shaped or oval to rounded. The leaves can be 12 cm long. The flowers are produced singly and are yellow or white. They are bell shaped. The flowers are 1.5 cm across and in the axils of leaves. Fruit are hollow and about 10 cm long and 6 cm wide and red when fully ripe. They contain many seeds. Kinds with different shaped fruit also occur.



**Distribution:** A tropical or subtropical plant. Plants grow from sea level up to about 2400 m altitude. They are killed by frost. Soils need

to be well drained and fertile. The fruit and plants can rot in the middle of the wettest seasons. They need a temperature above 4°C. A night temperature of 16-18°C and a day temperature of 26-28°C is best. A soil pH of 5.4-6.9 is suitable. They suit plant hardiness zones 8-12.

**Use:** The fruit are edible raw or cooked. They are stuffed, roasted, fried, preserved and used as flavouring. The leaves are edible when cooked.

**Cultivation:** Plants are grown from seed. Both self and cross pollination occur. It is possible to save seed. Seed will keep for 2-3 years. Seeds germinate in 6-10 days. Plants can be transplanted and need to be about 50 cm apart. About 50% of flowers set fruit.

**Production:** The first fruit can be harvested after 3-4 months.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (yellow raw)	92	113	1.0	24	183.5	0.5	0.2
fruit (green raw)	93.5	65	0.9	59	100	0.4	0.2
fruit (green boiled)	93.7	59	0.9	59	60	0.4	0.2
leaf	82.1	222	5.8	-	68	1.4	-

## Vegetables

**Common name:** Pumpkin

**Local:**

**Scientific name:** *Cucurbita maxima*

**Plant family:** CUCURBITACEAE

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



**Distribution:** A subtropical plant that grows from sea level to 2400 m altitude. They need a fertile soil. *C. moschata* is better suited to coastal areas. They are frost sensitive but better suited to cooler areas than *C. moschata*. It can grow in arid places. It suits hardiness zones 8-11.

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

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

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

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

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

## Vegetables

**Common name:** Greater yam

**Local:**

**Scientific name:** *Dioscorea alata*

**Plant family:** DIOSCOREACEAE

**Description:** A long angular vine with square stems that twine to the right around support sticks. The stem does not have spines and is often coloured green or purple. The leaves are heart shaped and borne in pairs along the vine. The leaves vary in shape, size and colour with different varieties. Leaves can be 10-30 cm long by 5-20 cm wide. The leaf stalk is 6-12 cm long. The flowers occur in the axils (where the leaf joins the stem) of the upper



leaves. The male flowers are in small heads along branched stalks. These can be 25 cm long and green. The female flowers are in shorter spikes. Many cultivated varieties do not produce fertile seed. The fruit are 3-winged and 2.5 cm long by 3.5 cm wide. The seeds, when they occur, have wings right around them. One large, but often irregular-shaped, tuber occurs under the ground. There are many different varieties. The tubers can vary in shape, size, colour, texture and other ways. Some varieties produce bulbils, or small bulbs, along the vine.

**Distribution:** It grows in many tropical countries, growing from sea level up to about 1800 m in the tropics. Yams are most important in seasonally dry areas. They need a well-drained soil with reasonable fertility and are, therefore, often planted first in rotations. The maximum temperature is  $>30^{\circ}\text{C}$  while the minimum is  $20^{\circ}\text{C}$ . The best temperature range is  $25\text{-}30^{\circ}\text{C}$ . Rainfall is often seasonal in yam areas and the maximum needs to be 14-20 weeks rain, with the best being 1150 mm during the growing season. Yams can tolerate drought, but give best yields with high rainfall. The critical rain period is during the first 5 months. They cannot tolerate water-logging. Yams are influenced by the number of hours of sunlight. Short days (less than 10-11 hours of sunlight) favour tuber development. Yams suit hardiness zones 10-12.

**Use:** The tubers are boiled, baked or mumued (cooked in the ground).

**Cultivation:** For general food production, use top pieces of the tuber after they have sprouted, use a branched stick for supporting the vine, space plants about 1 m apart and choose a smooth round variety of yam. This makes harvesting easier, and peeling and food preparation quicker. Varieties that get less leaf spot disease and are less damaged by virus diseases give a more reliable yield. Tubers which are cut and stored in shady places until they form sprouts give improved yields over tubers that are left whole then cut into sets at planting. Because yam tubers have a period of dormancy, tubers do not normally commence regrowth for up to 5-6 months. This means they store, but cannot easily be used for out of season replanting. Dormancy, or inactivity, of the yam tubers can be broken using Calcium Carbide treatment for 5 hours, or by covering tubers with leaves of *Croton aromaticus* or *Averrhoa bilimbi*.

In some kinds, the bulbils that grow along the vine can be used for planting. By using staggered plantings of male and female plants, and then hand-pollinating the flowers, it is possible to get seeds to develop and these can be used to establish new plants. It is common practice in many areas to plant the yam piece upside down. The probable reason for this is to give the shoot and roots time to develop and get established away from the sun and wind so that the plant does not dry out. People in yam areas have their varieties classified as to whether they are planted at the top or the



bottom of the hole, and whether the shoot is pointed up or downwards. A planting depth of 15 cm is best. Normally top pieces give a higher yield than middle pieces of the tubers and these are better than bottom pieces. Top pieces of the yam tuber give earlier and more reliable shoots and the yams mature earlier. These top pieces are also the less attractive part of the tuber for eating, so they are preferred for planting. The larger the sett, the earlier it develops shoots and the larger the yield. Putting plants more closely gives smaller yams, but more total food. Closer spacing is normally used on lighter soils.

Yams should also have sticks to climb up. It is best to have a stick that is twisted or branched because the vine can slip down a very straight stick. Normally, a stick 2 m tall is sufficient. It needs to be a strong stick, firmly fixed in the ground. Yam varieties have varying types of vine growth. This affects where the stick needs to be placed. The fat, irregular yams can have the sticks near the mound, as a thick clump of vines and leaves soon develops. But, if a the stick is put beside the mound of one of the long ceremonial yams, the vine will often reach the top of the stick before it has produced more than a couple of leaves and will then fall back down to produce its leaves on the ground. The stick for these varieties often needs to be put at some distance from the yam hole. The tip can be picked off the vine if branching is wanted earlier.

Light influences the growth of the tubers. If the tubers have light on them often, due to cracks in the soil on hillsides, tubers are smaller. Compact soil or stones means the tubers may be exposed to sunlight. This needs to be avoided as it reduces yield. Yams must have plenty of air in the soil, so they will not normally grow on heavy clay soils or in areas with a lot of soil moisture. The soil can be improved for yam growing by putting leaves and other plant material in the planting hole, by making a mound above the hole, or by planting on a hillside. In some very loose sandy soils, yams can just be planted in flat, unmounded soils without digging a special yam hole, but these situations are not common.

**Production:** In most places, the yam growth and time to maturity is linked to seasonal rainfall patterns. They are mostly planted just before the first rains, where a 8-10 month rainy season exists. They give better yields in 6-8 month rainy season areas, where they are planted 3 months before the rains. Earlier planting requires larger sett size to withstand drying out. In drier grassland areas, mulching the mounds at planting means fewer plants die and more food is produced. The time to maturity ranges from 5 months on the coast, to 9-10 months at higher altitudes. Yams will store well for over 6 months in a dry, dark, well-ventilated shed. Greater yam is an important root crop of the seasonally dry, hot humid, tropics.

**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	76.6	323	2.0	18	10	0.8	0.39

## Vegetables

**Common name:** Roselle

**Local:**

**Scientific name:** *Hibiscus sabdariffa*

**Plant family:** MALVACEAE

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



**Distribution:** A tropical plant that grows from sea level up to about 1000 m altitude. It will tolerate a range of soils and requires short days for flowering. It will grow in semi-arid locations. It grows best where average temperatures are in the range 25-30°C. It needs a temperature above 10°C. Plants will tolerate high temperatures. They grow up to 800 m altitude in Africa. A rainfall of 450-550 mm distributed over a 90-120 day growing period is required. It cannot tolerate waterlogged soils. It can grow in arid places. It suits hardiness zones 10-12.

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.2	1718	19.6	-	-	4.2	-
leaf	86.4	185	10.9	58	35	1.5	4.1
calyces	86.0	185	1.6	29	14	3.8	-

## Vegetables

**Common name:** Kangkong

**Local:**

**Scientific name:** *Ipomoea aquatica*

**Plant family:** CONVULVULACEAE

**Description:** Kangkong is a creeping sweet potato-like plant. It has hollow stems and can float on water. The leaves are green and are normally not divided like some sweet potato leaves, but the shape and size varies a little between different kinds. The trumpet shaped flower looks like a sweet potato flower and is normally white. The runners develop roots at the nodes and also branch. This branching increases when tips are picked off. Some variation in leaf shape can be observed. Leaf shape is less variable than



in the related sweet potato, but narrow and broad leafed kinds occur. White and green stemmed kinds occur. Green stemmed kinds have more cold tolerance than white stemmed.

**Distribution:** Kangkong is a tropical plant. It grows best in short day, stable high temperature, moist conditions. Temperatures need to be above 25°C for satisfactory growth. In equatorial regions plants probably grow up to 1000 m altitude. Below 23°C the growth rate is too slow for economic production, so production is mainly in the lowland tropics. Optimum soil pH is between 5.3-6.0. It suits damp places and grows well in swamps. It can grow as a partly floating plant in swamps and lagoons behind the beach along the coast. In some countries they grow the dry land form in gardens.

**Use:** The young tips of shoots are cooked and eaten. They can be boiled, steamed, stir-fried, or added to soups, stews or curries. The young stems can be used in pickles. The young tips can be eaten raw in salads and the roots are occasionally cooked and eaten.

**Cultivation:** Dryland kangkong is normally grown from seed. Sometimes seed are pre-soaked for 12-24 hours prior to sowing. Plants can also be grown from cuttings and establishment is rapid. Top cuttings 25-40 cm long can be planted beside a pond.

**Production:** Young tips can be harvested 30 days after planting, and subsequent harvests every 7-10 days. Production of new shoots probably declines at flowering. Yields up to 60000 kg/ha have been recorded.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	90.3	126	3.9	40	60	4.5	-
leaf (boiled)	92.9	84	2.1	520	16	1.3	0.2

## Vegetables

**Common name:** 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

<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>
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

**Common name:** African potato

**Local:**

**Scientific name:** *Plectranthus rotundifolius*

**Plant family:** LAMIACEAE

**Description:** Country Potato is a small annual herb. It grows 15-30 cm tall. Its succulent stems can lie along the ground or curve upwards. The leaves are thick and have a smell like mint. The flowers are small and pale violet. Dark brown tubers are produced in clusters at the base of the stem. The tubers can be up to 20 cm long and 2 cm wide.



**Distribution:** Country potato is a tropical plant. It grows well in high rainfall areas with low night time temperatures. It is grown as a monsoonal crop.

**Use:** The tubers of Country Potato are commonly boiled and eaten but they can also be eaten raw. They can be added to curries, baked, or fried into chips, steamed, added to soups or stews or mashed and fried. The leaves are edible and can be used as a flavouring. The ripe fruit can also be eaten.

**Cultivation:** Country Potato is grown from suckers from germinating tubers. The tubers are put in a nursery bed about 4 cm deep and 10 cm apart. Tubers germinate in 10-15 days once watered. These produce a cluster of sprouts which are then transplanted after about 3 months. The earth is heaped up around the plants to encourage tuber growth. Plant spacings of 20 cm apart in rows 90 cm apart are used.

Plants can also be grown from cuttings. It needs a well drained, sandy loam. It cannot stand water-logging. In heavier soils, plants should be grown on ridges. Plants cannot stand cold, frost or drought. The best soil pH for optimal growth is 6.5-7.0.

**Production:** Crops reach maturity after about 5-6 months. This may be longer in colder places. Yields of 8-15 tonnes per hectare are average. Tubers should be harvested as soon as they are mature to avoid decay.

**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	76	393	1.4	-	1.0	6.0	-

Image sourced from: <http://d3d71ba2asa5oz.cloudfront.net/12001418/images/plectranthusrotundifolius1.jpg>

## Vegetables

**Common name:** Carrot

**Local:**

**Scientific name:** *Daucus carota* subsp. *sativus*

**Plant family:** APIACEAE

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



**Distribution:** A temperate plant. In the tropics it is mostly grown in the highlands, but will grow from sea level to 2600 m altitude. Sometimes on the coast only leaves are produced. Carrots are frost resistant. In Nepal carrots are grown up to 1700 m altitude. It needs a deep loose soil. Seed germinate well in the temperature range 7-24°C. Plants grow well with a temperature about 15°C. It grows best with a pH of 6-7. It suits hardiness zones 3-9.

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

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

**Production:** There are tropical varieties that mature within 90-110 days.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root (raw)	89.9	180	1.0	2813	6	0.6	0.4
root (boiled)	91.5	79	0.6	2455	4	0.4	0.3
leaf	87.4	-	2.2	65	-	-	-

Nuts, seeds, herbs and other foods

**Common name:** 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 (dry)	50.8	635	3.7	-	52	95	1.9
corm	79.6	268	1.4	0	5	0.7	0.5



## Nuts, seeds, herbs and other foods

**Common name:** Sunflower

**Local:**

**Scientific name:** *Helianthus annuus*

**Plant family:** ASTERACEAE

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



**Distribution:** A temperate plant that suits the highlands of the tropics and can stand a light frost. It needs a well drained, rich soil. It is drought and frost resistant. Sunflower grow from the equator to 55°N latitude. It does not suit the wet tropics. It cannot tolerate very acid soils. It can grow in arid places. It suits hardiness zones 4-11. It is widely distributed in many environments.

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

**Cultivation:** Plants are grown from seed. Only well-filled seed should be planted. It is easy to save your own seed as dry seed stores well. A plant spacing of 1 m by 0.5 m is suitable. Seeds are sown at a depth of 2-4 cm. Mature heads are collected by hand, dried and then threshed.

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	5.4	2385	22.8	5	1.4	6.8	5.1

## Nuts, seeds, herbs and other foods

**Common name:** Sweet basil

**Scientific name:** *Ocimum basilicum*

**Local:**

**Plant family:** LAMIACEAE

**Description:** An erect, branched, woody shrub. The branches are hairless and smooth. The leaves are hairless and oblong, with a narrow tip and blunt base. The base of the stems is tinged red. The leaf stalk is 1.5 cm long. The leaf blade is 2.5-5 cm long by 1-2.5 cm wide. The flowers are somewhat purplish, with very short stalks. The small nuts are smooth, oval and slightly flattened. Plants vary a lot, and several varieties have been selected. They can have liquorice, cinnamon or lemon flavours, and vary in size.



**Distribution:** It grows in many warm temperate countries, but also in the tropics. It suits both the lowlands and the highlands in the tropics. It cannot stand frost. It suits warm and hot climates. It needs some shade in tropical areas. It needs protection from wind. It needs rich, moist, well-drained soil. Soil should be at 25-30°C for seed to germinate. It suits hardiness zones 10-12.

**Use:** The seeds are soaked in water and eaten. The leaves are used raw or boiled to flavour foods. The seed yields an oil used to flavour sauces, pickles, meats and confectionary.

**Cultivation:** It is grown from seed. Seed should be sown 2-3 mm deep and covered with a light sand or soil. Seeds germinate within 3-5 days. Seedlings are thinned out to 20 cm apart. Seedlings can be transplanted. If top shoots are picked off, a more bushy plant is produced and flowering is delayed.

**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	91.0	113	2.5	386	18.0	3.2	0.9
seed	6.4	1051	14.4	938	61.2	42.0	5.8

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

## Nuts, seeds, herbs and other foods

**Common name:** African peach

**Local:** Le pècher Africain

**Scientific name:** *Sarcocephalus latifolius*

**Plant family:** RUBIACEAE

**Description:** A small tree or shrub that loses its leaves. It has many stems and grows 2-9 m tall. It can grow a large tree in forest. The trunk is crooked and can be 30 cm across. It can have several stems. The branches are thick and drooping. The bark is dark grey and very fibrous. It is deeply cracked. The leaves are shiny green but darker on top and paler underneath. They are a wide oval shape and 10-21 cm long. The tip is pointed and the base is rounded. The leaves are thick with deep veins. The leaf stalk is red-purple. It is about 2 cm long. The flowers are white-yellow and have a strong smell. They occur in single rounded heads about 4-5 cm across. The flowers are in a rounded "pin cushion" like head. The individual flowers have slender tubes. The flower stalk is 1-2 cm long. The fruit is a compound fruit. It is red or pinkish with a rough appearance and the flesh is deep red and watery. The fruit is pitted like a golf ball. It is a round ball about 5-8 cm across. The surface of the fruit is rough with 5 sided pits. They contain many small seeds. The seeds are very small, about 1 mm across. They lie in the flesh around the solid core. The flesh is edible.



**Distribution:** It is a tropical plant. There is a savannah form and a forest form across West Africa. It also grows on ant hills. It grows between 900-1100 m above sea level. It can grow in arid places.

**Use:** The ripe fruit are eaten raw and also used in soups. The fruit can be dried for later use. It is the pulp of the fruit that is eaten. A drink is prepared from the fruit. The flower heads are eaten as a vegetable. **Caution:** It can induce abortions. It is also used for arrow poison.

**Cultivation:** Plants can be grown from fresh seed. The seeds are very small. To separate the very small seeds from the fruit, mash the fruit then float it in a bucket of water. The seed will separate out and sink to the bottom. They should then be collected and slowly dried. Seed should be planted within 2 months. Plants can be cut back and will re-grow. They can be grown from cuttings or layering.

**Production:**

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seeds	-	305	6.4	-	-	23.7	3.0
fruit	75.1	173	1.9	-	35.8	1.4	-

Image sourced from:

[https://th.bing.com/th/id/R.19a41a3af215f6655955aeeb6b5e66c8?rik=STs7lktmm%2fc3gA&riu=http%3a%2f%2fwww.westafricanplants.senckenberg.de%2fimages%2fpictures%2fsarcocephalus\\_latifolius\\_bn\\_dscn3283\\_1382\\_9d01d0.jpg&ehk=4aYK9W%2bYMFsXmxCH7TXBWjd9%2bS2ILISdptuD](https://th.bing.com/th/id/R.19a41a3af215f6655955aeeb6b5e66c8?rik=STs7lktmm%2fc3gA&riu=http%3a%2f%2fwww.westafricanplants.senckenberg.de%2fimages%2fpictures%2fsarcocephalus_latifolius_bn_dscn3283_1382_9d01d0.jpg&ehk=4aYK9W%2bYMFsXmxCH7TXBWjd9%2bS2ILISdptuD)

## Nuts, seeds, herbs and other foods

**Common name:** African breadfruit

**Local:**

**Scientific name:** *Treculia africana*

**Plant family:** MORACEAE

**Description:** An evergreen tree. It grows to 15-30 m tall. It can grow up to 50 m tall. It has a dense spreading crown. The trunk is fluted. The bark is dark grey and smooth. It is thick and produces a white latex when cut. This later turns rusty red. The leaves are simple and alternate. They are very large. Leaves can be 30 cm by 14 cm or larger. They are dark green and smooth above but paler and slightly hairy underneath. The leaves are tough. They have 10-18 pairs of clear veins. The leaf stalk is 1.5 cm long and the leaf tip is pointed. Young leaves are red or yellow. The flower heads are rounded and a yellow-brown. They are 2.5-10 cm across. Male and female flowers are usually separate. Flowers can grow in the axils of leaves or on older wood down to the trunk. The fruit is a compound fruit. It is rounded and very large. It can be 30-45 cm across. It grows on the trunk and main branches. Inside there are many orange seeds about 1 cm across. They are in a spongy pulp. The outer fruit surface is covered with pointy growths.



**Distribution:** A tropical plant. It suits hot, tropical lowland climates. It grows in forests near rivers. It can grow in swampy areas. It grows from sea level up to 1500 m in Uganda or 1200 m in Tanzania.

**Use:** The seeds can be dried, fried and eaten. They are also boiled, roasted or ground into flour. The flour is used in soups and nut milk. An edible oil can be extracted from the seeds.

**Cultivation:** Plants are grown from seed. Seed can be planted in pots then transplanted or they can be sown direct. There are about 5000 seeds per kg. Seeds will only store for a few weeks but seed treatment is not needed before sowing.

**Production:** The tree is fairly fast growing. A fruit can weigh 12 kg.

**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)	9.2	1555	12.6	-	-	320	-

## Nuts, seeds, herbs and other foods

**Common name:** 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 -1 0 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

**Common name:** Sesame

**Local:**

**Scientific name:** *Sesamum indicum*

**Plant family:** PEDALIACEAE

**Description:** A small, erect annual plant. It is very branched and grows 1-2 m tall. The stem is stout, 4 sided and furrowed along its length. It is densely covered with fine, downy, glandular hairs that vary in shape. The lower leaves have long stalks and are spear shaped, often with lobes or a toothed edge. The leaf stalks are 3-11 cm long. The leaf blade is 4-20 cm long by 2-10 cm wide. Upper leaves are narrow and oblong. They are 0.5-2.5 cm wide. The flowers occur in the axils of upper leaves, either on their own, or



in groups of 2 or 3. They can be white, pink, purplish and with yellow spots and stripes. The fruit can be smooth or rough and there are 2 chambers in the capsule. The fruit are brown or purple. They are oblong and deeply grooved. The seeds are small and oval. They are 3 mm by 1.5 mm and vary in colour from white, yellow, grey, red, brown or black. The fully ripe pods burst open.

**Distribution:** A tropical plant that suits the hot, dry, semi-arid tropics and sub-tropics. It can tolerate short periods of drought once established. It needs a temperature of 20-24°C in early growth, then 27°C for ripening. It grows from sea level to about 1200 m in areas with an annual rainfall of 400-1000 mm. Soils need to be well drained. It is very intolerant of water-logging. It cannot stand high humidity and needs frost free conditions. It needs a dry period for seed drying. It does not like acid soils. It grows in open sunny places. It can grow in arid places.

**Use:** The seeds are eaten. They are used in soups or fried or boiled. They are used in tahini and hummus. Seeds are eaten in the form of sweetmeats. Roasted seeds are used in pickles. They are also put on bread. Oil from the seeds is used in cooking and on salads. The refuse from the seed after the oil has been extracted is boiled in water and made into soup.

**Cultivation:** Plants are grown from seed. Seed will not germinate below 21°C. Seeds are broadcast on well prepared land and then harrowed in using a light harrow, or sown 2-15 cm apart in rows 20-45 cm apart. Plants can be thinned or weeded during early growth to produce a better crop. Seeding rates of 9-11 kg/ha are used. Some varieties shatter easily.

**Production:** Yields of 340-500 kg/ha are average. Plants reach maturity in 80-180 days. Crops are harvested as the leaves begin to drop. Plants are cut and stoked or dried in racks. The hull is removed by soaking in water overnight, then partly dried and rubbed against a rough surface.

**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)	4.7	2397	17.7	1	-	14.6	7.8
leaf (raw)	85.5	188	3.4	-	-	-	-
oil	0.1	3683	0.2	-	-	-	-

## 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>Celosia argentea</i>	Quail grass	leaf	84.0	185	4.7	-	33	7.8	-	30
ANACARDIACEAE	<i>Mangifera indica</i>	Mango	fruit	83.0	253	0.5	180	30	0.5	0.04	42
ANACARDIACEAE	<i>Anacardium occidentale</i>	Cashew	nut	4.0	2478	17.5	-	-	2.8	4.8	64
APIACEAE	<i>Daucus carota</i> subsp. <i>sativus</i>	Carrot	root (raw)	89.9	180	1.0	2813	6	0.6	0.4	57
ARECACEAE	<i>Borassus flabellifer</i>	Wine palm	fruit	89.4	139	0.7	208	35.1	1.7	0.3	38
ASTERACEAE	<i>Helianthus annuus</i>	Sunflower	seed	5.4	2385	22.8	5	1.4	6.8	5.1	59
BOMBACACEAE	<i>Adansonia digitata</i>	Boobab	fruit	16.0	1212	2.2	-	360	7.4	6.7	37
CHRYSOBALANACEAE	<i>Parinari curatellifolia</i>	Mobola plum	nut	2.6	2737	28.7	-	-	5.5	3.1	61
CLEOMACEAE	<i>Cleome viscosa</i>	Sticky cleome	leaf	80.4	-	5.6	-	-	24	-	33
CONVOLVULACEAE	<i>Ipomoea aquatica</i>	Kangkong	leaf	90.3	126	3.9	40	60	4.5	-	53
CUCURBITACEAE	<i>Luffa cylindrica</i>	Smooth loofah	leaf	90	113	5.1	-	95	11.5	-	34
CUCURBITACEAE	<i>Cucumis melo</i>	Cantaloupe	fruit	93.0	109	0.5	300	30	0.4	0.2	41
CUCURBITACEAE	<i>Cucurbita maxima</i>	Pumpkin	leaf	88.0	160	4.9	260	28	2.5	0.9	49
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	leaf (raw)	84.7	252	5.0	44	170	7.1	0.3	54
CYPERACEAE	<i>Eleocharis dulcis</i>	Chinese water chestnut	corm (dry)	50.8	635	3.7	-	52	95	1.9	58
DIOSCOREACEAE	<i>Dioscorea alata</i>	Greater yam	tuber	76.6	323	2.0	18	10	0.8	0.39	50
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	leaf	82.0	382	7.1	57	275	7.6	-	35
FABACEAE	<i>Arachis hypogaea</i>	Peanut	seed (dry)	4.5	2364	24.3	0	-	2.0	3.0	19
FABACEAE	<i>Glycine max</i>	Soybean	seed	9.0	1701	33.7	55	-	6.1	-	20
FABACEAE	<i>Parkia biglobosa</i>	African locust bean	seed			35					21
FABACEAE	<i>Senna tora</i>	Stinking cassia	seed	11.64		32.4			1.4		22
FABACEAE	<i>Sesbania grandiflora</i>	Sesbania	seed	10.4	-	68.2	-	-	-	-	23
FABACEAE	<i>Vigna radiata</i>	Mung bean	seed	11.0	1432	22.9	55	4	7.1	-	24
FABACEAE	<i>Faidherbia albida</i>	Apple ring acacia	seed	6.5	1437	24.8	-	-	6.8	2.6	25
FABACEAE	<i>Sesbania sesban</i>	Egyptian sesban	seed	9.2	1446	32.0	-	-	-	-	26
FABACEAE	<i>Senna occidentalis</i>	Coffee senna	leaf	84.9	205	5	-	17.9	12.7	-	32
FABACEAE	<i>Tamarindus indica</i>	Tamarind	fruit	38.7	995	2.3	20	60	1.1	0.7	47
LAMIACEAE	<i>Plectranthus rotundifolius</i>	African potato	tuber	76	393	1.4	-	1.0	6.0	-	56
LAMIACEAE	<i>Ocimum basilicum</i>	Sweet basil	seed	6.4	1051	14.4	938	61.2	42.0	5.8	60
LAURACEAE	<i>Persea americana</i>	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	44
MALPIGHIACEAE	<i>Byrsonima crassifolia</i>	Nance	fruit	82.8	276	0.1	50	140	17		40



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>Hibiscus sabdariffa</i>	Roselle	leaf	86.4	185	10.9	58	35	1.5	4.1	52
MORACEAE	<i>Treculia africana</i>	African breadfruit	seed (dry)	9.2	1555	12.6	-	-	320	-	63
MORACEAE	<i>Artocarpus altilis</i>	Breadfruit	leaf	75.5	314	5.0	-	-	17.5	-	27
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	46
NYCTAGINACEAE	<i>Boerhavia diffusa</i>	Hogweed	leaf	82.0	218	4.5	-	-	7.8	0.4	29
OPIACEAE	<i>Opilia amentacea</i>	Catkin blooming	leaf	9.2	-	14.8	-	3.9	15.7	3.2	31
PEDALIACEAE	<i>Sesamum indicum</i>	Sesame	seed (dry)	4.7	2397	17.7	1	-	14.6	7.8	65
POACEAE	<i>Acroceras amplexens</i>	Jajeo	seed	10.4	1388	6.5			4.0		11
POACEAE	<i>Cenchrus biflorus</i>	Sandbur grass	seed	9.8	1547	17.8	-	-	-	-	12
POACEAE	<i>Dactyloctenium aegyptium</i>	Comb fringe grass	seed	7.5	1234	9.8	-	-	6.9	4.7	13
POACEAE	<i>Digitaria exilis</i>	Hungry rice	seed (raw)	11.2	1470	7.1	0	-	8.5	0.82	14
POACEAE	<i>Oryza glaberrima</i>	Floating rice	seed	11.3	1538	7.4	-	-	3.4	-	15
POACEAE	<i>Oryza sativa</i>	Rice	seed (brown)	13.5	1480	7.6	-	-	2.8	-	16
POACEAE	<i>Pennisetum glaucum</i>	Bullrush millet	seed	11.6	1442	10.5	-	-	6.5	1.7	17
POACEAE	<i>Zea mays</i>	Maize	seed (mature)	10.4	1528	10.0	100	4	4.9	2.2	18
RUBIACEAE	<i>Sarcocephalus latifolius</i>	African peach	seeds	-	305	6.4	-	-	23.7	3.0	62
SOLANACEAE	<i>Capsicum annuum</i>	Capsicum	fruit (yellow raw)	92	113	1.0	24	183.5	0.5	0.2	48







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