# Potentially Important Food Plants of Ghana




Rotary

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

STRATHSPEY CHARITABLE TRUST

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

*www.foodplantsolutions.org*

# Potentially Important Food Plants of Ghana

**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.

This publication has been made possible through funding provided by the Strathspey Charitable Trust.

Food Plant Solutions Field Guide – Ghana, Version 1 (English) June 2025

**Preface**

This guide is based on information from the Food Plants International (FPI) database developed by Tasmanian agricultural scientist Bruce French, AO. 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 Ghana This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Ghana, 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. More detailed or specific information on plants, including references to material by other authors, is available on DVD on request.



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

# Contents

**INTRODUCTION** ..... **1**

**STARCHY STAPLES** ..... **10**

**LEGUMES** ..... **21**

**LEAFY GREENS** ..... **29**

**FRUIT** ..... **37**

**VEGETABLES** ..... **50**

**NUTS, SEEDS, HERBS AND OTHER FOODS** ..... **59**

**NUTRITIONAL VALUES OF FOOD PLANTS BY PLANT FAMILY** ..... **66**

## *Introduction*

Bruce Fench, AO – founder of Food Plants International (FPI) and developer of the FPI database
Edited by Food Plant Solutions

Potentially Important Food Plants of Ghana has been produced to provide information on approximately 40 edible plants that are known to grow in Ghana. 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**

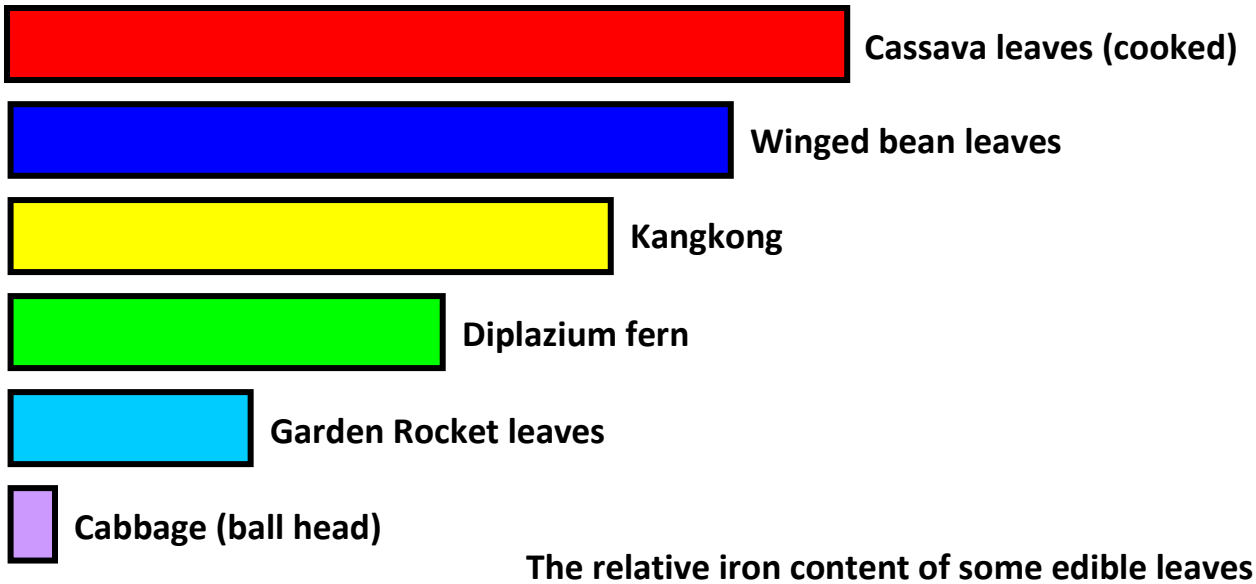
Many food plants have local names, as well as a common English name. Every type of plant also has its own scientific name. Although the scientific name might not be widely recognised, this is the link by which people in different countries and with different languages can recognise the same plant. We 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

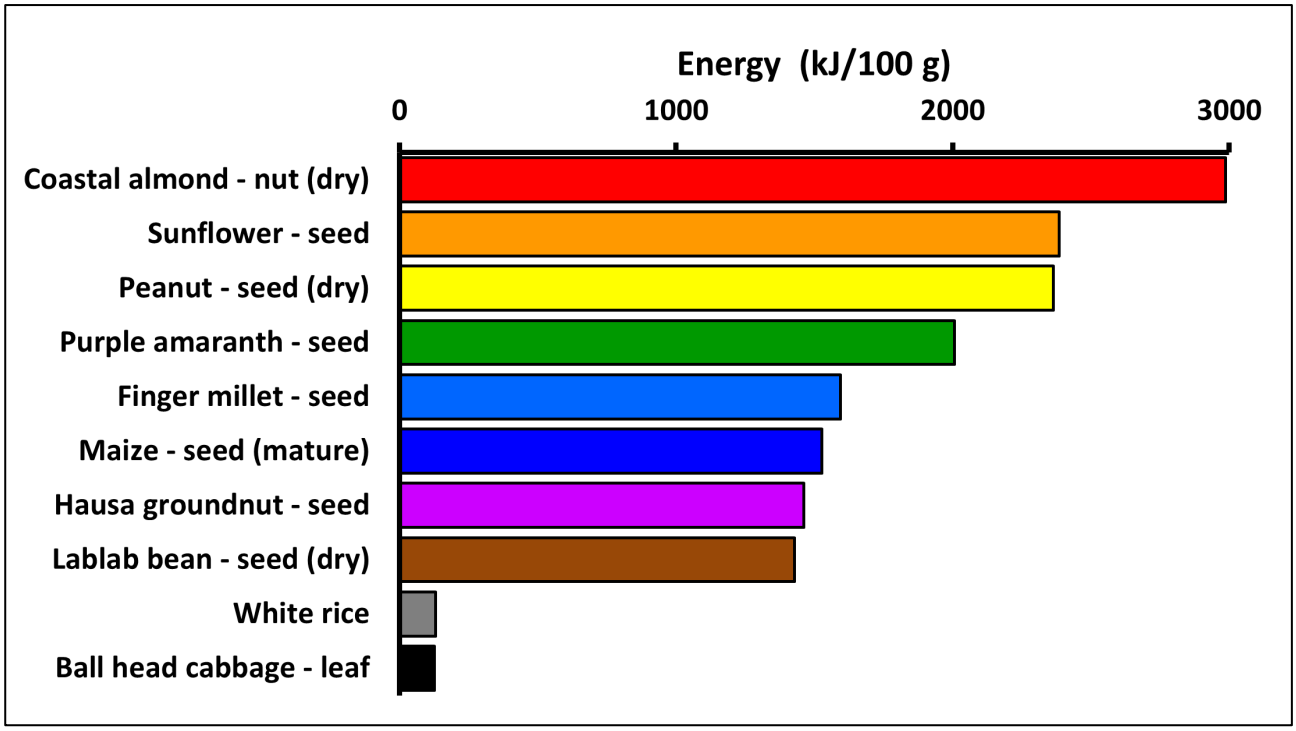
we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot 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 than damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage.

**Diseases**

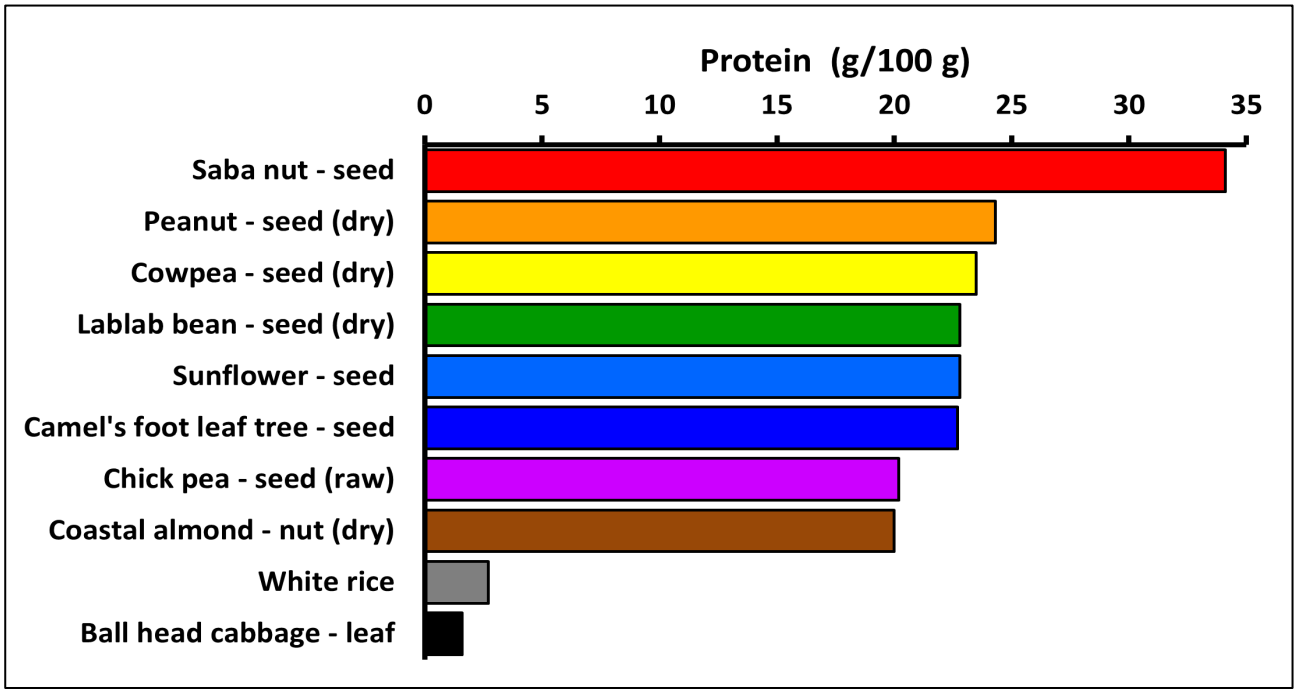
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct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

*Unless otherwise indicated, images in this publication have been sourced from the Food Plants International database (www.foodplantsinternational.com).*

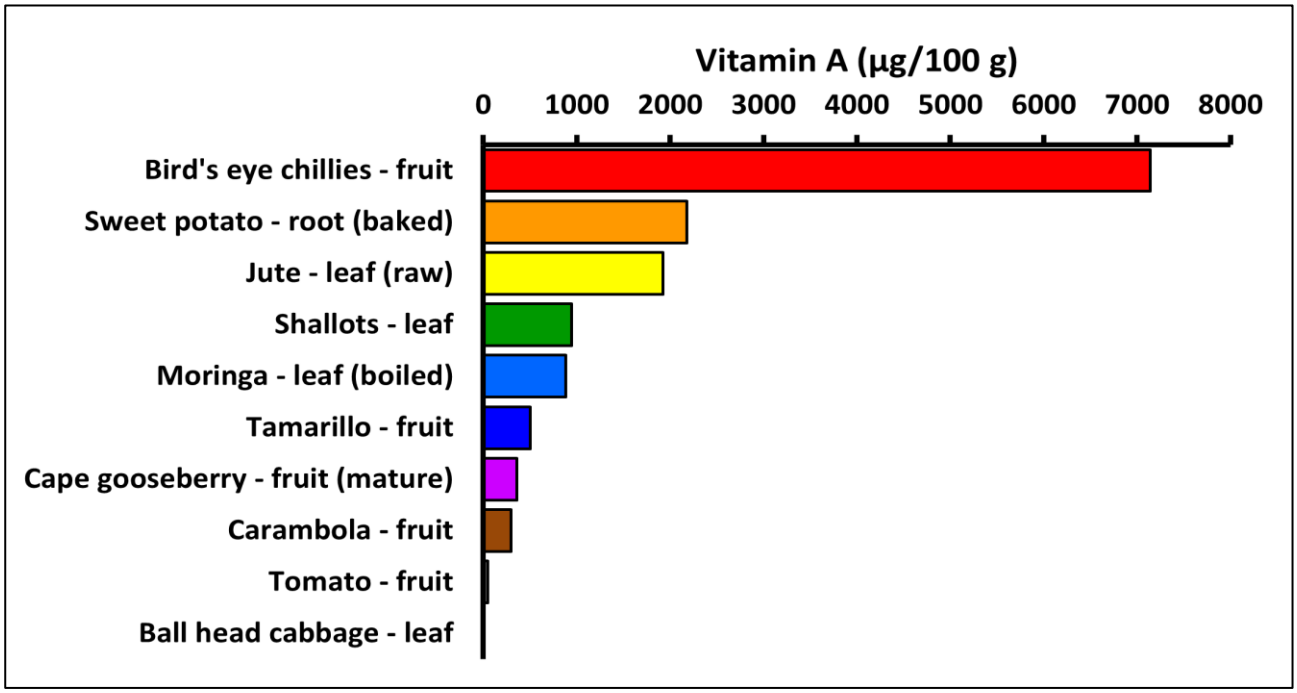
## Food value charts for a selection of plants from Ghana



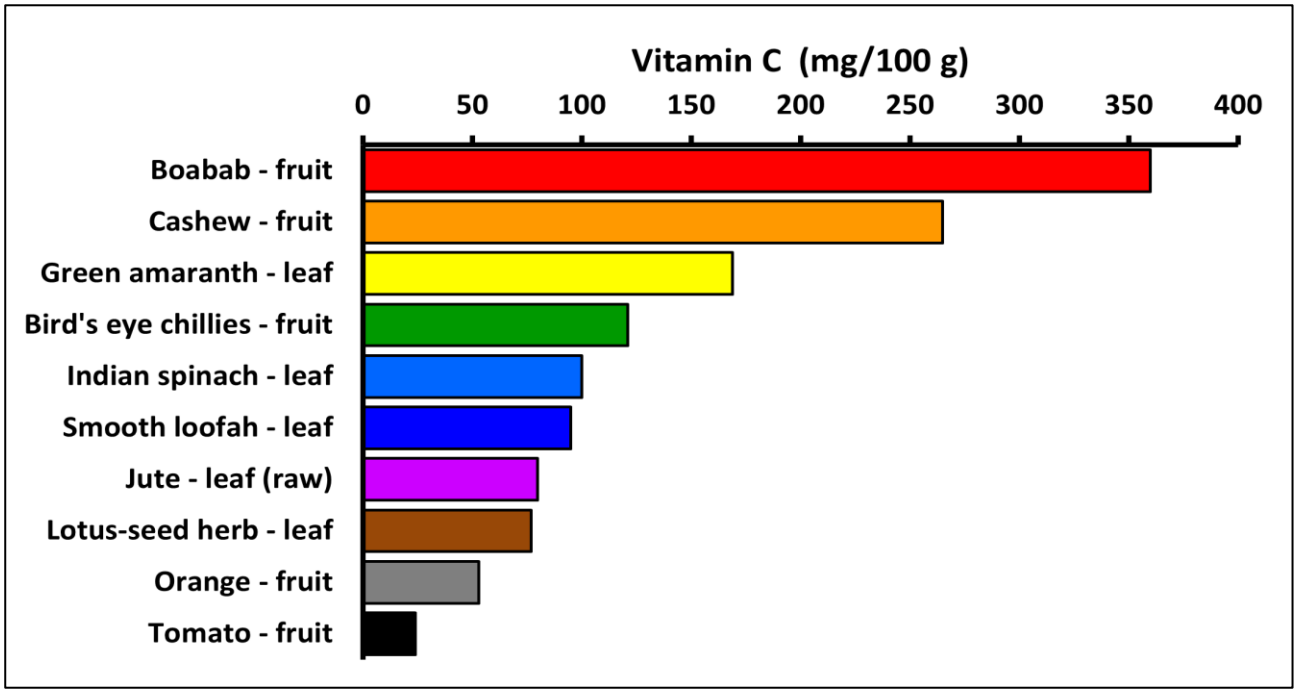

Energy is important for growth and repair of the body, blood flow and movement for work, exercise and play. All foods provide energy but foods containing oils, such as oil seeds, and starch, such as cereal grains and tubers, are particularly high in energy.



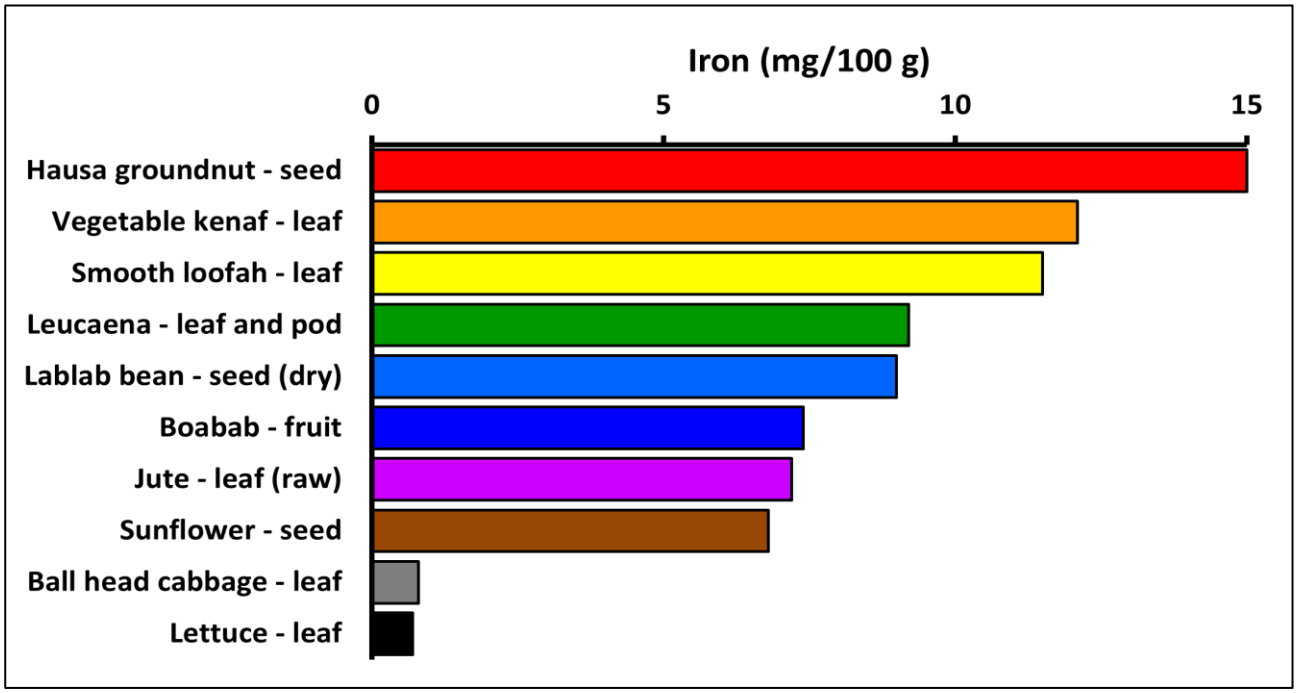

Protein helps the body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women. Symptoms of protein deficiency include wasting and shrinkage of muscle tissue, and slow growth (in children).



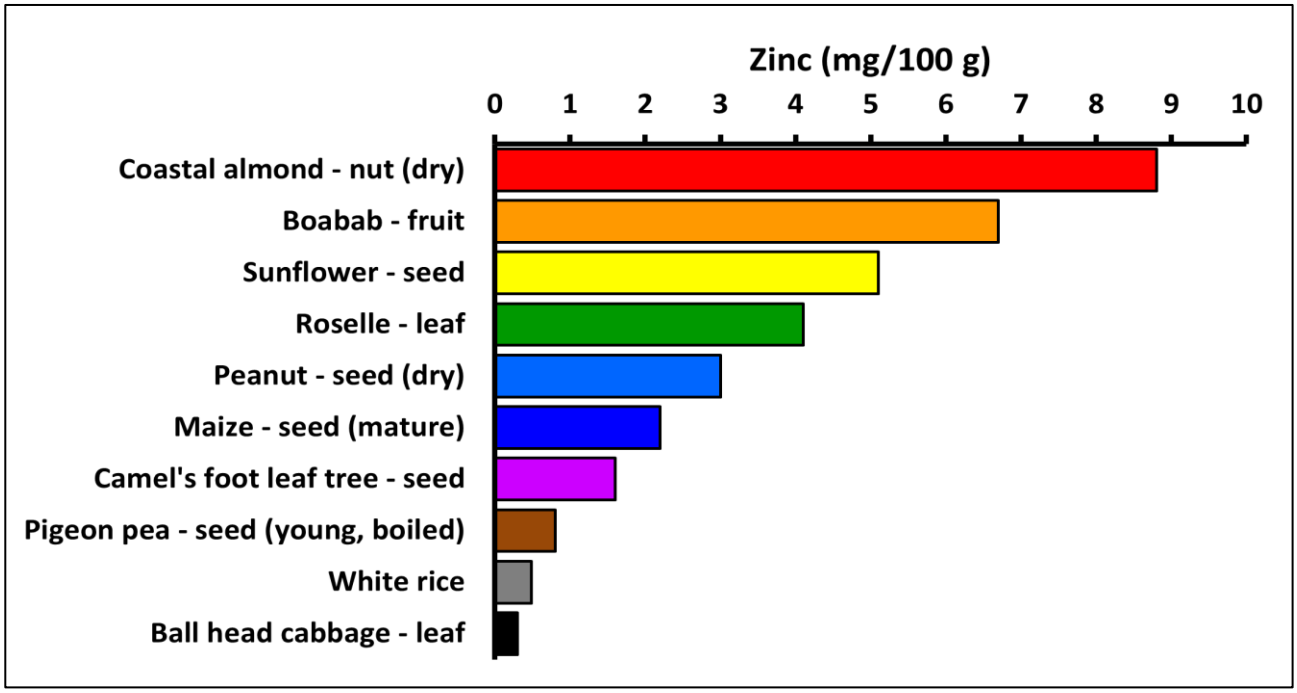

Vitamin A is very important for eyesight and fighting disease, particularly in infants, young children and pregnant women. People who are short of Vitamin A have trouble seeing at night.




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 widely grown may be omitted. Such foods are often in the starchy staple category (e.g. rice, maize). 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**: 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°C while the minimum is 20°C. The best temperature range is 25-30°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 setts 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 *Averrhoea 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 |

## Starchy staples

**Common name**: Lesser yam
**Local:**

**Scientific name:** *Dioscorea esculenta*
**Plant family: DIOSCOREACEAE**

**Description**: A prickly, climbing yam with a spiny vine. It can climb 1.2-2.4 m high and spread 1.8 m across. The vine twines to the left. The leaves are round with a gap where the leaf stalk joins. They are almost heart-shaped. The leaf is about 12 cm long. This yam produces a cluster (5-20) of tubers under the ground. The tubers are often sticky when cut. In many varieties, there are sharp thorns just under the ground. The flowers are green, 4 mm across and borne on long slender spikes. These are singly in the axils of leaves. There are many different varieties.

**Distribution**: It grows in many tropical countries, from sea level up to about 1500 m, but mostly below 800 m. It cannot tolerate water-logging and needs a reasonably long rainy season and a loose, fertile soil. It does poorly on sandy soils and becomes mis-shapen in heavy clay soils. High levels of organic matter promote growth. It suits hardiness zones 9-12. Lesser yam is an important root crop for the tropical humid lowlands.

**Use**: The tubers are cooked and eaten.

**Cultivation**: Normally, small tubers (50-75 g) are planted, but cut portions of a tuber can be used. Using either the top or the bottom section of a tuber gives better establishment and yield than middle portions. Using larger tubers gives larger individual tubers and higher yields for individual plants. With a spacing of 30 cm between plants and 100 cm between rows, about 2000 kg of planting material are used if 70 g tubers are used. Tubers are planted 8-12 cm below the ground. Plants can be grown from stem cuttings where a leaf and node are propagated under mist. This method is normally only used for increasing the amount of planting material of a selected variety. Planting in mounds assists drainage, improves aeration and makes harvesting easier. A spacing of 80-100 cm between plants is suitable. Planting is normally adjusted to fit in with the beginning of the rainy season. The growing season of 9-10 months is long and an extended wet season is therefore desirable. Stakes 2 m long are required. Lesser yams compete poorly in shade. Weed control is most critical during the first 3 months. As early growth of the plant is sustained from the tuber, fertilisers can be applied after planting. Added nitrogen fertiliser is more effectively used when plants are staked. Nitrogen is of more benefit for leaf growth in the early stages of plant development. Potassium is beneficial, although phosphorus applications often do not give significant responses, as lesser yams are efficient at extracting it from the soil.

**Production**: High yields can be obtained. Plants take about 9 months to reach maturity. In some varieties and under some conditions, leaves do not die-off and tubers must be harvested to avoid tubers rotting as new growth commences. Tubers need to be harvested and handled carefully. They must often be cut from the vine and can be washed and dried. Tubers will store for about 3 months under ventilated conditions above 15°C. Fungal growth and rots easily occur on cut or damaged surfaces under damp conditions. Tubers need to be peeled either before or after cooking.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| tuber | 74.2 | 470 | 2.1 | 84 | 20 | 0.75 | 0.5 |

## Starchy staples

**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 | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| tuber | 62.8 | 625 | 1.4 | 30 | 15 | 0.23 | 0.48 |
| leaf | 82.0 | 382 | 7.1 | 57 | 275 | 7.6 | - |

## Starchy staples

**Common name**: Finger millet
**Local:**

**Scientific name:** *Eleusine coracana*
**Plant family: POACEAE**

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

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

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

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

**Production**: It is self-pollinating and pollination occurs over 8-10 days. Millet seed stores very well and can be stored without damage for 10 years. Often it is stored on the head. Yields of about 450-900 kg of dried grain per hectare are usual. This can easily be increased to 1,650 kg per hectare. Crops take 3-6 months until harvest.

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

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

## 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 | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (mature) | 10.4 | 1528 | 10.0 | 100 | 4 | 4.9 | 2.2 |

## Starchy staples

**Common name:** Purple amaranth
**Local:**

**Scientific name:** *Amaranthus cruentus*
**Plant family: AMARANTHACEAE**

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

**Distribution**: It grows in the tropics and more temperate regions. In the tropics it grows mainly in the highlands. In Papua New Guinea it occurs between 1200 and 2200 m altitude. It needs a night temperature above 15°C and preferably a day temperatures above 25°C. It grows best in fertile, well drained soil and suits hardiness zones 8-11.

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 87.7 | 2006 | 14.7 | - | 0 | 3.8 | - |
| leaf | 84.0 | 176 | 4.6 | - | 64 | 8.9 | - |

## Starchy staples

**Common name**: Cocoyam
**Local:**

**Scientific name:** *Xanthosoma sagittifolium*
**Plant family: ARACEAE**

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

**Distribution**: It grows in many tropical countries and suits tropical rainforest regions. It can tolerate high rainfall and light shade. It does well in regions with an annual average temperature of 26°C and a well distributed rainfall of 1400-2100 mm during the growing season. It grows from sea level up to about 2000 m. Soils need to be well-drained, but moist with a pH of 5.5-6.8.

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| root | 67.1 | 559 | 1.6 | 5 | 13.6 | 0.4 | 0.5 |
| leaf | 90.6 | 143 | 2.5 | 3300 | 37 | 2.0 | - |
| shoot | 89.0 | 139 | 3.1 | - | 82 | 0.3 | - |

## *Legumes*

**Common name**: Chick pea
**Local:**

**Scientific name:** *Cicer arietinum*
**Plant family: FABACEAE**

**Description**: Chick peas are erect, annual herbs with a strong taproot. Plants grow up to 60 cm high and all parts are hairy. Plants are often bluish green in colour. The leaves are up to 5 cm long and have 9-15 pairs of leaflets along a stalk and a single leaflet at the end. The leaflets are 1-2 cm long by 0.3-1.4 cm wide and are strongly pointed and with a toothed edge. The flowers are carried singly on long stalks in the axils of leaves and are white, pink or purple. The flowers normally never open and are self pollinated. The pods are inflated, 2-3 cm long and have 1 or 2 seeds. The seeds are angular and up to 1 cm across. They have a pointed beak. The seed colour can vary from brown, white, red or black. There are many named varieties.

**Distribution**: Chick pea is a sub-tropical crop. It suits high altitudes in the tropics because it needs cold nights with dew. It is well suited to semi arid regions. It can tolerate salt and drought. It does not do well in warm, humid places. It needs well drained soil and is damaged by frost. For best growth, night temperatures between 18-26°C, and day temperatures of 21-29°C, are required. The temperature range of 8°C between day and night is required. Annual rainfall of 600-750 mm and a relative humidity of 20-40% is suitable. The best soil pH is 5.5-7.5 but they will grow on alkaline soils.

**Use**: Mainly the ripe seeds are eaten. They are most commonly boiled and mashed but they can also be roasted or fried or used in stews and soups. The young leaves, shoots and pods are sometimes eaten. Sprouted seeds can be eaten. When roasted they can be eaten as a snack. The seeds can also be used to make flour. Chick peas are used in hummus, couscous, falafel, and to make pita bread. They can be fermented into miso and tempeh and the roasted roots and seeds can be used as a coffee substitute.

**Cultivation**: Chick peas are grown from seed. Often other crops are grown mixed with Chick peas but these are planted 3-4 weeks after sowing the Chick peas. Seed should be planted 2-12 cm deep. Seed will germinate at temperatures above 5°C but are best above 15°C. Spacing plants 10 cm apart in rows 25-30 cm apart is suitable if plants are put in rows. Plants are cut and harvested when leaves turn brown.

**Production**: Yields of 400-1600 kg per hectare of seed are average for chick peas. Plants can reach maturity in 4.5-5 months, but 7 months or longer are taken for some types.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (raw) | 9.9 | 1362 | 20.2 | 190 | 3 | 6.4 | - |

## Legumes

**Common name**: Pigeon pea
**Local:**

**Scientific name:** *Cajanus cajan*
**Plant family: FABACEAE**

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

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

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

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

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

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

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

## Legumes

**Common name**: Lima bean
**Local:**

**Scientific name:** *Phaseolus lunatus*
**Plant family: FABACEAE**

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

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

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 12.0 | 1407 | 19.8 | - | - | 5.6 | - |
| seed (young, cooked) | 67.2 | 515 | 6.8 | 37 | 10.1 | 2.5 | 0.8 |
| seed (young, raw) | 70.2 | 473 | 6.8 | 30 | 23.4 | 3.1 | 0.8 |

## Legumes

**Common name**: Lablab bean
**Local:**

**Scientific name:** *Lablab purpureus*
**Plant family: FABACEAE**

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

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

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

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

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

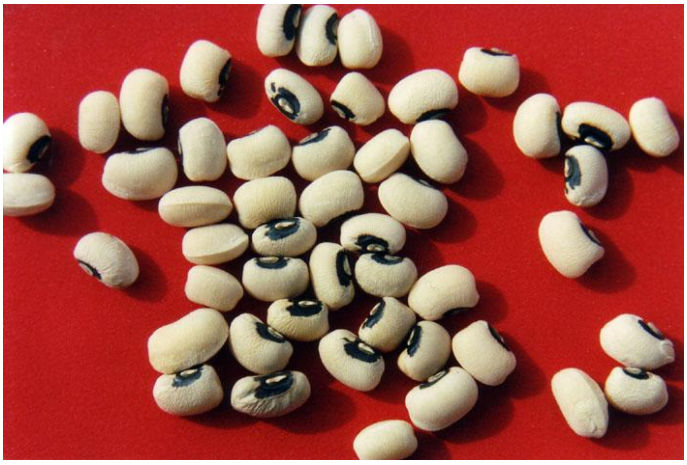
**Food Value:** Per 100 g edible portion

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

## Legumes

**Common name**: Cowpea
**Local:**

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



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

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

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

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

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

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

## Legumes

**Common name**: Leucaena
**Local:**

**Scientific name:** *Leucaena leucocephala*
**Plant family: FABACEAE**

**Description**: A small erect tree. It grows to 6-10 m high. It has fine divided leaves. The leaves have 2 rows of leaflets. The leaves are 15 to 25 cm long and the leaflets 8 to 16 cm long. They are a dark dull green on top and dull greyish green underneath. The flowers are white and in round heads. They are in the axils of leaves or on the ends of branches. The pods are flat and 10-15 cm long and 1.8 cm wide with 15-25 seeds inside. It has shiny brown seeds. There are 3 subspecies.

**Distribution**: It is a tropical plant. It is introduced and common at low and medium altitudes throughout the tropics. It is widespread from sea level up to about 1700 m altitude in the tropics. It is often used as shade for coffee. It is drought resistant. It grows in the Sahel. It can grow on dry and poor soils. It can tolerate salt. It needs well drained soil and full sun. It can grow in arid places. It suits hardiness zones 10-12.

**Use**: The mature seeds are toasted and ground and used as a coffee substitute. They are also added to stews. The young leaves are sometimes used as a vegetable. The leaves can be eaten in small amounts. The tender pods and shoots are cooked as a vegetable. They are used in curries. **Caution:** The leaves contain a chemical (mimosine) which causes hair to fall out.

**Cultivation**: It grows easily from seeds. It also regrows from cut stumps and it can be grown from cuttings. Plants are hard to eliminate and can become a weed problem in dry areas.

**Production**: It grows very quickly. It grows to 8 m in 18 months. It can stand only light frosts.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 79.5 | 284 | 2.9 | - | - | - | - |
| leaf and pod | 80.7 | 247 | 8.4 | - | - | 9.2 | - |

## Legumes

**English**: Camel's foot leaf tree
**Local:**

**Scientific name:** *Piliostigma thonningii*
**Plant family: FABACEAE**

**Description**: It is a leafy shrub or a spreading tree. It loses its leaves during the year. It can grow to 12 m tall. The leaves are broad and lobed. The bark is rough and brown. The leaves are simple and can be 20 cm across. The tip of the leaf has lobes and the base of the leaf has notches. The veins spread out from this notch. The upper surface of the leaf is green and the lower surface a lighter colour and with red veins. The leaves are on thick stalks. The male and female flowers are carried separately. The male heads have fewer flowers than the female. The flower buds are fat and oval. They are velvety and in long strings on sturdy stalks. The flowers are 2.5 cm wide. Only one or two flowers open at one time in a bunch. They hang downwards and drop off easily. The pods are large and woody. They are up to 23 cm long by 8 cm wide. They are green but turn brown. They are covered with tiny raised lines. The pods do not break open but fall off. The pods and seeds are edible.

**Distribution**: A tropical plant. It grows in open woodland and often near streams. It grows in the Sahel. In Ethiopia it grows at low and medium altitudes especially between 900-1700 m. It cannot stand cold temperatures or frost and is tolerant of drought. It grows in areas with an annual rainfall between 400-1200 mm. It can grow in arid places. It also grows on termite mounds. It grows in the lowlands. It grows in Miombo woodland in Africa.

**Use**: The dried pods and seeds are eaten when food is scarce. The young leaves are chewed to relieve thirst. The bark and dried leaves can be used to make tea.

**Cultivation**: Plants can be grown from seeds. The seeds are removed from a dry pod by breaking it open with a hammer. The seeds are put in hot water and soaked overnight. Then they are planted. Seeds germinate in 5-10 days. Seedlings are transplanted when the first adult leaves appear.

**Production**: It grows slowly. Fruit are produced during the rainy season.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 9.9 | 1381 | 22.7 | - | - | 4.7 | 1.6 |
| pod | 7.0 | 1079 | 4.8 | - | - | 6.8 | 0.3 |

## Legumes

**Common name**: Hausa groundnut
**Local:**

**Scientific name:** *Macrotyloma geocarpum*
**Plant family: FABACEAE**

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

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

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

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

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

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

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

Image sourced from: https://storage.googleapis.com/powop-assets/PPA/1275_1299/h1285f_fullsize.jpg

## *Leafy greens*

**English**: Indian spinach
**Local:**

**Scientific name:** *Basella alba*
**Plant family: BASELLACEAE**

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

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

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 85.0 | 202 | 5.0 | 56 | 100 | 4.0 | - |

## Leafy greens

**Common name**: Jute
**Local:**

**Scientific name:** *Corchorus olitorius*
**Plant family: MALVACEAE**

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

**Distribution**: A tropical plant. It is mostly coastal, below 250 m altitude. Temperatures of 22-35°C are suitable. It can stand both drought (2-3 weeks) and water-logging, except when young. A well-drained soil is best. They require humus-rich soils. A soil pH of 5.5-7.0 is best, but they can grow in soils with pH up to 8.5. They also need adequate moisture for good leaf production. A rainfall of 1000 mm is suitable. A high relative humidity (80-90%) is best. It produces seeds when day lengths are short. It grows in most African and Asian countries.

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf (raw) | 80.4 | 244 | 4.5 | 1923 | 80 | 7.2 | - |
| leaf (cooked) | 87.2 | 155 | 3.4 | 156 | 33.0 | 3.1 | 0.8 |

## Leafy greens

**Common name**: Silver spinach
**Local:**

**Scientific name:** *Celosia trigyna*
**Plant family: AMARANTHACEAE**

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

**Distribution**: A tropical plant that grows in tropical lowlands and highlands in Africa. It is often along the coast but grows from sea level to 1960 m above sea level. It needs an annual rainfall of up to 2500 mm and an average temperature of 25-30°C. It cannot tolerate a temperature below 15°C. It grows best on fertile, well drained soils.

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

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

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

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

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

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

## Leafy greens

**Common name**: Vegetable kenaf
**Local:**

**Scientific name:** *Hibiscus cannabinus*
**Plant family: MALVACEAE**

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

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

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

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

**Production**:

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (dry) | 8.1 | 1785 | 20.2 | - | - | - | - |
| leaf | 79.0 | 280 | 5.5 | 34 | - | 12.1 | - |

## Leafy greens

**Common name**: 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 | Vitamin 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 | - |

## Leafy greens

**Common name**: Kangkong
**Local:**

**Scientific name:** *Ipomoea aquatica*
**Plant family: CONVOLVULACEAE**

**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 | Vitamin 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 |

## Leafy greens

**Common name**: Lotus-seed herb
**Local:**

**Scientific name:** *Alternanthera sessilis*
**Plant family: AMARANTHACEAE**

**Description**: A low lying and spreading plant which has many branches. It continues to grow from year to year. It has a strong taproot. The stem and branches are up to 60-100 cm long and near the ends there are 2 lines of hairs along the stem. The leaves are smooth and attached to the stem without a stalk. They are opposite. The leaves are 1-10 cm long and 0.2-2 cm wide. The flowers heads are white and 5-7 mm long. They grow along the plant and do not have flower stalks. It flowers all year round. The fruit are oval and compressed on the side. The seed is about 1.5 cm across. When plants are growing in water the stems become hollow and the plants float.

**Distribution**: A tropical plant. It grows in the lowlands and the highlands. It occurs in most tropical places. It is common in waste land at low and medium altitudes in the Philippines. It grows in open moist places from sea level to 2000 m in Papua New Guinea. In Fiji it grows from sea level to 500 m. In Nepal it grows to 2400 m altitude. It can grow in arid places. It is best in alkaline soil. It can grow in seasonally water logged soils and near rivers and ditches.

**Use**: The leaves and tender tips are cooked and eaten. They are used in soups. It is also used to prepare a cool drink. The harvested leaves can only be stored for 2-3 days.

**Cultivation**: It can be grown by dividing the underground stem. It can also be grown from sections which root at then nodes. It can be grown by seed.

**Production**: The first harvest of leaves can be taken 50-60 days after planting.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 89.3 | 109 | 4.5 | 57 | 77 | - | - |
| shoot | - | - | 5.0 | 577 | - | 16.7 | - |

Image sourced from: https://commons.wikimedia.org/wiki/File:Alternanthera_sessilis.jpg

## Leafy greens

**Common name**: Green amaranth
**Local:**

**Scientific name:** *Amaranthus viridis*
**Plant family: AMARANTHACEAE**

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

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 87.3 | 148 | 4.5 | 72 | 169 | 6.0 | - |

Image sourced from: https://c2.staticflickr.com/8/7032/6410387909_045351f52d_b.jpg

## *Fruit*

**Common name**: Hybrid plantains
**Local:**

**Scientific name:** *Musa x paradisiaca*
**Plant family: MUSACEAE**

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

**Distribution**: A tropical and subtropical plant that grows from sea level up to about 2000 m altitude in the tropics. They are rarely an important food above about 1600 m. In Nepal they grow to about 1800 m altitude. They do best in warm and humid tropical climates. Temperatures need to be above 15°C. The best temperature is 27°C. The maximum growing temperature is 38°C. Bananas grow best in full sun. For best growth, a rainfall of 200-220 mm per month is needed. A deep friable soil is best. They can tolerate a pH of 4.5-7.5. It suits hardiness zones 10-12.

**Use**: Fruit are eaten raw or cooked depending on variety. Male buds and flowers are eaten on some varieties. They are cooked as a vegetable. The central pith of the false stem and the underground rhizome are also sometimes eaten. Although it has little food value, the corm can be boiled, dried and eaten with the false stem.

**Cultivation**: They are planted from sword suckers. Diploids need re-planting annually but many triploids can be re-suckered from the base on the same site. Spacing depends on variety. A population of 1000 – 3000 plants per hectare is used, depending on variety. Suckers are usually planted 30 cm deep.

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit (cooking) | 65.3 | 510 | 2.0 | 113 | 18.4 | 0.6 | 0.1 |
| fruit (sweet) | 70.7 | 337 | 1.1 | 200 | 10 | 0.4 | 0.2 |
| stem | 88.3 | 176 | 0.5 | - | 7 | - | - |
| flower bud | 91.3 | 109 | 1.6 | - | - | 1.0 | - |

## 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 | Vitamin 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**: Carambola
**Local:**

**Scientific name:** *Averrhoa carambola*
**Plant family: OXALIDACEAE**

**Description**: A small, evergreen tree, growing 6-12 m tall. The trunk of the tree is short and crooked, and has branches near the base. The bark is smooth and dark grey. A leaf is made up of 2-11 leaflets, with a leaflet at the end. The leaves are darker and more shiny on the top surface. The flowers are small (8 mm long), red and white, and in clusters on the small branches. The fruit are star-shaped with five or six angled ridges. They are yellow and up to 16 cm long and 9 cm wide. The flesh is white. There are one or two shiny light brown seeds, about 1 cm long, in the bottom of each lobe. Some carambola have short styles (female flower parts) and these types need to be cross-pollinated by insects. This means two types need planting. Long style types can fertilise themselves. Fruit flavour can vary from very sour to very sweet.

**Distribution**: It has been taken to many tropical countries. Carambola needs a warm tropical climate, so it is mostly seen in the coastal lowlands below about 500 m altitude. It will grow up to 1200 m in the equatorial tropics. Mature trees can tolerate slight frost. It can grow on several different types of soil. The soil should be well-drained. It will grow on alkaline soils, but is better in acid soils. It cannot tolerate water-logging. It is suited to moist places, but performs better in areas where there is some dry season rather than in places with heavy, constant rain. Trees are fairly wind-resistant, providing the winds are not cold. Trees are stressed by temperatures near 0°C as well as above 37°C. It suits hardiness zones 10-12.

**Use**: Fruit can be eaten raw or used for drinks. They are used in curries. They can be used for souring dishes. They are also used for jams, jellies, preserves and pickles. **Caution:** The fruit contain soluble oxalates.

**Cultivation**: Trees are grown from seed. Seeds grow easily, but only a small number of seeds are fertile. Well-developed seeds should be chosen. Seeds are planted in a seed bed and planted out when 15-20 cm high. Because seeds are produced by cross-pollination, variation is common. It is therefore better to use budding or grafting. Taking buds off good trees, or grafting twigs from them onto 1 year old seedling roots, is the most common method. Air-layering can also be used, although it is difficult. A spacing of 6 m x 6 m is suitable. Trees need to be grafted if sweeter kinds of fruit are to be selected. Because the seeds are covered by a fatty layer, washing them with soap improves the germination.

**Production**: Seedling trees fruit after 4-5 years. They can produce 400 fruit per tree. Flowers open after 14-21 days and fruit mature after 14-15 weeks. Trees live for a long time. Flowers and fruit can be found on the tree at most times of the year, although there are often 2 or 3 main flushes of flowering and fruiting. Fruiting tends to be seasonal, about March to May in the southern hemisphere. Trees do not require pruning or any special care once established. Flowers are cross-pollinated by bees, flies and other insects. Hand-pollination does not help much with fruit set. Once ripe, fruit will keep for 7-20 days, but can be stored longer at 12°C.

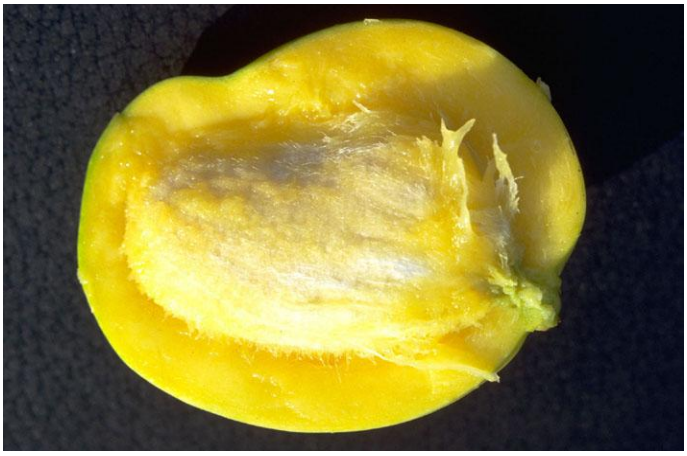
**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 90.8 | 149 | 0.5 | 300 | 40 | 1.0 | 0.1 |

## 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.

**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 | Vitamin 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**: Cape gooseberry
**Local:**

**Scientific name:** *Physalis peruviana*
**Plant family: SOLANACEAE**

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

**Distribution**: A temperate plant that grows in the tropical highlands. It suits warm climates and does best in warm sunny conditions. It needs well drained soil. Plants are not killed by a slight frost but it grows best free from severe frosts and strong winds. In Indonesia plants are found from 700-2300 m altitude, but fruit best above 1500 m. It can grow in arid places and suits hardiness zones 8-10.

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

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

**Production**: Plants produce fruit in 1 year.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit (mature) | 84.2 | 201 | 2.0 | 360 | 30 | 1.5 | - |

## Fruit

**Common name**: Pawpaw
**Local:**

**Scientific name:** *Carica papaya*
**Plant family: CARICACEAE**

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

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

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 75.4 | 378 | 8.0 | - | 140 | 0.77 | - |
| fruit | 88.0 | 163 | 0.5 | 290 | 54 | 0.4 | 0.18 |
| fruit (unripe) | 92.1 | 109 | 1.0 | - | - | 0.3 | - |

## Fruit

**Common name**: Tamarillo
**Local:**

**Scientific name:** *Cyphomandra betacea*
**Plant family: SOLANACEAE**

**Description**: A small, soft-wooded fruit tree in the tomato and tobacco family. It grows as a shrub up to 4 m tall and is shallow rooted. The brittle stem is 5-10 cm across. The leaves are large (25 cm x 12 cm) and soft and heart-shaped at the base. The sweet smelling flowers are 1-2 cm across and occur in loose clusters near the ends of branches. Flowers are normally self-pollinating but need wind. The red or orange egg-shaped fruit are 6-12 cm long and hang off the ends of the branches. The skin of the fruit is somewhat tough, but the flesh around the seeds is soft and juicy. The edible flesh varies from yellow to dark purple. The edible seeds are black, thin and nearly flat. There are several named cultivated varieties.

**Distribution**: A subtropical plant suited to tropical highlands. It grows at 750-2200 m altitude in the equatorial tropics, and up to 3000 m in the continental tropics. It is more cold hardy than tomato, and does best where average temperatures are 15-21°C. It cannot stand much frost, although mature trees will survive short periods of light frosts. It can't stand water-logging or drought. Trees can grow under shade but do better in sun, unless it is hot and dry. Deep, fertile, permeable, disease-free soil is best. Plants don't fruit at low altitudes in the tropics due to constant high temperatures. They need shelter from wind. It suits hardiness zones 9-11.

**Use**: The fruit is eaten raw or cooked. The layer just under the skin can be bitter. The layer around the seeds is sweet. The seeds can be eaten, or strained out. The outside skin is easily removed by immersing fruit in boiling water for 1-2 minutes. The fruit can be boiled, stewed, grilled, baked or pickled, or used in jams, jellies, chutneys, conserves, pies, preserves and sauces.

**Cultivation**: They can be grown from seed or cuttings. Seeds grow better if they are washed and dried, then placed in a freezer for 24 hours before planting out. Seeds produce a high branched erect tree. Cuttings produce a lower bushier plant. Cuttings of 60-90 cm long stalks are suitable and should be taken from 1-2 year old wood which is 1-2 cm thick. Root cuttings can also be used. It has shallow roots, so needs careful weeding. A spacing of 3 m apart is sufficient. Because the roots are easily damaged by nematodes, plants grafted or budded onto nematode resistant rootstocks will live longer. Root rot fungus can make it difficult to get plants established in old gardens. High humidity can also cause stem rots. Young plants can be pruned to produce lower branches and fruiting. Fruit is produced on new branches, so branches which have fruited can be pruned out. Flowers are self-compatible so pollination by wind can occur within the one plant.

**Production**: Fruiting commences in the second year when grown from seed. Trees bear hundreds of fruit throughout the year. Yields of 20 kg per plant are possible. Trees live 5-6 years, although if infested with root knot nematodes, may live only 3-4 years. Fruit are ready to harvest when the red or yellow colour develops. Fruit can be stored above 3°C in a refrigerator for 10 weeks.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 86.2 | 113 | 2.0 | 500 | 28 | 0.7 | - |

## Fruit

**Common name**: Strangler fig
**Local:**

**Scientific name:** *Ficus thonningii*
**Plant family: MORACEAE**

**Description**: A fig tree that can lose its leaves during the dry season of the year. It is often a strangler fig on oil palm. It grows 12-25 m tall. It can grow in soil or attached to other plants. It can be a climber. It can have buttresses or have several stems. The crown is dark and rounded and spreading. The bark is smooth and grey. The leafy twigs are 2-8 mm thick. The leaves are arranged in spirals. The leaves vary. They are often oval. The leaves are 3-12 cm long by 2-6 cm wide. There are 7-12 pairs of side veins. The young leaves are pale and hairy underneath. The fig fruit are about 1 cm across. The fruit often occur in pairs in the axils of the leaves. They become purple-red when ripe.

**Distribution**: A tropical plant. It grows in wet and dry upland forest. It also grows in open grassland, woodland and swamp forest and along rivers. It can be on the edges of mangroves. It grows in the Sahel. It grows in areas with a 700-1800 mm rainfall. It grows in savannah forest often on stony hills in West Africa. It grows between 1000-2500 m altitude. It is drought tolerant. It can grow in arid places. It suits hardiness zones 7-9.

**Use**: The fig fruit are eaten raw. They are also used for jams and jellies and for alcoholic drinks. The leaves are eaten raw in salads.

**Cultivation**: It can be grown from seed or from cuttings. The fruit are dried and the seeds removed. The fruit can be soaked in cold water for a day then turned inside out to remove the seeds. Cuttings 15 cm long by 1 cm wide are suitable. It can also be grown from large branches 2-3 m long by 10 cm wide.

**Production**: It is fast growing. Fruit are often infested with insects.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 77.1 | 318 | 3.0 | - | - | 10.0 | - |
| fruit | 77.9 | 209 | 1.3 | - | 2.6 | 1.0 | 0.3 |

## Fruit

**Common name**: Gumvine
**Local:**

**Scientific name:** *Saba senegalensis*
**Plant family: APOCYNACEAE**

**Description**: A creeper or liana. It grows over 40 m long. It can be 47 cm around. The trunk can be 20 cm across. The leaves are opposite and twice as long as wide. The flowers are in groups of 3-30 and a loose group. They are tube shaped and have a yellow throat. The fruit are oval and 6 cm long and 8 cm across. The pulp is yellow. It is sweet-sour, soft and edible.

**Distribution**: A tropical plant. It grows on the edges of forests in West Africa.

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

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

**Production**:

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 80.0 | 297 | - | 0.8 | 36 | 1.0 | - |

Image sourced from:
http://www.westafricanplants.senckenberg.de/images/pictures/saba_senegalensis_sylpir_37869548-60117922_1369_9ffea1.jpg

## *Vegetables*

**Common name**: Moringa
**Local:**

**Scientific name:** *Moringa oleifera*
**Plant family: MORINGACEAE**

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

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

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

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

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

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

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

## Vegetables

**Common name**: Shallots
**Local:**

**Scientific name:** *Allium cepa var aggregatum*
**Plant family: AMARYLLIDACEAE**

**Description**: These onion like plants produce a cluster of bulbs. They are narrowly oval. It grows to 1.2 m high. The leaves are round and hollow. This is a genuinely perennial form of *Allium cepa*, the bulb grows deeper in the soil and divides to produce a number of underground bulbs each year in much the same way as shallots. Large bulbs divide to form 5-15 bulbs whilst smaller bulbs grow into one large bulb. They do not produce bulbils in the flower-head.

**Distribution**: A temperate plant. They can be grown throughout the country but do best in the cooler higher places. They need a fertile well drained soil. They are frost resistant. They tolerate a pH in the range 4.5-8.3. It suits hardiness zones 5-10.

**Use**: The bulbs are eaten raw or cooked. The leaves are eaten raw or cooked. The flowers are used raw or to flavour salads.

**Cultivation**: Normally plants are grown by planting one bulb. It is best to plant them on slightly raised beds. Plants should be about 20 cm apart.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 90.0 | 126 | 1.8 | 945 | 19 | 3.7 | - |
| bulb | 81 | 281 | 1.9 | - | 2 | 0.8 | - |

## Vegetables

**Common name**: Choko
**Local:**

**Scientific name:** *Sechium edule*
**Plant family: CUCURBITACEAE**

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

**Distribution**: A tropical and subtropical plant. Choko requires relative humidity of 80-85%, annual rainfall of at least 1500-2000 mm and average temperatures of 20-25°C with limits of 12-28°C. In equatorial tropical regions, chokos will grow from sea level to about 2,200 m altitude. In the lowlands it grows best in shade. Chokos need a reasonably well drained soil. It can grow in arid places. It suits hardiness zones 9-12.

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

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

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

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

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

## Vegetables

**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 | Vitamin 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

## Vegetables

**Common name**: Okra
**Local:**

**Scientific name:** *Abelmoschus esculentus*
**Plant family: MALVACEAE**

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

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

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

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

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

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

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

## Vegetables

**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 branhes. 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 m. 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 | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 94.3 | 79 | 1.1 | - | - | 0.7 | - |
| leaf | 90 | 113 | 5.1 | - | 95 | 11.5 | - |

## Vegetables

**Common name**: Sweet potato
**Local:**

**Scientific name:** *Ipomoea batatas*
**Plant family: CONVOLVULACEAE**

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

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

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

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

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

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

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

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

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| root (baked) | 72.9 | 431 | 1.7 | 2182 | 24.6 | 0.5 | 0.3 |
| root (raw) | 70.0 | 387 | 1.2 | 4000 | 25 | 0.7 | 0.4 |
| root (boiled) | 72.0 | 363 | 1.1 | 1705 | 15 | 0.6 | 0.3 |
| leaf | 86.3 | 168 | 3.9 | 105 | 58 | 2.9 | - |

## Vegetables

**Common name**: Eggplant
**Local:**

**Scientific name:** *Solanum melongena*
**Plant family: SOLANACEAE**

**Description**: A perennial shrubby herb up to 1 m tall. It is often grown as an annual. It has a deep taproot and branched side roots. The stem is thick and covered with many woolly hairs. The plant has many branches. Often the plant is spiny. Leaves can be 20 cm long and wavy along the edge. Leaves are covered with hairs. Flowers are bluish red and 5 cm across. They are either solitary or in small groups opposite the leaves. They have 5 large woolly lobes which continue to surround the base of the fruit. Fruit are white, blue, green or purple. The fruit colour and shape vary. Sometimes the fruit is spiny. Often the fruit are 10-20 cm long and 5-8 cm wide. Numerous kidney shaped seeds are in the flesh of the berry. There are many cultivated varieties.

**Distribution**: A tropical plant. Plants grow from sea level up to 2200 m altitude in the tropics. It suits wet climates but does well in dry climates with irrigation. It needs a long warm growing period. A daily mean temperature of 20-30°C is most suitable. They are frost tender. They need a rich, friable, well tilled soil. In the sub-tropics they can be grown as a summer crop.

**Use**: Fruit are mostly fried then eaten. They can also be grilled, baked, stuffed and stewed. They are used in curries. The fruit are also dried and stored. The leaves, although edible, are hairy and not good flavor.

**Cultivation**: Plants are grown from seeds. Seeds germinate slowly. At the best temperature, they germinate in 8-12 days. Seed are sown in nursery beds. Seedlings can be transplanted when about 8 cm tall or 4-6 weeks old. Plants need to be about 60-100 cm apart. Because some cross pollination can occur, seed crops need to have varieties planted 400 m apart.

**Production**: Fruit are ready for harvest after 3 months. They continue to yield for 3-4 months.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 91.8 | 117 | 0.8 | 6 | 1.3 | 0.4 | 0.2 |
| fruit (fresh) | 93.4 | 62 | 0.7 | 50 | 5 | 0.4 | 0.3 |
| leaf | 86.4 | 198 | 4.6 | 280 | - | 3.4 | 0.6 |

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

**Common name**: Saba nut
**Local:**

**Scientific name:** *Pachira glabra*
**Plant family: MALVACEAE**

**Description**: A tropical plant. It is native to Central America. It grows on alluvial plains and lowland rainforests. It suits humid locations.

**Distribution**: A small tree. It grows 17 m high. The trunk is bright green. The leaves have 5-7 leaflets. The leaves have long leaf stalks. The flowers come out at night. They have light green strap-like petals. The stamen is white and curved. The fruit is a green capsule 12.5 cm long. It contains many large seed. It is like a cocoa pod. There are 10-24 seeds.

**Use**: The seeds are eaten fresh, boiled or roasted.

**Cultivation**: Plants are grown from seed. Cuttings or air-layering can also be used. The seeds are harvested from the fruit once they are open. Seeds are sown when fresh. They germinate in 5-10 days. The rate of germination is high. Seedlings can be transplanted into the field in 4 months.

**Production**:

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 66 | - | 34.1 | - | - | - | - |

Image sourced from:
https://zoom50.wordpress.com/2010/10/06/sabamoney-tree-pachira-glabra/

## 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 | Vitamin 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**: Yellow nutsedge
**Local:**

**Scientific name:** *Cyperus esculentus*
**Plant family: CYPERACEAE**

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

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

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

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

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

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

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

## Nuts, seeds, herbs and other foods

**Common name**: Coastal almond
**Local:**

**Scientific name:** *Terminalia catappa*
**Plant family: COMBRETACEAE**

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

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

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

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

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

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

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

## Nuts, seeds, herbs and other foods

**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 | Vitamin 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 | - |

## 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 | Vitamin 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**: Bird's eye chillies
**Local:**

**Scientific name:** *Capsicum frutescens*
**Plant family: SOLANACEAE**

**Description**: It is a shrubby, perennial plant growing about 1 m tall. The leaves are smaller than round capsicums or bell peppers. Two or more flowers occur together in the axils of leaves. They have small pointed fruit about 1-2 cm long and they are red when ripe. They have a very hot taste when eaten or touched on the lips.

**Distribution**: It is grown in most tropical countries. It grows from sea level up to about 1800 m altitude in the equatorial tropics. It can't tolerate water-logging or frost. It tolerates high temperatures and a wide range of rainfall. Very high rainfall leads to poor fruit set and rotting of fruit. Soil needs to be well-drained and, preferably, fertile with adequate organic material. Light, loamy soils rich in lime are best. It suits hardiness zones 10-12.

**Use**: The leaves are eaten for their mild, spicy taste. The leaves are eaten cooked. The fruit can be used in very small quantities to spice food. The small, red fruit are very hot to eat due to a chemical called capsaicin. They are used to add spice and flavour to other foods. It would not be appropriate to eat sufficient of Bird's eye chilli fruit to significantly affect nutrition.

**Cultivation**: The seeds are dried in the sun. They are small. For large-scale plantings, 1.8-2.3 kg/ha of seed is needed. Seed is best sown in nurseries and the seedlings transplanted when they have 4-5 leaves (after 3-4 weeks). They can be transplanted at about 0.8 m spacing. Pruning out the tops can increase branching. This is often done 10 days before transplanting. Excessive nitrogen can reduce fruit setting.

**Production**: The first picking of fruit can occur 3 months after planting and continue about every two weeks. Plants continue to be harvested for about 4-5 years before replanting. For dried chillies, the fruit are dried in the sun for 3-15 days. The fresh weight is reduced by about two thirds during drying. Yields of dry chillies can be from 300-2500 kg/ha depending on growing conditions, irrigation, etc.

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

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | Vitamin C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 74.0 | 395 | 4.1 | 7140 | 121 | 2.9 | - |

## *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** | *Amaranthus cruentus* | Purple amaranth | seed | 87.7 | 2006 | 14.7 | - | 0 | 3.8 | - | 18 |
| **AMARANTHACEAE** | *Celosia trigyna* | Silver spinach | leaf | 89.0 | 139 | 2.7 | 94 | 10 | 5.0 | - | 31 |
| **AMARANTHACEAE** | *Alternanthera sessilis* | Lotus-seed herb | leaf | 89.3 | 109 | 4.5 | 57 | 77 | - | - | 35 |
| **AMARANTHACEAE** | *Amaranthus viridis* | Green amaranth | leaf | 87.3 | 148 | 4.5 | 72 | 169 | 6.0 | - | 36 |
| **AMARYLLIDACEAE** | *Allium cepa var aggregatum* | Shallots | leaf | 90.0 | 126 | 1.8 | 945 | 19 | 3.7 | - | 51 |
| **ANACARDIACEAE** | *Mangifera indica* | Mango | fruit | 83.0 | 253 | 0.5 | 180 | 30 | 0.5 | 0.04 | 41 |
| **ANACARDIACEAE** | *Anacardium occidentale* | Cashew | fruit | 84.7 | 213 | 0.8 | 0.12 | 265 | 1.0 | 0.2 | 64 |
| **APOCYNACEAE** | *Saba senegalensis* | Gumvine | fruit | 80.0 | 297 | - | 0.8 | 36 | 1.0 | - | 49 |
| **ARACEAE** | *Xanthosoma sagittifolium* | Cocoyam | root | 67.1 | 559 | 1.6 | 5 | 13.6 | 0.4 | 0.5 | 19 |
| **ASTERACEAE** | *Helianthus annuus* | Sunflower | seed | 5.4 | 2385 | 22.8 | 5 | 1.4 | 6.8 | 5.1 | 60 |
| **BASELLACEAE** | *Basella alba* | Indian spinach | leaf | 85.0 | 202 | 5.0 | 56 | 100 | 4.0 | - | 29 |
| **BOMBACACEAE** | *Adansonia digitata* | Boabab | fruit | 16.0 | 1212 | 2.2 | - | 360 | 7.4 | 6.7 | 38 |
| **CARICACEAE** | *Carica papaya* | Pawpaw | fruit | 88.0 | 163 | 0.5 | 290 | 54 | 0.4 | 0.18 | 44 |
| **COMBRETACEAE** | *Terminalia catappa* | Coastal almond | nut (dry) | 4.2 | 2987 | 20.0 | - | 2 | 6.3 | 8.8 | 62 |
| **CONVOLVULACEAE** | *Ipomoea aquatica* | Kangkong | leaf | 90.3 | 126 | 3.9 | 40 | 60 | 4.5 | - | 34 |
| **CONVOLVULACEAE** | *Ipomoea batatas* | Sweet potato | root (baked) | 72.9 | 431 | 1.7 | 2182 | 24.6 | 0.5 | 0.3 | 56 |
| **CUCURBITACEAE** | *Sechium edule* | Choko | leaf | 91.0 | 105 | 4.0 | 75 | 24 | 1.4 | - | 52 |
| **CUCURBITACEAE** | *Luffa cylindrica* | Smooth loofah | leaf | 90 | 113 | 5.1 | - | 95 | 11.5 | - | 55 |
| **CYPERACEAE** | *Cyperus esculentus* | Yellow nutsedge | bulb | 77.4 | 342 | 0.9 | - | 21 | 4.2 | 0.6 | 61 |
| **DIOSCOREACEAE** | *Dioscorea alata* | Greater yam | tuber | 76.6 | 323 | 2.0 | 18 | 10 | 0.8 | 0.39 | 10 |
| **DIOSCOREACEAE** | *Dioscorea esculenta* | Lesser yam | tuber | 74.2 | 470 | 2.1 | 84 | 20 | 0.75 | 0.5 | 12 |
| **EUPHORBIACEAE** | *Manihot esculenta* | Cassava | tuber | 62.8 | 625 | 1.4 | 30 | 15 | 0.23 | 0.48 | 14 |
| **FABACEAE** | *Cicer arietinum* | Chick pea | seed (raw) | 9.9 | 1362 | 20.2 | 190 | 3 | 6.4 | - | 21 |
| **FABACEAE** | *Cajanus cajan* | Pigeon pea | seed (young, boiled) | 71.8 | 464 | 6.0 | 13 | 28.1 | 1.6 | 0.8 | 22 |
| **FABACEAE** | *Phaseolus lunatus* | Lima bean | seed (young, cooked) | 67.2 | 515 | 6.8 | 37 | 10.1 | 2.5 | 0.8 | 23 |
| **FABACEAE** | *Lablab purpureus* | Lablab bean | seed (dry) | 10.0 | 1428 | 22.8 | - | - | 9.0 | - | 24 |
| **FABACEAE** | *Vigna unguiculata* | Cowpea | seed (dry) | 11.2 | 1189 | 23.5 | - | 1.5 | 6.4 | - | 25 |
| **FABACEAE** | *Leucaena leucocephala* | Leucaena | leaf and pod | 80.7 | 247 | 8.4 | - | - | 9.2 | - | 26 |
| **FABACEAE** | *Piliostigma thonningii* | Camel's foot leaf tree | seed | 9.9 | 1381 | 22.7 | - | - | 4.7 | 1.6 | 27 |

| Plant Family | Scientific name | Common name | Edible part | Moisture % | Energy kJ | Protein g | Vit A µg | Vit C mg | Iron mg | Zinc mg | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FABACEAE** | *Macrotyloma geocarpum* | Hausa groundnut | seed | 9.0 | 1461 | 19.4 | - | - | 15.0 | - | 28 |
| **FABACEAE** | *Sesbania grandiflora* | Sesbania | leaf | 82.3 | 323 | 8.7 | 66 | 60 | 4.0 | - | 53 |
| **FABACEAE** | *Arachis hypogaea* | Peanut | seed (dry) | 4.5 | 2364 | 24.3 | 0 | - | 2.0 | 3.0 | 63 |
| **MALVACEAE** | *Corchorus olitorius* | Jute | leaf (raw) | 80.4 | 244 | 4.5 | 1923 | 80 | 7.2 | - | 30 |
| **MALVACEAE** | *Hibiscus cannabinus* | Vegetable kenaf | leaf | 79.0 | 280 | 5.5 | 34 | - | 12.1 | - | 32 |
| **MALVACEAE** | *Hibiscus sabdariffa* | Roselle | leaf | 86.4 | 185 | 10.9 | 58 | 35 | 1.5 | 4.1 | 33 |
| **MALVACEAE** | *Abelmoschus esculentus* | Okra | fruit (cooked) | 90.0 | 134 | 1.9 | 58 | 16.3 | 0.5 | 0.6 | 54 |
| **MALVACEAE** | *Pachira glabra* | Saba nut | seed | 66 | - | 34.1 | - | - | - | - | 59 |
| **MORACEAE** | *Ficus thonningii* | Strangler fig | fruit | 77.9 | 209 | 1.3 | - | 2.6 | 1.0 | 0.3 | 48 |
| **MORINGACEAE** | *Moringa oleifera* | Moringa | leaf (boiled) | 87 | 189 | 4.7 | 883 | 31.0 | 2.0 | 0.2 | 50 |
| **MUSACEAE** | *Musa x paradisiaca* | Hybrid plantains | fruit (sweet) | 70.7 | 337 | 1.1 | 200 | 10 | 0.4 | 0.2 | 37 |
| **OXALIDACEAE** | *Averrhoa carambola* | Carambola | fruit | 90.8 | 149 | 0.5 | 300 | 40 | 1.0 | 0.1 | 39 |
| **POACEAE** | *Eleusine coracana* | Finger millet | seed | 11.7 | 1594 | 6.2 | - | - | 5.3 | - | 16 |
| **POACEAE** | *Zea mays* | Maize | seed (mature) | 10.4 | 1528 | 10.0 | 100 | 4 | 4.9 | 2.2 | 17 |
| **SOLANACEAE** | *Physalis peruviana* | Cape gooseberry | fruit (mature) | 84.2 | 201 | 2.0 | 360 | 30 | 1.5 | - | 43 |
| **SOLANACEAE** | *Cyphomandra betacea* | Tamarillo | fruit | 86.2 | 113 | 2.0 | 500 | 28 | 0.7 | - | 46 |
| **SOLANACEAE** | *Solanum melongena* | Eggplant | leaf | 86.4 | 198 | 4.6 | 280 | - | 3.4 | 0.6 | 58 |
| **SOLANACEAE** | *Capsicum frutescens* | Bird's eye chillies | fruit | 74.0 | 395 | 4.1 | 7140 | 121 | 2.9 | - | 65 |

Rotary

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

www.foodplantsolutions.org