

Potentially Important Food Plants of Niger



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

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

www.foodplantsolutions.org

Potentially Important Food Plants of Niger

Dedication

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

Preface

This guide is based on information from the Food Plants International (FPI) database developed by Tasmanian agricultural scientist Bruce French. The source material and guidance for the preparation of the book has been made possible through the support of Food Plants International, the Rotary Clubs of District 9830, particularly the Rotary Club of Devonport North who founded Food Plant Solutions, (previously the Learn2Grow project), and many volunteers who have assisted in various ways.

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

Food Plant Solutions was initiated by the Rotary Club of Devonport North to assist in creating awareness of the edible plant database developed by Food Plants International, and its potential in addressing malnutrition and food security in any country of the world. In June 2007, Food Plant Solutions was established as a project of Rotary District 9830, the Rotary Club of Devonport North and Food Plants International. The primary objective of the project is to increase awareness and understanding of the vast food resource that exists in the form of local plants, well adapted to the prevailing conditions where they naturally occur, and how this resource may be used to address hunger, malnutrition and food security. For more information, visit the website www.foodplantsolutions.org. More detailed or specific information on plants, including references to material by other authors, is available on DVD on request.

Disclaimer: This Field Guide has been produced using information from the “Edible Plants of the World” database compiled by Bruce French of Food Plants International. Although great care has been taken by Food Plants International and Food Plant Solutions, neither organisation, or the people involved in the compilation of the database or this Field Guide:

- makes any expressed or implied representation as to the accuracy of the information contained in the database or the Field Guide, and cannot be held legally responsible or accept liability for any errors or omissions
- can be held responsible for claims arising from the mistaken identity of plants or their inappropriate use
- assume responsibility for sickness, death or other harmful effects resulting from eating or using any plant described in the database or this Field Guide

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

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Introduction

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

Growing food

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

A country with very special plants

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

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

Getting to know plants

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

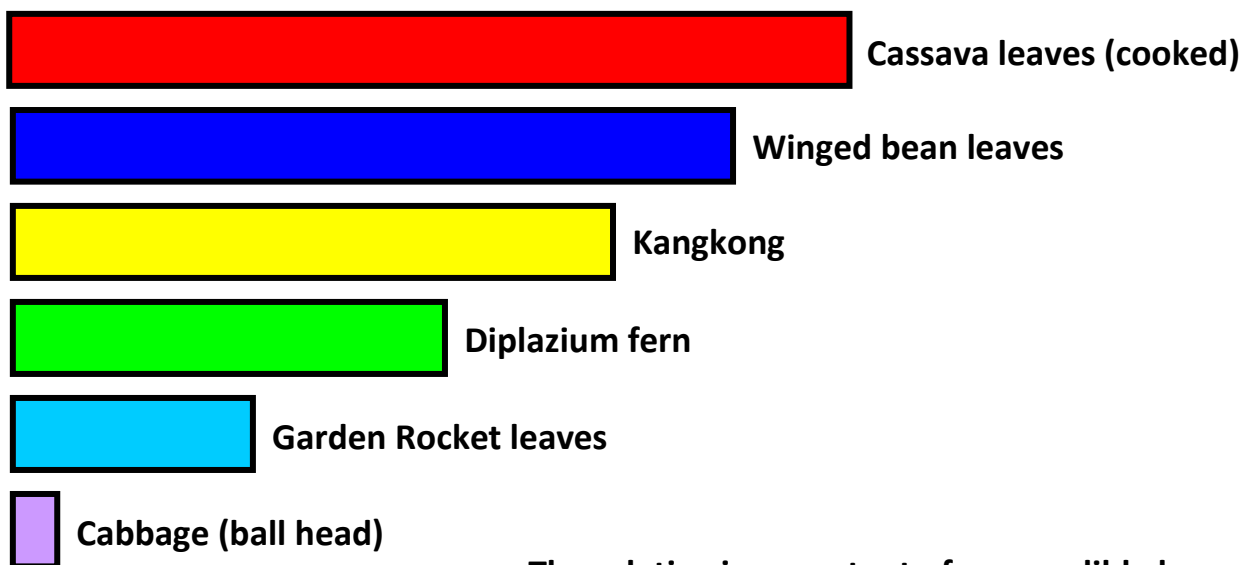
Naming of plants

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

Local food plants are often very good

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

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



The relative iron content of some edible leaves

A healthy balanced diet

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

Learning to cook well

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

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

Learning to grow “wild” food plants

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

Saving better types of plants

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

Growing from cuttings and suckers

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

Saving seed

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

Growing a garden of mixed plants

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

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

Different types of plants for food security

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

Looking after the soil

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

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

Building up the soil

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

Poor soils where crops won't grow

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

Soil nutrients

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

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

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

Making compost

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

Pests

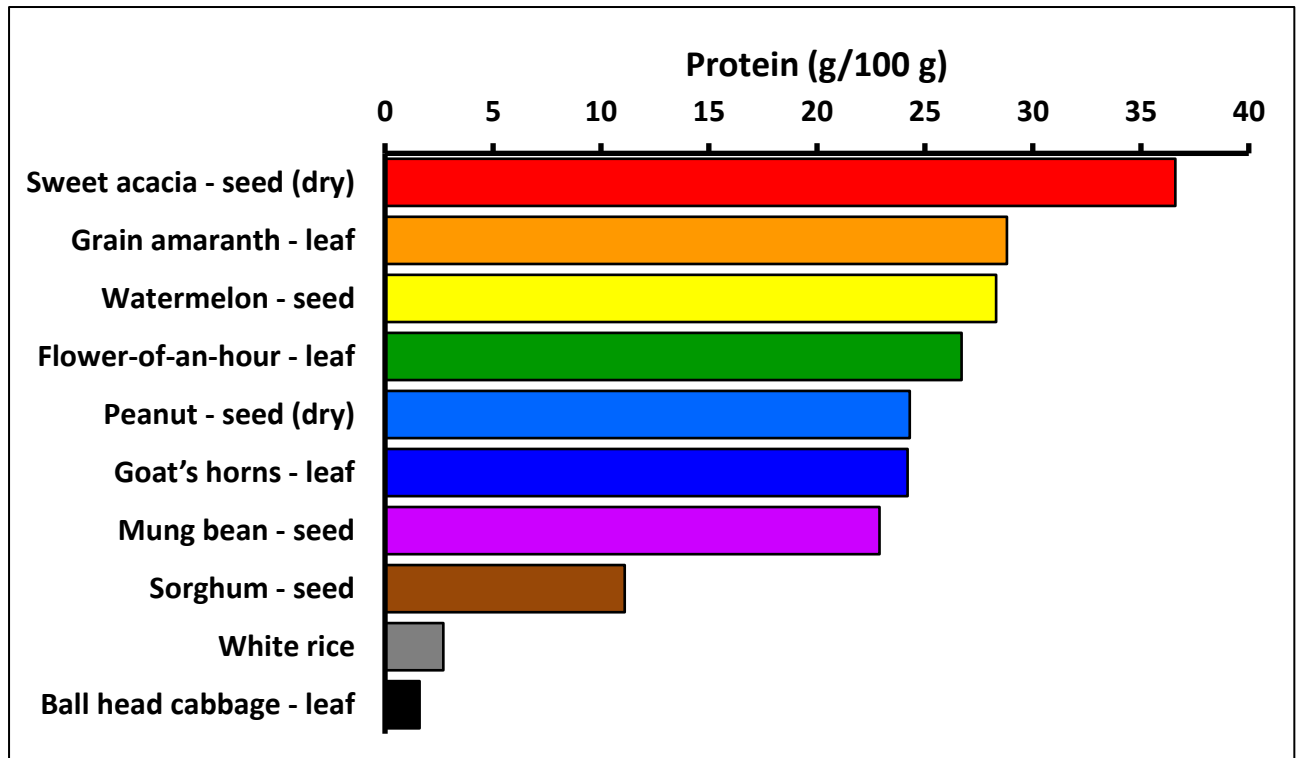
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects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

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

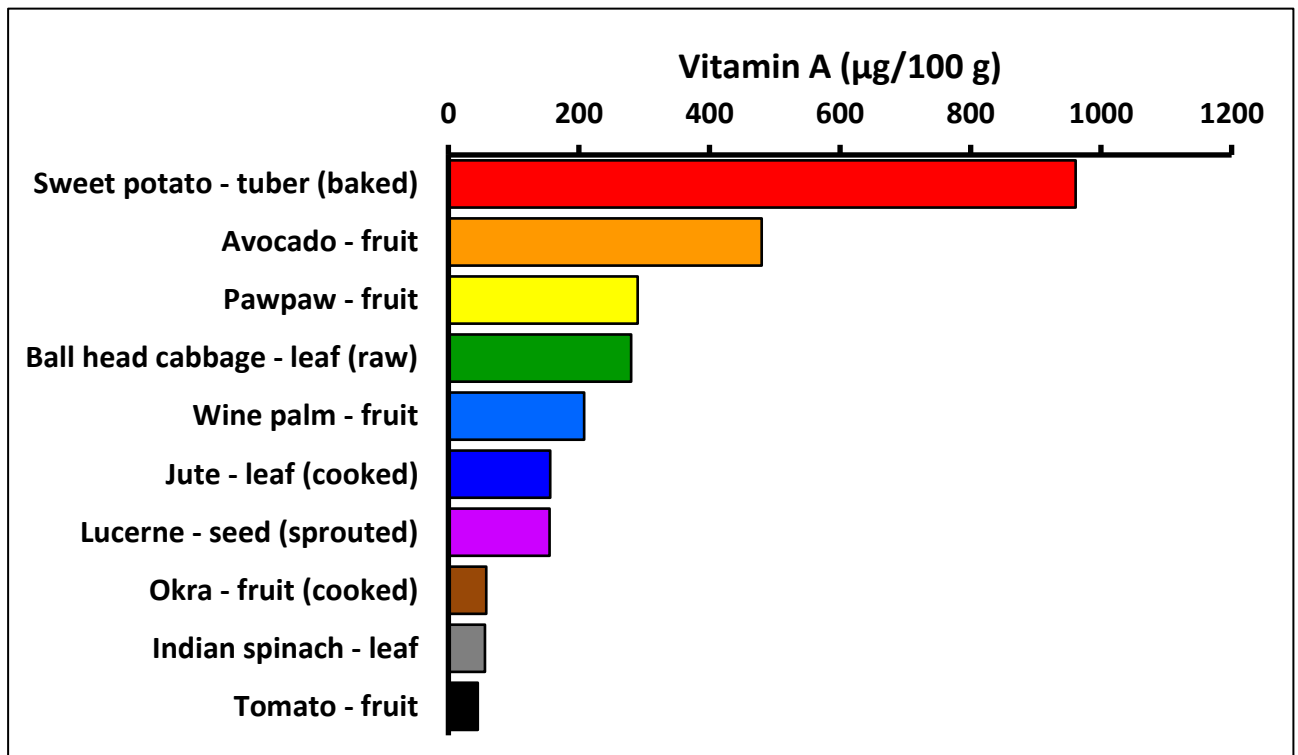
Diseases

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

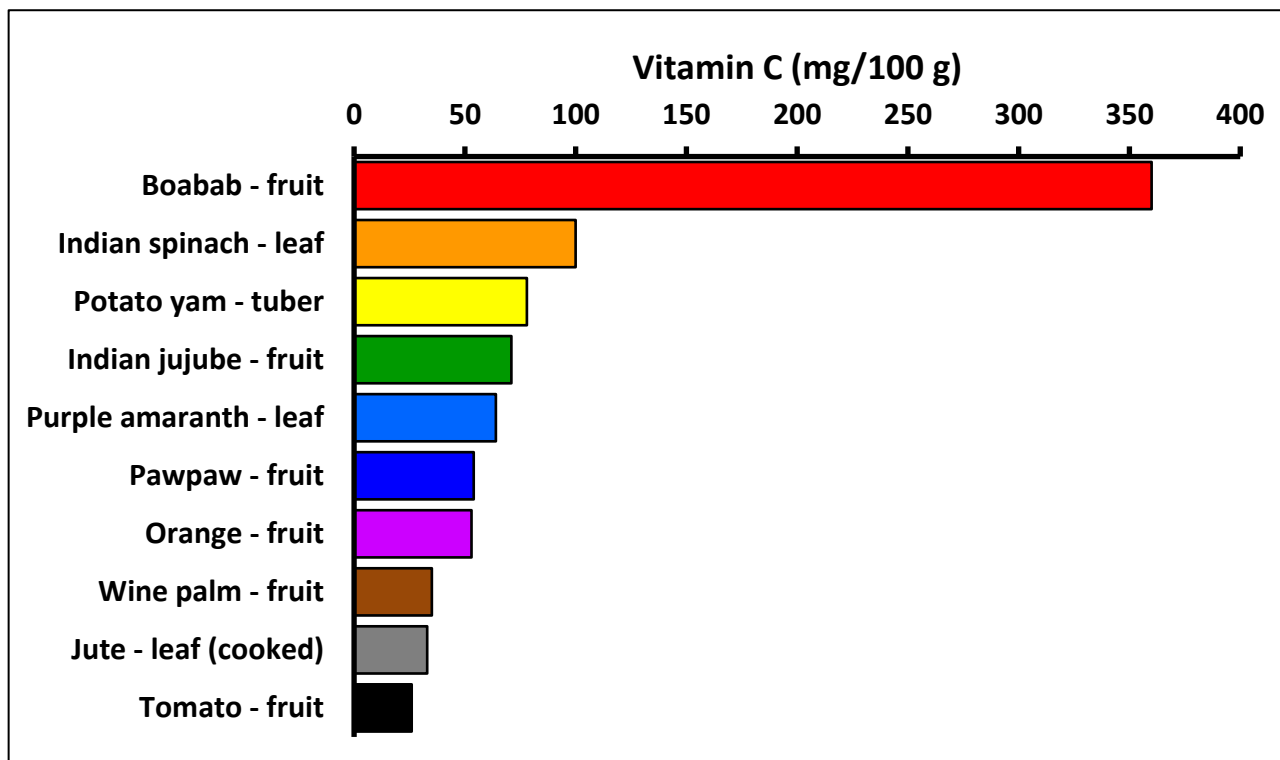
Food value charts for a selection of plants from Niger



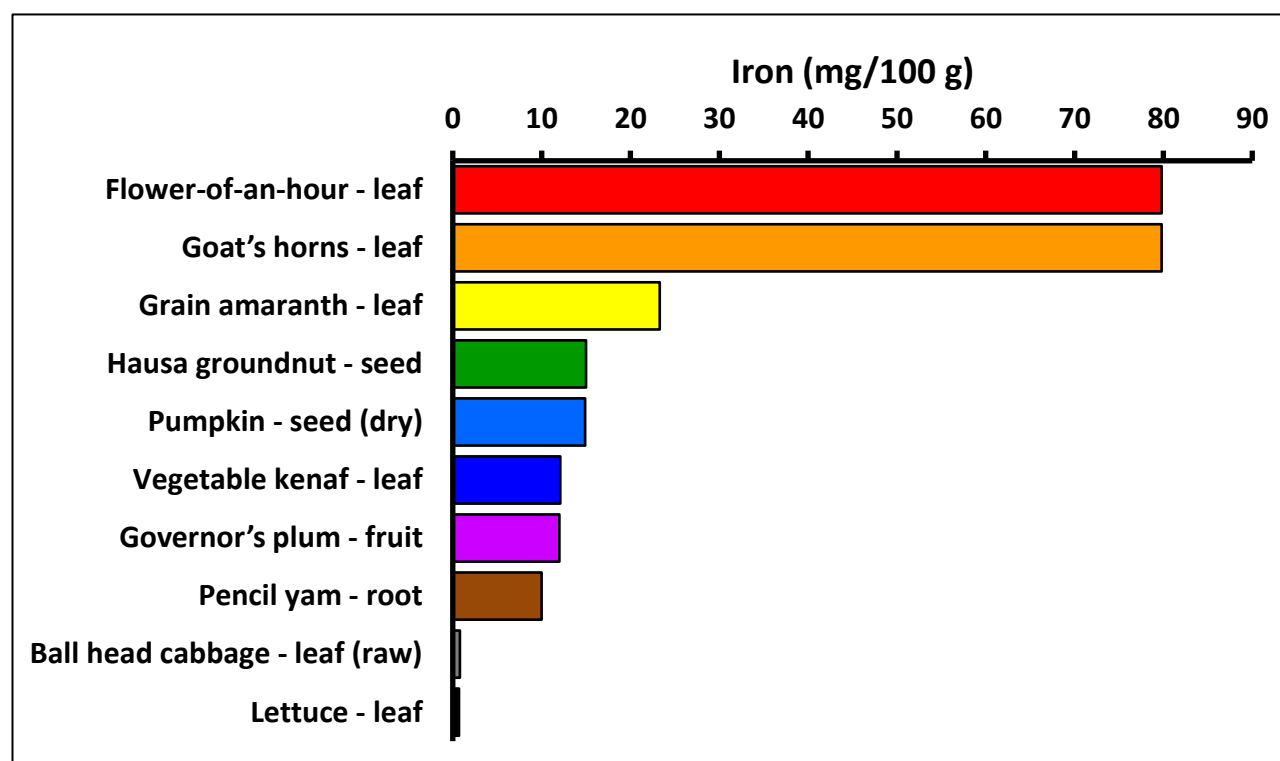
Protein helps the body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women. Symptoms of protein deficiency include wasting and shrinkage of muscle tissue, and slow growth (in children).



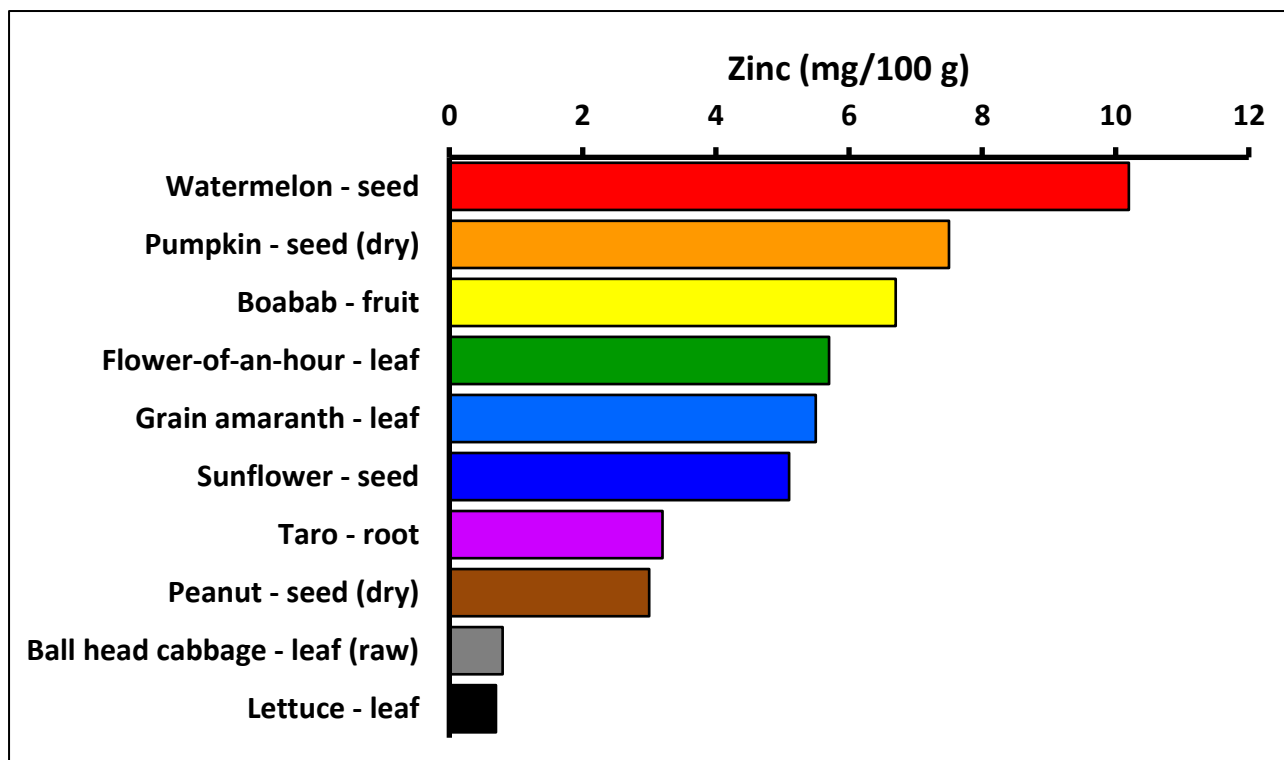
Vitamin A is very important for eyesight and fighting disease, particularly in infants, young children and pregnant women. People who are short of Vitamin A have trouble seeing at night.



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



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



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

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

Starchy staples

English: Taro

Local:

Scientific name: *Colocasia esculenta*

Plant family: ARACEAE

Description: This plant has large flat leaves on the end of upright leaf stalks. It grows up to 1 m high. The leaf stalk or petiole joins the leaf towards the centre of the leaf. The leaves are 20-50 cm long. Near the ground a thickened rounded corm is produced. Around this plant there is normally a ring of small plants called suckers. Many different varieties occur. If left to maturity, a lily type flower is produced in the centre of the plant. It has a spathe 15-30 cm long which is rolled inwards. The flowers are yellow and fused along the stalk. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and *Colocasia esculenta* var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.



Distribution: It is a tropical plant. Taro grows from sea level up to about 2300 m altitude in the tropics. It grows well in humid places. It can stand damp soil and grow under light shade. It suits hardiness zones 9-12.

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

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

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

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

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

Evapotranspiration for flooded taro averages about 4 mm per day, ranging from 1.5-7.2 mm, with a total of about 1200 mm for the crop. Intermittent moisture can result in irregular shaped corms. Flooding has been found to be more effective than sprinkler irrigation, or furrow irrigation. Increased suckering, giving greater leaf area, seems to be the reason for this.

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: African yam bean

Local:

Scientific name: *Sphenostylis stenocarpa*

Plant family: FABACEAE

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



Distribution: It is a tropical plant that grows from sea level up to 1800 m altitude. It grows in grassland and woodland and sometimes in marshy sites. It can grow in arid places.

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

Cultivation: It can be grown from seed or tubers.

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1470	19.2	-	-	-	-
seed (boiled)	67.9	485	7	-	-	1.3	1.1
tuber	64.0	542	3.8	-	-	-	-

Image accessed from:

https://upload.wikimedia.org/wikipedia/commons/thumb/4/48/Sphenostylis_angustifolia%2C_veldblomstappie%2C_Faerie_Glen_NR%2C_a.jpg/1200px-Sphenostylis_angustifolia%2C_veldblomstappie%2C_Faerie_Glen_NR%2C_a.jpg

Starchy staples

English: Sweet potato

Local:

Scientific name: *Ipomoea batatas*

Plant family: CONVOLVULACEAE

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



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

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Sorghum

Local:

Scientific name: *Sorghum bicolor*

Plant family: POACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: 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. 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 reduced root yields. When drainage is good and soil moisture is adequate, cassava stalks can be planted at any orientation from horizontal to vertical, but in very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: 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	proVit C mg	Iron mg	Zinc mg
seed	11.7	1594	6.2	-	-	5.3	-

Starchy staples

English: Potato yam

Local:

Scientific name: *Dioscorea bulbifera*

Plant family: DIOSCOREACEAE

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



Distribution: An annual tropical plant. It will grow from the coast up to about 1700 m altitude in equatorial zones. It is common near the edge of grassland and forest at mid altitudes. Both wild and cultivated forms occur. It is common near secondary forest at low and medium altitudes.

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Pencil yam

Local:

Scientific name: *Vigna vexillata*

Plant family: FABACEAE

Description: A variable climbing herb that keeps growing from year to year. It has a narrow woody rootstock that is dull white and wrinkled. The hairy vines are 30 cm to 3 m long. The leaves have 3 leaflets and these are oval or long. They can be 3-16 cm long by 0.4-8 cm wide. They taper towards the tip and are rounded at the base. The leaf stalk is 2-11 cm long. The flowering stalks are in the axils of leaves and have 2-6 flowers. The flowering stalk is 5-36 cm long. The pea like flower has a standard which is 2-3 cm long and not the same on both sides. Flowers are pink or purple. The keel is paler with



a beak curved back at the end and twisted to one side. The fruit are pods which are held erect. They are 4-14 cm long by 3-4 mm wide and covered with short brown hairs. There are 10-18 seeds. The seeds are light brown to black. They are kidney shaped and 3-4 mm long by 2 mm wide.

Distribution: It is a tropical plant that mostly grows naturally in open woodland on sandstone soils. It will grow in dry, acid and high aluminium soils that are infertile. It can grow in arid places.

Use: The tuberous roots are eaten raw or cooked. They can be boiled or roasted. The seeds are cooked and eaten.

Cultivation: Plants can be grown from seed or tubers.

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	79.6	302	2.1	-	11.6	0.8	0.5
root	68.9	287	2.3	-	-	10.0	1.7

Image accessed from: http://farm3.static.flickr.com/2347/1651731806_c282f57a3c.jpg%3Fv%3D0

Legumes

English: Sweet acacia

Local:

Scientific name: *Acacia farnesiana*

Plant family: FABACEAE

Description: An evergreen shrub. It grows 5-7 m tall and 3 m across. The stem is slender and erect. The crown is open. It is a spreading, densely branched shrub. The bark is smooth and brown. The leaves are branched and green. There are 4-6 pairs of larger leaves and 10-20 pairs of small leaflets. They have tiny leaflets and thorns up to 2 cm long, occur in pairs. The leaf stalk has a gland at or above the middle. The flowers are large orange balls. They are strongly perfumed. (The oil is used as a perfume in France.) The pods are long and dark brown to black. They



are 5-8 cm long by 0.5-1 cm wide. They are inflated and sausage like. Often they are curved. They are marked with narrow lines. The pods have hard grey seeds imbedded in a pithy substance. The pods do not split open at maturity. The seeds are chestnut brown and 7-8 mm long by 5.5 mm wide.

Distribution: It is a tropical plant. This tree occurs naturally in Australia, Asia and Africa. It will grow on most soils. It is drought and frost resistant. It most commonly grows naturally on clay soils. It grows in areas with an annual rainfall between 400-4000 mm. It can grow in acid or alkaline soils. It can grow in arid places. It suits hardiness zones 11-12.

Use: The pods have been recorded as eaten after cooking. The gum is eaten. The ground up seeds are eaten. The germinated seeds are claimed to be eaten. The gum is used to prepare sweets. The young leaves are used in India as a substitute for tamarind in chutneys.

Cultivation: It is grown from seed.

Production: It is fast growing. Flowering can occur almost continuously if watering is regular. Flowering is normally November to January, with pods available from March to July.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	8.1	1522	36.6	-	-	6.0	0.6

Legumes

English: Pigeon pea

Local:

Scientific name: *Cajanus cajan*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Jack bean

Local:

Scientific name: *Canavalia ensiformis*

Plant family: FABACEAE

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

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



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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Hausa groundnut

Local:

Scientific name: *Macrotyloma geocarpum*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Lablab bean

Local:

Scientific name: *Lablab purpureus*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: 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	proVit C mg	Iron mg	Zinc mg
seed	12.0	1407	19.8	-	-	5.6	-
seed (young, cooked)	67.2	515	6.8	37	10.1	2.5	0.8
seed (young, raw)	70.2	473	6.8	30	23.4	3.1	0.8

Legumes

English: Mung bean

Local:

Scientific name: *Vigna radiata*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

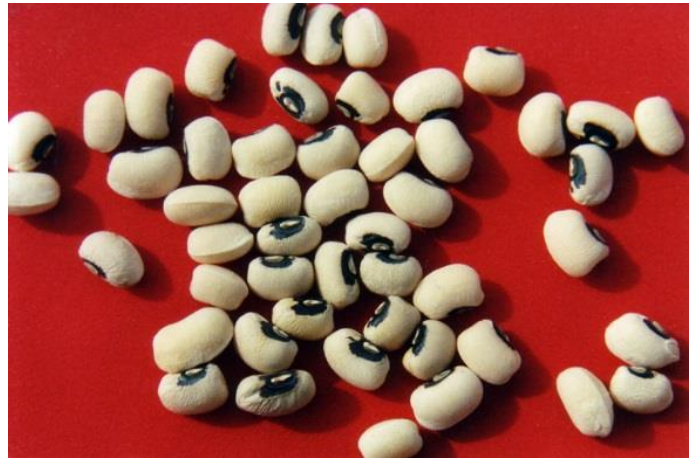
English: Cowpea

Local:

Scientific name: *Vigna unguiculata*

Plant family: FABACEAE

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



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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

English: Jute

Local:

Scientific name: *Corchorus olitorius*

Plant family: MALVACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

Common name: Flower-of-an-hour

Local:

Scientific name: *Hibiscus trionum*

Plant family: MALVACEAE

Description: An annual herb. It can be erect or lie over. It is 25-70 cm high. The leaves are alternate. The leaf stalk is 2-4 cm long. The leaf blade has 3-5 lobes arranged like fingers on a hand. The leaf blade is 3-6 cm across. The central lobe is longer. The leaf blade is covered with coarse star like hairs. The flowers occur singly in the axils of leaves. They are yellow and purple at the base. They are like a Hibiscus flower. The fruit is a capsule which is about 1 cm across. It is a hairy five celled capsule. There are many black seeds.



Distribution: It suits tropical, subtropical and temperate regions. It does best in a sunny position. It does not occur in hot humid tropical rain forest zones. It suits drier warmer places. It can grow in hot arid zones with a marked dry season. It grows up to 2635 m above sea level. It can grow in arid places. It suits hardiness zones 10-12.

Use: The shoots and leaves are cooked and eaten. The pods are used in soups and stews. The pods are sun-dried and powdered and used later in food in Sudan. The seeds are eaten raw and have a sesame flavour.

Cultivation: Plants can be grown from seed or cuttings.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	6.3	1263	26.7	-	-	79.8	5.7
shoot	-	-	21.0	-	-	21.8	9.4

Image accessed from: <https://i.pinimg.com/originals/29/a5/c2/29a5c2c4457308d0fc36439ee5e26310.jpg>

Leafy greens

English: Goat's horns

Local:

Scientific name: *Sida cordifolia*

Plant family: MALVACEAE

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



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

Use: The leaves are edible when cooked.

Food Value: Per 100 g edible portion

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

Image accessed from

[http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia \(Bala\) in Hyderabad, AP W IMG_9420.jpg](http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_(Bala)_in_Hyderabad,_AP_W_IMG_9420.jpg)

Leafy greens

English: Edible hibiscus

Local:

Scientific name: *Abelmoschus manihot*

Plant family: MALVACEAE

Description: A branched shrub up to 2 m or more high. It has smooth, green, rounded twigs. The large leaves are simple and smooth, can vary in shape and have 3-5 lobes. They are normally very dark green, but pale green types can occur. The leaf stalks are 6-13 cm long and stalks can be green or have red colours on them. The hibiscus-like flowers are borne singly and are yellow with dark purple centres. They are produced on mature bushes. The fruit pods are a dry capsule with many small seeds, and are rather stiff or have bristly hairs. Plants can last for several years.



Distribution: It is grown in many Asian and Pacific countries. It is well-suited to the tropical lowlands, but grows only poorly at an altitude of 1800 m. It needs fertile soil. Plants will withstand occasional short periods of temperatures, down to about -5°C, so long as they are in a very well-drained soil. It suits areas with high humidity. It suits hardiness zones 10-12.

Use: Young leaves are cooked and eaten. They are slimy unless steamed or fried. It is a very nutritious plant.

Cultivation: It is normally grown from cuttings. Lengths of about 25 cm (2 or 3 leaf joints or "nodes") of fresh, green, stem cuttings are used. These are stuck in the ground. It can be grown from seeds. The narrow-leafed types tend to compete less well with weeds. In some areas, people tend to put the narrow-leafed types in the middle of the garden cropped amongst sweet potato, and the broad-leafed types near stumps or logs and around the edges of gardens. The pale, green-leafed types grow slowly. A fertile soil is needed. It can be planted in good soil in a newly cleared garden site or near houses where the soil fertility can be built up by adding food scraps, compost and ashes. The growth and colour of the leaves can be improved greatly by spraying the leaves each 2-3 weeks with a very small amount of nitrogen fertiliser (urea), dissolved in water (0.5% solution). This uses less fertiliser than putting it on the ground where it can wash away in the rain. Picking the tips off branches of the plants encourages the plant to produce more branches and leaves. If too many leaves are picked off the one bush at the one time when harvesting, it slows down the growth of more leaves. If the soil is very fertile, older bushes, which are only growing a few leaves, can be chopped off and the stump will regrow into a new bush. It is a very fast growing and productive food plant in the hot, humid tropics.

Production: Leaves are ready to harvest after about 80 days. Yields of 6.7-7.3 t/ha/crop have been recorded.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	88	120	3.4	1.0	7.0	1.5	1.2

Leafy greens

English: Grain amaranth

Local:

Scientific name: *Amaranthus caudatus*

Plant family: AMARANTHACEAE

Description: An annual plant which can be 2 m high and 45 cm across. The stems are angular and it can have a single stem or be branched. It is often limp in the upper parts. Plants are hairy at first but become smooth. Often they are tinged purple. Leaves are 2-4 cm long by 0.7-1.6 cm wide on a leaf stalk 0.5-1.5 cm long. Leaves can taper to a tip at the end. They can also thin towards the base. The veins are pale underneath. The flower clusters are in spikes on the side or top branches. The flowers are sometimes branched and can droop over. They can be 45 cm long. The fruit is oval. Seed are 1-1.3 mm across.



Distribution: A tropical plant. It can grow in warm temperate places. It cannot tolerate frost. Plants do best under high light, warm conditions and dry conditions. They need a well-drained soil. Some varieties can tolerate pH up to 8.5 and there is some salt tolerance. It can grow in arid places. In the Andes it grows between 500-3000 m above sea level. It suits hardiness zones 8-11.

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

Cultivation: Plants can be grown from seed if the soil is warm. Seeds are small and grow easily. Cuttings of growing plants root easily. Amaranths are mostly grown from seeds. The seeds are collected from a mature dry seed head of an old plant. These dry flower stalks are stored and then the flowers rubbed between the hands over the garden site. Collecting the seeds is fairly easy by banging flower heads on a mat or piece of cloth then the rubbish can be blown out of this mixture by dropping it and blowing gently as it falls. The very small seeds of these plants are scattered over the ashes or fine soil in fertile ground. Some types are self-sown.

Amaranthus seeds are very small. A thousand seeds weigh about 0.3 g. It is very difficult to sow such small seeds evenly over the ground. So there are a few different methods you can use to try and get the plants well-spaced. One way is to mix the seeds with some sand and then when you sprinkle this along a row it will only contain a few seeds among the sand. The other way is to throw the seeds over a small plot of ground which will be a nursery. After 2 or 3 weeks the seedlings can be transplanted into the garden bed where they are to grow. If the seeds are just scattered over the garden, the small seedlings can be thinned out and either eaten or transplanted to a different spot. Seedlings are transplanted when about 5-7 cm tall. Plants can be harvested when small by thinning out and either transplanted or eaten cooked. Plants can be harvested whole or have top leaves harvested several times. Harvesting begins after 4-7 weeks and can continue over 2 months.

A spacing of about 8 cm x 8 cm is used if the plants are to be harvested by pulling up the whole plant. If the harvesting is to be done by picking off the top leaves, a wider spacing is normally used.

When the tops are picked out 3 or 4 times over the life of the one plant, a spacing of about 30 cm x 30 cm is used.

As far as producing a large amount of food is concerned, the spacing is not very important. Having between 200 and 1000 plants per square metre gives about the same total amount of food. The main thing that varies is the size of the leaves. Mostly people like larger leaves so a wider spacing of 8 cm to 10 cm for plants to be pulled out is suitable. For plants to be harvested by picking out the tops, they can be picked down to about 15 cm high. Picking lower makes the plant flower later, but it also recovers more slowly from picking.

Amaranths grow quickly. Seedlings come up above the ground in 3-5 days. They are 5-7 cm high and big enough for transplanting after about 20 days. The plants can be pulled out and used after 6 weeks. If they are harvested by picking out the tops, this can be started at 5-7 weeks and continued 3-4 times over the next 2 months.

Amaranths eventually stop producing leaves and grow flowers. Flowering occurs after about 3 months and seed can be recollected about a month later. Amaranths are called day-length neutral plants because they still produce flowers at about the same stage, irrespective of whether there are many or few hours of daylight. Because flowering stops harvesting of leaves, it is a problem, but there does not seem to be any easy way of slowing down flowering. Flowering can be delayed a little by picking out the tops down to a lower level. Also it is made a little later if plants are grown in the shade. But lower picking and growing in the shade mean the plants produce less food, so there is no point. Plants need to be harvested and used when they are ready. If plants are left growing the amount of harvestable leaf gets less and the quality gets poorer.

Nitrogen deficiency shows as the oldest leaves near the bottom of the plant going yellow. This is because the plant needs more nitrogen to grow more new leaves at the top and there is not enough nitrogen in the soil for it to get it from there. So it reuses the nitrogen it used in the oldest leaves. These leaves therefore go yellow. Potassium deficiency shows as the edges of the oldest leaves going yellow. These shortages of nutrients could be corrected by adding some nitrogen or potash fertiliser but it is most likely too late for the current crop.

Production: Plants take 4-6 months from sowing to harvesting the seed, but up to 10 months in some Andean highland regions. Yields from 1-5 tonnes per hectare of seed are common. Yields of up to one kilogram of edible leaves have been harvested by pulling out plants from an area of one square metre. The young leaves or whole plants are eaten cooked. If plants are picked 3 or 4 times over 6-8 weeks then two kilograms of edible leaves can be harvested. From a plant that grows so quickly and is such good quality food this is a very high production.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	6.0	1034	28.8	33	-	23.3	5.5
seed			13				

Leafy greens

English: 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. 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	proVit C mg	Iron mg	Zinc mg
seed	87.7	2006	14.7	-	0	3.8	-
leaf	84.0	176	4.6	-	64	8.9	-

Leafy greens

English: 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 when day lengths are 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	proVit C mg	Iron mg	Zinc mg
leaf	85.0	202	5.0	56	100	4.0	-

Fruit

English: Boabab

Local:

Scientific name: *Adansonia digitata*

Plant family: BOMBACACEAE

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



Distribution: It is a tropical plant that grows in the lowlands. It grows in the hot dry regions of tropical Africa, such as the Sahel. It survives well in dry climates. It grows where rainfall is 100-1000 mm a year. It can tolerate fire. It grows where the annual temperatures are 20-30°C. In most places it grows below 900 m altitude but occasionally grows to 1500 m altitude. It requires good drainage. It can grow in arid places and suits hardiness zones 11-12.

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

Common name: Avocado

Local:

Scientific name: *Persea americana*

Plant family: LAURACEAE

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



Distribution: A subtropical plant that grows from sea level up to 2250 m in the tropics. It cannot stand water-logging. Branches are easily damaged by wind. It needs a frost free location or where frosts are rare.

West Indian varieties thrive in humid, tropical climates, freeze at or near 0°C and can stand some salinity. Mexican types come from dry subtropical plateaus and thrive in a Mediterranean climate. They are hardy to -7° C. They are salt sensitive, have the smallest fruits and the thinnest skin. The best daytime temperature is 25-33°C. Guatemalan types come from cool, high-altitude tropics and are hardy to -3° C. It does best with neutral or slightly acid and well aerated soil. Growth is disrupted when soil temperature is below 13°C. It needs high humidity at flowering and fruit set. It can grow in arid places.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A μg	proVit C mg	Iron mg	Zinc mg
fruit	74.4	805	1.8	480	11	0.7	0.4

Image accessed from:

[https://upload.wikimedia.org/wikipedia/commons/7/7d/Avocados_\(Persea_americana\)_ \(18159574242\).jpg](https://upload.wikimedia.org/wikipedia/commons/7/7d/Avocados_(Persea_americana)_ (18159574242).jpg)

Fruit

Common name: Wild custard apple

Local:

Scientific name: *Annona senegalensis*

Plant family: ANNONACEAE

Description: A shrubby tree which loses its leaves during the year. It grows to 2-6 m high. The bark is grey and smooth. The young stems are hairy and orange. The older bark becomes thick and folded. It peels off to expose paler patches. The leaves are oval and blue-green. They are 18 cm long. They are curved like a spoon. Under the leaf is hairy. The leaves have a peculiar smell when crushed. The flowers are yellow green. They occur as one to three together hanging down below the twigs. The fruit is rounded and 2-7 cm across. It is smooth but divided like lots of small parts fused together. It is green when unripe and turns orange-yellow when ripe. It has a smell like a pineapple. It has many seeds. They are pale brown. The sweet pulp around the seeds is edible.



Distribution: A tropical plant. It grows in the lowlands. It is found throughout Africa. It grows in tropical and warm regions. It grows in semi-arid to sub humid regions. It grows in the Sahel. The young trees need light shade. They need well drained soil. It is a tree of the savannah regions. It grows in the lowlands. It is best with a temperature range of 17-30°C and a rainfall of 700-2500 mm per year. It can grow in arid places. It grows best with a pH of 5.5-7. In Malawi it grows below 1200 m altitude. In Kenya it grows from sea level to 1750 m above sea level.

Use: The flower buds are eaten. They are used in soups and as a flavouring. The flesh of the ripe fruit is eaten fresh. It has a pleasant taste. The leaves are edible cooked.

Cultivation: It is grown from fresh seeds. It is probably best to grow seedlings in a nursery and then to transplant them. Seed grow easily but not all at the same time. There are 2500-3000 seeds per kg. Seed can only be easily stored for 6 months. Plants can be cut back and allowed to re-grow. Plants can be grown by root suckers.

Production: Trees are slow growing. Trees flower from October to December in the southern hemisphere. The fruit is ready from January to March. Fruit mature in about 120 days. It is best to pick fruit before they ripen and to ripen them in a dark warm place.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.2	329	1.7	-	18.1	0.7	0.3

Image accessed from: <https://i.pinimg.com/originals/53/4c/92/534c927f13c6aaf559ea818da08bf153.jpg>

Fruit

English: Wine palm

Local:

Scientific name: *Borassus flabellifer*

Plant family: ARECACEAE

Description: A small evergreen palm that usually grows 10-20 m tall, but can grow to 40 m. It spreads to 5 m across. The stem is stout and may be 1 m across. It is often swollen at the base. It has a crown of leaves shaped like the fingers on a hand or spreading out like a fan. There can be 30-40 of the fan like leaves at the crown. The leaves are large with short stout leaf stalks. There can be 80 slender leaflets which are pointed, folded and rich green. Younger trees are covered with dead leaves or leaf bases. Leaves can be 1-2 m across. The flowers



occur in flower stalks up to 1.5 m long. The male and female flowers occur in different trees. The females spikes are larger and have a boat shaped spathe. The fruit are borne in bunches like coconuts. The fruit are 10-12.5 cm across and slightly flattened at the ends. They have dark, purple skin. Green bracts occur at the base. Each fruit has 3 seeds. The flesh resembles the flesh of a coconut.

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
sap (thickened)	5.5	1594	0.7	-	-	1.6	0.3
palm heart	69.5	431	2.7	-	-	-	-
seed (sprouts)	69.5	431	2.7	-	-	-	-
seed (immature)	82.3	297	0.9	-	-	-	-
fruit	89.4	139	0.7	208	35.1	1.7	0.3

Fruit

English: Pawpaw

Local:

Scientific name: *Carica papaya*

Plant family: CARICACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: Governor's plum

Local:

Scientific name: *Flacourtia indica*

Plant family: FLACOURTITACEAE

Description: A shrub or small tree that grows 5-15 m tall. The trunk is crooked and low branched and armed with scattered slender spines. The leaves are alternate, pointed at the base and rounded at the tip. The edges of the leaves are toothed with rounded lobes. Leaves are dark green on top and pale green underneath. They are 6-17 cm long and 3-7 cm wide. Male and female trees occur. The flowers are small and white; occur singly or in pairs in the axils of leaves or near the ends of short branches. The edible fruit are rounded, fleshy, purple or nearly black. They are smooth and about 1 cm across. The flesh is yellowish, juicy and acid. There are 6-10 small flattened seeds inside.



Distribution: A tropical plant that grows in the lowlands. They thrive in dry, shrubby areas at low altitudes. Trees grow in coastal areas and up to 700 m or higher. In Africa it grows from sea level to 2400 m above sea level. It grows in sub-tropical, broadleaved, evergreen forest. It can grow in arid places. It also grows on limestone.

Use: The fleshy pulp of the fruit is eaten raw when ripe or can be cooked and eaten or made into jelly. Fruit can be dried and stored.

Cultivation: Trees are normally grown from seed. Because the seeds have a hard seed coat it helps to scratch the seed to assist germination. Cuttings and air layering can be used. Groups of trees containing both male and female trees need to be grown from root suckers or by budding. Some kinds are self-pollinating. A spacing of 12-16 m apart is needed.

Production: Fruit matures in 60-90 days from pollination.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	69.5	452	0.5	15	14	12	-

Fruit

English: Date palm

Local:

Scientific name: *Phoenix dactylifera*

Plant family: ARECACEAE

Description: An unbranched, evergreen palm that grows to 30 m tall. The trunk can be 30-40 cm across. The trunk is covered with fibres and has the bases of old leaves along it. It produces suckers on the trunk and at the base. The fronds are grey-green. The leaves are 6-7 m long. The leaflets are 20-40 cm long. They are spaced in two irregular rows along each side of the stalk. Male and female flowers are produced on separate trees. The flowers spadices are yellow-brown. There are 1000-1500 fruit in a cluster. The fruit is small, brown and very sweet. It has one grooved seed. The fruit is 2.5-5 cm long. When ripe, the fruit is dull yellow and the flesh soft. The skins of the fruit darken when dried. Strands of fruit have 25-35 dates. The fruit are edible.



Distribution: They suit dry, subtropical climates. It needs hot, dry arid climates while fruit mature. It can tolerate salty or brackish water. It can also grow in alkaline soils but with reduced yields. In cold temperate regions the palm grows but rarely flowers. It does best in areas with long dry summers and sufficient heat for fruit to ripen. It should not have rain during flowering and fruit set. It needs 3400 heat units above 10°C for fruit to fully mature. It suits plant hardiness zones 9-12.

Use: The fruit is eaten fresh or dried. They are also used for jams and preserves. The date stones can be fermented or roasted and used as a coffee substitute. They can be pressed for oil. Dates are also pressed for juice. The sap is used for jaggery and sugar. The male flower can be eaten. The pollen is eaten.

Cultivation: Plants are grown from seed and take 4-5 months to germinate. They begin bearing 5-6 years after planting and reach full production by 15 years. A palm lasts about 80 years. Female plants need to be pollinated before they bear fruit. A single male is sufficient to pollinate 50 females. Taking suckers from good producing plants is a more reliable means of growing new plants. A well-established palm can give 8-18 good suckers over a 6 year period. These suckers should have some leaves cut off during transplanting. About 10% of plants should be male, for pollination. Selection of a good pollinator tree is important. Fruit thinning is often needed to give good sized fruit. Three to four bunches per tree are sufficient.

Production: Trees take about 6 years to reach good production. There can be 45-70 kg of fruit per tree. Trees continue to bear for 50 years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (dry)	22.5	1151	2.0	5	-	1.2	0.3
fruit	58.5	598	0.9	50	6	1.3	-

Fruit

English: Indian jujube

Local:

Scientific name: *Ziziphus mauritiana*

Plant family: RHAMNACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.0	360	0.8	21	71	0.4	0.4
fruit (dry)	17.4	1201	4.3	-	-	-	-

Vegetables

English: Okra

Local:

Scientific name: *Abelmoschus esculentus*

Plant family: MALVACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Pumpkin

Local:

Scientific name: *Cucurbita maxima*

Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is a creeping vine with tendrils. It is an annual plant. The stems are soft and round in cross section. The leaves are large and hang loose. They are dark green and kidney shaped. The edges of the leaves are entire. There are large nodes at the base of the leaf. The tendrils are fairly stout and are divided half way along their length into many branches. Male flowers are carried on long upright stalks. The 5 petals are united into a long yellow tube. The female flowers are larger



than the male and are fewer in number and carried on shorter stalks. The fruit varies in size, colour and patterns on the skin. They can be round, oval or flattened, with yellow, orange or green skin. The surface can be smooth or rough and warty. The flesh is yellow and edible. The seeds are in the centre. The seeds are white or brown. They are flattened but plump and have a slanting scar at the top. The seeds are edible. (*C. moschata* does not have hairy stems but has fruit with a thickened stalk near where it joins the fruit.) There are a large number of cultivated varieties.

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Marrow

Local:

Scientific name: *Cucurbita pepo*

Plant family: CUCURBITACEAE

Description: A bristly hairy annual vine in the pumpkin family. It has branched tendrils. The stems are angular and prickly. The leaves are roughly triangular. The leaves have 5 lobes which are pointed at the end and are toothed around the edge. Male and female plants are separate on the same plant. Male flowers are carried on long grooved flower stalks. Female flowers are borne on shorter more angular stalks. The fruit stalks have furrows along them but are not fattened near the stalk. The fruit vary in shape, size and colour. Often they are oval and yellow and 20 cm long by 15 cm wide. The seeds are smaller than pumpkin and easy to separate from the tissue. The scar at their tip is rounded or horizontal, not oblique. There are a large number of cultivated varieties.



Distribution: A subtropical plant. They are more suited to drier areas. They are frost sensitive, and grow best with day temperatures between 24-29°C and night temperatures of 16-24°C. It suits tropical highland regions. It suits hardiness zones 8-11.

Use: The young fruit are cooked and eaten. They can be steamed, boiled or fried. They are used in pies, soups, stews and cakes. The young leaves and the ripe seeds can also be eaten cooked. The seeds are dried, salted and toasted and eaten as a snack food. The seeds can also be pressed to produce oil. The sprouted seeds are used in salads. Flowers and flower buds can be eaten boiled. They can be dried for later use.

Cultivation: They are grown from seeds. The seeds germinate after one week. They can be grown from cuttings. They are best planted on mounds. A spacing of 2-3 m between plants is needed. Hand pollination assists fruit setting. Plants can also be grown from cuttings as plants root at the nodes.

Production: The first usable immature fruit are ready 7-8 weeks after planting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	3.7	2266	29.4	-	-	7.3	-
leaf	89.0	113	4.0	180	80	0.8	-
fruit (mature)	92.0	105	1.6	17	16	2.4	-
fruit	91.3	102	1.1	-	12	0.8	0.2
yellow fruit	92.0	97	1.0	180	8	1.4	-
immature fruit (raw)	92.0	92	1.5	-	9	0.4	0.1

Vegetables

English: Bitter cucumber

Local:

Scientific name: *Momordica charantia*

Plant family: CUCURBITACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.6	2020	18.6	-	-	-	-
leaf (raw)	84.7	252	5.0	44	170	7.1	0.3
leaf tip (boiled)	88.7	146	3.6	173	57	1.0	0.3
fruit	93.6	105	1.2	-	-	0.2	-
pod (boiled)	94.0	79	0.8	11	33	0.4	0.8
pod (raw)	94.0	71	1.0	380	84	0.4	0.8

Vegetables

Common name: Bush onions

Local:

Scientific name: *Cyperus bulbosus*

Plant family: CYPERACEAE

Description: A sedge. These grow in clumps and have grass like leaves and solid stalks. It is a herb. It grows 10-40 cm high. The rhizomes are slender. They produce brown to black tubers are the tips. The leaves are 10-20 cm long by 0.2-0.3 cm wide. They are flat and erect. They are shiny green. The culms are 20-40 cm tall. The spikelets are 1-3 cm long.



Distribution: A tropical plant. It grows in tropical regions. In Australia it is inland near salt lakes. It grows in dry regions and seasonally wet grasslands. It grows in areas with an annual rainfall of about 300 mm. In East Africa it grows from 300-2400 m altitude. It can grow in arid places.

Use: The husk is removed and the bulb is eaten raw or roasted. The bulbs are also ground and added to flour.

Cultivation: Plants can be grown by division or tubers. They can also be grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
bulb	42.8	883	3.4	-	32	3.4	0.6

Image sourced from: <https://alchetron.com/Cyperus-bulbosus>

Vegetables

English: Vegetable kenaf

Local:

Scientific name: *Hibiscus cannabinus*

Plant family: MALVACEAE

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



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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English:

Local:

Scientific name: *Leptadenia lancifolia*

Plant family: APOCYNACEAE

Description: A creeping shrub with many stems. The leaves are alternate and taper towards the tip. The stems are light green. Young shoots curve upwards and there are long spaces between the leaves. The leaves are up to 10 cm long. They are oval and light green. The flowers are greenish-yellow. The fruit are cone shaped and have 2 valves. These split open releasing cottony winged seeds. The plant has a sticky sap when crushed.



Distribution: A tropical plant that grows in dry savannah. In Ethiopia it grows between 500-1500 m altitude. It grows on sandy loams. It grows in areas with an annual rainfall between 1100-1500 mm. It can grow in arid places. It can tolerate drought. It is little damaged by insects.

Use: The young leaves are eaten. They are washed then cooked. They are usually cooked along with other leaves. They are slightly bitter and are eaten with beans, pigeon pea, or cowpeas.

Cultivation: It can be grown on the fences near houses to provide leafy greens. Plants are grown from seeds.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (raw)	81.0	226	4.9	4915	78	5.4	-

Image accessed from:

[http://www.westafricanplants.senckenberg.de/images/pictures/leptadenia hastata, kafoutine, senegal, 7116 6620 915747 o 996 b0494d.jpg](http://www.westafricanplants.senckenberg.de/images/pictures/leptadenia_hastata_kafoutine_senegal_7116_6620_915747_o_996_b0494d.jpg)

Vegetables

English: Yellow nutsedge

Local:

Scientific name: *Cyperus esculentus*

Plant family: CYPERACEAE

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



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

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

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

Production: Yields of 800-900 kg per hectare of tubers are achieved on sandy soils. Yields of 8,000-14000 kg per hectare are possible. Tiger nuts take 90-120 days to reach maturity.

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Peanut

Local:

Scientific name: *Arachis hypogea*

Plant family: FABACEAE

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



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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Lucerne

Local:

Scientific name: *Medicago sativa*

Plant family: FABACEAE

Description: A herb. It is an erect or spreading legume. It grows to 80 cm high and spreads to 30-80 cm wide. It forms deep roots. It keeps growing from year to year. The stems are slender and hairy. The leaves are bluish green. The leaves have 3 leaflets like clover. The leaflets are oval or narrow. They are 3 cm long. The flowers are mauve. They appear in long stalked bunches. The fruit are small sickle shaped pods. The pods are deep brown. There are many named cultivated varieties.



Distribution: It will grow in warm and temperate climates. In West Africa it grows along the northern border of the Sahara. It can grow in arid places. It suits hardiness zones 4-8.

Use: Seeds are often sprouted and the young sprouts eaten raw. Young leaves are eaten cooked. They are often lightly cooked and added to meat dishes. The seeds can be ground into flour for bread. The dried and powdered leaves and flowers can be used as tea.

Cultivation: Plants are grown from seed sown where they are to grow. Plants can be 10 cm apart. Plants can be cut back to encourage new growth for the young leaves.

Production: The first picking of young leaves can be made 3-4 weeks after sowing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (sprouted)	91.2	122	4.0	155	8.2	1.0	0.9

Nuts, seeds, herbs and other foods

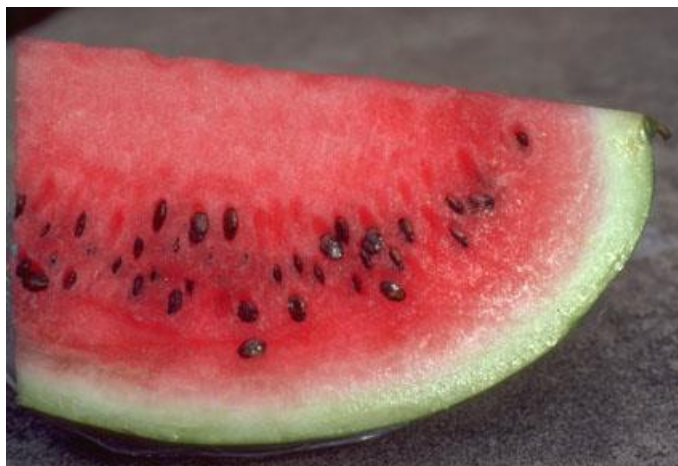
English: Watermelon

Local:

Scientific name: *Citrullus lanatus*

Plant family: CUCURBITACEAE

Description: An annual climber, with deeply divided leaves and tendrils along the vine. It trails over the ground and has hairy, angular stems. The leaves are on long leaf stalks. The leaves are deeply divided along their length. These leaf lobes are rounded and can themselves be divided. The leaves are 5-20 cm long by 2-12 cm across. The tendrils are divided. The plant has separate male and female flowers on the same plant. The flowers are pale yellow and smaller than pumpkin flowers. The flowers occur in the axils of leaves. The male flowers appear first.



Fruit are large and round or oval. They can be 60 cm long. Fruit have a hard smooth skin. Several fruit colours and shapes occur. They often have a dark green mottle, or blotches. The fruit has reddish, juicy flesh and black or red seeds. The seeds are oval-shaped and smooth.

Distribution: It grows in most tropical and subtropical countries. It grows best on the coast in the tropics, but will grow up to about 1000 m altitude. It will not stand water-logging and does well on sandy soils. Plants are frost-sensitive. Seed will not germinate below 21°C. Temperatures between 24-30°C are suitable. Fruit are sweeter in arid warm areas. It suits hardiness zones 10-12.

Use: The fruit is eaten raw when ripe. Small, unripe fruit can be cooked as a vegetable. The skin is sometimes candied in vinegar and eaten with fish. Seeds are also eaten. They are dried, soaked in salt water, then roasted. Oil is extracted from the seeds. Very young leaves are occasionally eaten. It is a popular fruit.

Cultivation: They are suitable mainly for the dry season. A spacing of 1.5-2 m is suitable. They grow easily from seed. They do best when fully exposed to the sun. Seed can be dried and stored. If too much vegetative growth occurs, picking out the tip to produce side branches will produce more fruit.

Production: Harvesting commences after 4-5 months. The main fruit season is November to January. The ripeness can be determined by tapping the fruit to get a dull sound. The part of the fruit on the ground changes from green to light yellow and the tendril near the base of the fruit becomes dry when ripe. Fruit yield can be 45-60 t/ha.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	94.0	92	0.4	20	5	0.3	0.1
seed	5.1	2330	28.3	0	0	7.3	10.2

Nuts, seeds, herbs and other foods

English: Desert date

Local:

Scientific name: *Balanites aegyptiaca*

Plant family: ZYGOPHYLLACEAE

Description: A small, spiny, evergreen tree that grows 6-15 m tall. It produces a rounded crown of tangled thorny branches. The bark is dark brown or grey and has patterns on it. It becomes corky and cracked with age. The branches are stiff and brittle and have stout, single spines up to 8 cm long. The thorns are soft at first then become woody. The leaves occur as distinctive pairs of grey-green leaflets. They are 2.5-6 cm long by 1.5-4 cm wide and are leathery and slightly hairy. The leaves are slightly different shape in each



half. There are 4-6 prominent veins which are clearly seen on the underside of the leaf. The flowers are in small, hairy clusters. They are 1.4 cm across. They are yellow-green and have a sweet smell. The fruit is yellowish-green and 5 cm long by 2.5 cm wide. The fruit are date like. Both ends of the fruit are rounded. There is a hard pointy seed about 4 cm long by 2 cm wide. The flesh around the seed is yellow and bittersweet. The seed is easily separated from the flesh.

Distribution: A tropical plant that is found all over Africa. It grows in the lowlands and Miombo woodland in Africa. It occurs from arid to sub-humid areas. It suits hot, dry areas, such as the Sahel. It grows from sea level to 2000 m altitude. It prefers valley soils but will grow on a range of soils. It suits a rainfall of 200-800 mm. It needs an average temperature of 20-30°C.

Use: The nut or seed is used to make meal. The seeds are boiled in several changes of water then eaten with sorghum. A yellow edible oil is produced by the seeds after long boiling. The fruit and dried pulp are eaten. The fruit is bitter unless very ripe. The fruit are used for syrup and alcoholic drinks. The leaves and flowers are eaten as a vegetable. The resin from the cut bark is chewed. The fruit can be used to treat water supplies to kill the snail hosts of Bilharzia, and the water-flea which carries Guinea worm disease.

Cultivation: It is grown from seed, either in a nursery in pots, or direct. Root suckers can also be used. There are 600-1200 seeds per kg. Seed removed from the fruit can be stored for a year. Seed should be sown vertically with the stem end down for best results. Seeds germinate in 1-4 weeks. Soaking the seed helps them germinate. They can be soaked in cold water for 2 days with the water being changed after 24 hours. Seedlings are slow growing but root suckers are faster.

Production: Trees produce after 5-8 years. Fruit mature in 60 days. In Tanzania, fruit are collected between April and June. A good tree can produce 10000 fruit in one year. Ripe fruit can be sun dried and stored. Seed kernels can be 60% oil.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	63.5	249	10.5	-	-	4.9	0.4
nut (dry)	5.0	2286	23.0	-	-	7.0	-
fruit (dry)	19.0	1150	5.0	-	-	3.1	-
fruit	64.0	510	2.2	-	-	-	-

Nuts, seeds, herbs and other foods

English: Sunflower

Local:

Scientific name: *Helianthus annuus*

Plant family: ASTERACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Mesquite

Local:

Scientific name: *Prosopis africana*

Plant family: FABACEAE

Description: A large tree that. It can grow to 25 m high. The trunk is 80 cm across. It grows straight and un-buttressed in forests and low and crooked in open conditions. The crown is open and the leaves droop. The bark is very dark and scaly. The leaves are alternate and twice divided. The leaves are 10-15 cm long. There are 9-16 pairs of leaflets along 3-6 pairs of opposite leaflets stalks. The leaflets are oblong and 12-30 mm long. The flowers are pale green to yellow. They have a scent. The fruit are dark brown pods. They are thick and hard and 15 cm long by 3 cm wide. There are about 10 loose rattling seeds in each pod.



Distribution: A tropical plant that can grow in forest, savannah and Sahel in West Africa. It grows in areas with an annual rainfall between 400-1200 mm. It grows between 720-1220 m above sea level. It can grow in arid places.

Use: The seeds are used to make a vegetable butter used in flavouring. They are fermented. They are also used in chutneys and relishes. The young pods are eaten.

Cultivation: Plants are grown from seeds. Seeds germinate best when treated with hot water before sowing. The seedlings can be transplanted after 14-18 weeks.

Production: It flowers shortly after the rainy season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed(dry)	4.2	1450	15.4	-	-	-	-

Image sourced from: <https://alchetron.com/Prosopis-africana>

Nuts, seeds, herbs and other foods

English: Tamarind

Local:

Scientific name: *Tamarindus indica*

Plant family: FABACEAE

Description: A large spreading tree up to 24 m tall. It has a broad, dense, evergreen crown. The trunk can be 1 m across. The bark is rough and grey with a checkered pattern. The tree can lose its leaves in dry areas. The leaves are carried one after another along the branch. The whole leaf is 6-12 cm long and it is divided into 10-17 pairs of leaflets. These are oblong and without stalks. The whole leaf has a leaf stalk about 15 cm long. The leaflets are 1-2.5 cm long and 4-9 mm wide. They are a dull dark green with a rounded tip. The flowers are pale yellow with brown markings. The flowers are about 2.5 cm across and hang on long, many flowered stalks. The fruit is an oblong, thin-skinned, fleshy capsule. The brown seeds are inside this long rough surfaced, sausage-like fruit. This pod is 6-8 cm long and about 2 cm wide and contracted between the seeds. The pod cracks when mature. The seeds are shiny and hard. The edible pulp is date like and reddish brown.



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

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

Cultivation: It can be grown by seeds or cuttings. It is best to sow seedlings in pots then transplant them, but seed can be sown direct. There are about 1400 seeds per kg. Seed should be soaked in hot water or the seed coat nicked before sowing. Seed can be stored for 2 years if kept dry, cool and away from insects. Trees can be topped or cut back and allowed to re-grow. Nothing grows under the trees due to the acidity of the leaves. Trees can be grown by air layering or cuttings.

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

Food Value: Per 100 g edible portion

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

Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	<i>Amaranthus caudatus</i>	Grain amaranth	leaf	6.0	1034	28.8	33	-	23.3	5.5	34
AMARANTHACEAE	<i>Amaranthus cruentus</i>	Purple amaranth	leaf	84.0	176	4.6	-	64	8.9	-	36
ANNONACEAE	<i>Annona senegalensis</i>	Wild custard apple	fruit	77.2	329	1.7		18.1	0.7	0.3	41
APOCYNACEAE	<i>Leptadenia lancifolia</i>		leaf (raw)	81.0	226	4.9	4915	78	5.4	-	56
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	11
ARECACEAE	<i>Borassus flabellifer</i>	Wine palm	fruit	89.4	139	0.7	208	35.1	1.7	0.3	42
ARECACEAE	<i>Phoenix dactylifera</i>	Date palm	fruit	58.5	598	0.9	50	6	1.3	-	47
ASTERACEAE	<i>Helianthus annuus</i>	Sunflower	seed	5.4	2385	22.8	5	1.4	6.8	5.1	63
BASELLACEAE	<i>Basella alba</i>	Indian spinach	leaf	85.0	202	5.0	56	100	4.0	-	37
BOMBACACEAE	<i>Adansonia digitata</i>	Boabab	fruit	16.0	1212	2.2	-	360	7.4	6.7	38
CARICACEAE	<i>Carica papaya</i>	Pawpaw	fruit	88.0	163	0.5	290	54	0.4	0.18	44
CONVOLVULACEAE	<i>Ipomoea batatas</i>	Sweet potato	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	14
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	53
CUCURBITACEAE	<i>Cucurbita maxima</i>	Pumpkin	seed (dry)	6.9	2264	24.5	38	1.9	14.9	7.5	51
CUCURBITACEAE	<i>Cucurbita pepo</i>	Marrow	fruit (mature)	92.0	105	1.6	17	16	2.4	-	52
CUCURBITACEAE	<i>Citrullus lanatus</i>	Watermelon	seed	5.1	2330	28.3	0	0	7.3	10.2	60
CYPERACEAE	<i>Cyperus bulbosus</i>	Bush onions	bulb	42.8	883	3.4	-	32	3.4	0.6	54
CYPERACEAE	<i>Cyperus esculentus</i>	Yellow nutsedge	rhizome	36.5	1262	3.5	-	-	8.0	-	57
DIOSCOREACEAE	<i>Dioscorea bulbifera</i>	Potato yam	tuber	70.8	357	2.7	-	78	3.1	0.4	20
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	17
FABACEAE	<i>Sphenostylis stenocarpa</i>	African yam bean	seed (boiled)	67.9	542	3.8	-	-	-	-	13
FABACEAE	<i>Vigna vexillata</i>	Pencil yam	root	68.9	287	2.3	-	-	10.0	1.7	21
FABACEAE	<i>Acacia farnesiana</i>	Sweet acacia	seed (dry)	8.1	1522	36.6	-	-	6.0	0.6	22
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed (young, boiled)	71.8	464	6.0	2	28.1	1.6	0.8	23
FABACEAE	<i>Canavalia ensiformis</i>	Jack bean	pod (fresh)	88.0	155	2.4	-	-	-	-	24
FABACEAE	<i>Macrotyloma geocarpum</i>	Hausa groundnut	seed	9.0	1461	19.4	-	-	15.0	-	25
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	pod (fresh)	86.7	203	3.9	-	1.0	2.4	-	26
FABACEAE	<i>Phaseolus lunatus</i>	Lima bean	seed (young, cooked)	67.2	515	6.8	37	10.1	2.5	0.8	27
FABACEAE	<i>Vigna radiata</i>	Mung bean	seed	11.0	1432	22.9	55	4	7.1	-	28
FABACEAE	<i>Vigna unguiculata subsp. unguiculata</i>	Cowpea	young pod + seed (boiled)	89.5	142	2.6	45	17.0	0.7	0.2	29
FABACEAE	<i>Arachis hypogea</i>	Peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	58
FABACEAE	<i>Medicago sativa</i>	Lucerne	seed (sprouted)	91.2	122	4.0	155	8.2	1.0	0.9	59
FABACEAE	<i>Prosopis africana</i>	Mesquite	seed(dry)	4.2	1450	15.4	-	-	-	-	64
FABACEAE	<i>Tamarindus indica</i>	Tamarind	fruit	38.7	995	2.3	20	60	1.1	0.7	65
FLACOURTITACEAE	<i>Flacourtia indica</i>	Governor's plum	fruit	69.5	452	0.5	15	14	12	-	463
LAURACEAE	<i>Persea americana</i>	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	39
MALVACEAE	<i>Corchorus olitorius</i>	Jute	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	30
MALVACEAE	<i>Hibiscus trionum</i>	Flower-of-an-hour	leaf	6.3	1263	26.7	-	-	79.8	5.7	31
MALVACEAE	<i>Sida cordifolia</i>	Goat's horns	leaf	6.6	1296	24.2	-	-	79.8	-	32
MALVACEAE	<i>Abelmoschus manihot</i>	Edible hibiscus	leaf	88	120	3.4	1.0	7.0	1.5	1.2	33
MALVACEAE	<i>Abelmoschus esculentus</i>	Okra	fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6	50
MALVACEAE	<i>Hibiscus cannabinus</i>	Vegetable kenaf	leaf	79.0	280	5.5	34	-	12.1	-	55
POACEAE	<i>Sorghum bicolor</i>	Sorghum	seed	-	1459	11.1	-	-	-	-	16

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
POACEAE	<i>Eleusine coracana</i>	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	19
RHAMNACEAE	<i>Ziziphus mauritiana</i>	Indian jujube	fruit	77.0	360	0.8	21	71	0.4	0.4	48
ZYGOPHYLLACEAE	<i>Balanites aegyptiaca</i>	Desert date	nut (dry)	5.0	2286	23.0	-	-	7.0	-	61



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