

Potentially Important Food Plants of South Africa



**FOOD PLANT
SOLUTIONS**
ROTARIAN ACTION GROUP

*Solutions to Malnutrition
and Food Security*



A Project of the Rotary Club of Devonport North,
District 9830 & Food Plants International

www.foodplantsolutions.org

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Dedication

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

Preface

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

The selection of plants included in this guide has been developed by Michael Hill and Melanie Bower 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 South Africa. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of South Africa, 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
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- assume responsibility for sickness, death or other harmful effects resulting from eating or using any plant described in the database or this Field Guide

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

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Introduction

This book is designed as a simple introduction to useful, and sometimes under-utilised, food plants of South Africa. It is hoped people will take greater pride and interest in these plants and become confident and informed about how to grow and use them. Many of the local food plants that occur in every country are very good quality foods. Unfortunately, people often reject traditional food plants in favour of introduced varieties. The principle behind Food Plant Solutions is to encourage the use of these local plants.

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. While this is sometimes true, it is often not the case. Many of the newer or introduced food plants, such as the round or ballhead cabbages and lettuce, 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 showing there are often much better choices of local foods with higher levels of important nutrients.

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 local regions. Others have hundreds of varieties and are the main food for people in different regions. Information on these plants, and in many cases, 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. Potatoes should be grown from new seed pieces each year to prevent build up of virus diseases. Tomatoes will yield fewer but larger fruit if lower branches are pruned. 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.

An Important Note

As noted above, a guiding principle behind Food Plant Solutions is to encourage the use of local plants. It is acknowledged that some of these may be major agricultural crops that are already well known, such as:

- Rice
- Oats
- Mango
- Wheat
- Maize/corn
- Banana

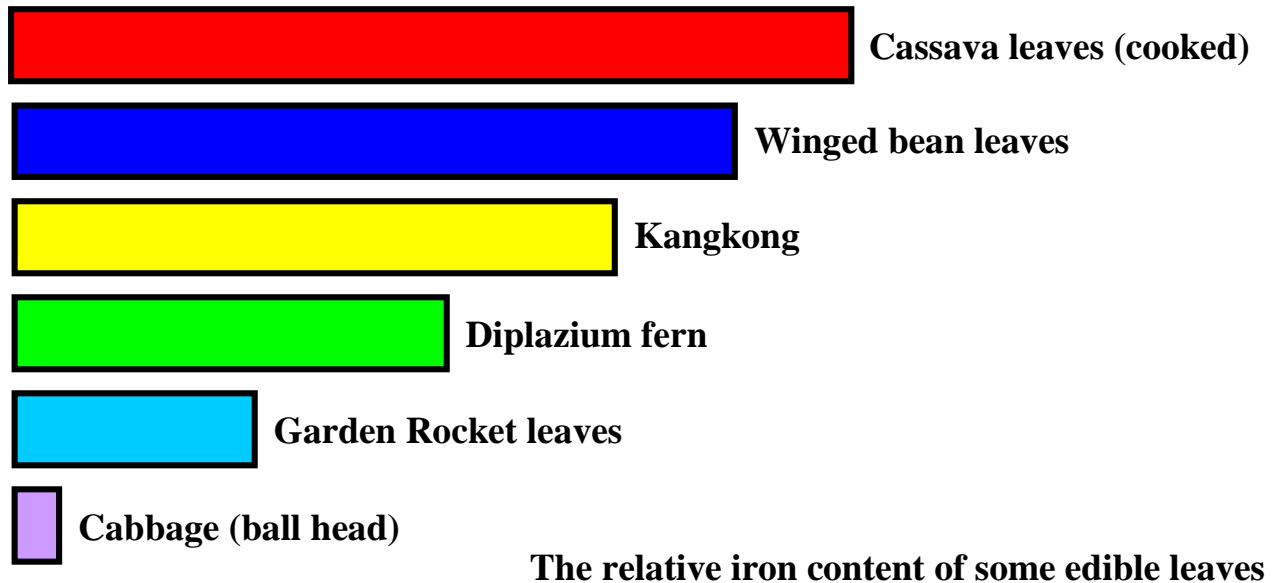
There are others, but these serve as examples.

As a general principle, these types of plants are not included in a field guide, as they are well known, and in some cases (e.g. corn), can be relatively high input crops. However, if they are particularly important in a country, such as rice in many Asian countries, they may still be included. The main purpose of the Food Plants Solution project is to look beyond these types of crops, and focus on plants that are less well known and, as noted above, often have superior food value and lower input requirements.

It is also important to note that while some plants have extremely high levels of some nutrients, many of these are used as flavouring foods (condiments), and are generally used only in small amounts. Therefore, the nutritional contribution they make to the diet will be relatively small. Typical of these types of plants are coriander, parsley etc. Once again, these should not be considered as major food sources. A few may be included in the *Nuts, Seeds, Herbs and other foods* section of the field guide.

Nutrient Value

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



A healthy balanced diet

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

Learning to cook well

Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Some plants contain 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) becomes more readily 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 region. 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, (and keeping it watered), 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 some 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. In many cases, small tubers of yams, taro etc. are stored for planting for the next crop. This is not always good practice, as the small tubers could be the result of diseases (such as viruses) in the plant. A good rule is to take cuttings or save tubers from the best plants for re-planting.

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. 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. This

is not to say that imported varieties might not be better, but it is worth checking that the new plant will perform as well as, or better than, those currently grown, before going to the trouble of importing seed. *If you can't get seeds or planting material from local gardens, it is probably not a suitable local plant! Once again saving seed from the better plants helps ensure that you have better crops the next time you 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. 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 tubers will store well for a few months in the right conditions.

Crop rotation

Crop rotation involves planting different crops in succession to improve soil fertility and reduce the impact of insect pests and diseases. The crops in the rotation should be selected to reduce the risk of carry-over pests and diseases from one crop to the next. A three-year rotation would normally involve growing a legume to increase soil nitrogen levels, and then two different crops before a legume is planted again. Maximum suppression of diseases and insects should be achieved if the non-legume crops are alternated between grass and broad-leafed plant families. Crops planted in a mixture of two or more species will provide greater diversity, and hence reduce losses due to pests and diseases.

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.

Control of soil erosion

Erosion, or loss of soil, occurs when wind or running water carries soil away from cultivated areas. If erosion continues year after year, the land will become unproductive. Trees and shrubs can be planted in strips across the direction of the dominant wind to reduce wind erosion, or across the slope to help slow water that flows over cultivated soils. Growing crops with good leaf cover, or leaving crop residues to cover the soil surface, will significantly reduce soil loss during windy or wet seasons. When possible, any soil disturbance, such as tillage, should occur after the risk of windy weather or wet weather run-off has passed. In steep areas, tillage should be on the contours around hills, rather than up and down the slope. Various techniques can be used to leave ridges or terraces in the tilled soil to help slow water, or reduce the effects of wind, and hence reduce soil loss. Always reduce tillage to the minimum amount possible while still achieving a successful crop.

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. Cutting it into small pieces will help it break down more quickly into usable compost.

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 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 an 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. Compost returns nutrients to the soil, improves the soil's ability to retain moisture and also helps improve soils that are acid or saline.

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. Cutting the plant material (especially stems), into small pieces no longer than about the width of a finger, will help it break down quicker. If possible, make layers of plant material, then a small layer of soil, and then scatter fire ash on top. Keep repeating this process to make a heap. A good compost heap should be warm inside. Be careful with diseased plant material. This should be burnt, otherwise the disease may be spread when you use the compost at a later date.

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. A handful of compost placed at the base of each plant can be beneficial.

Pests

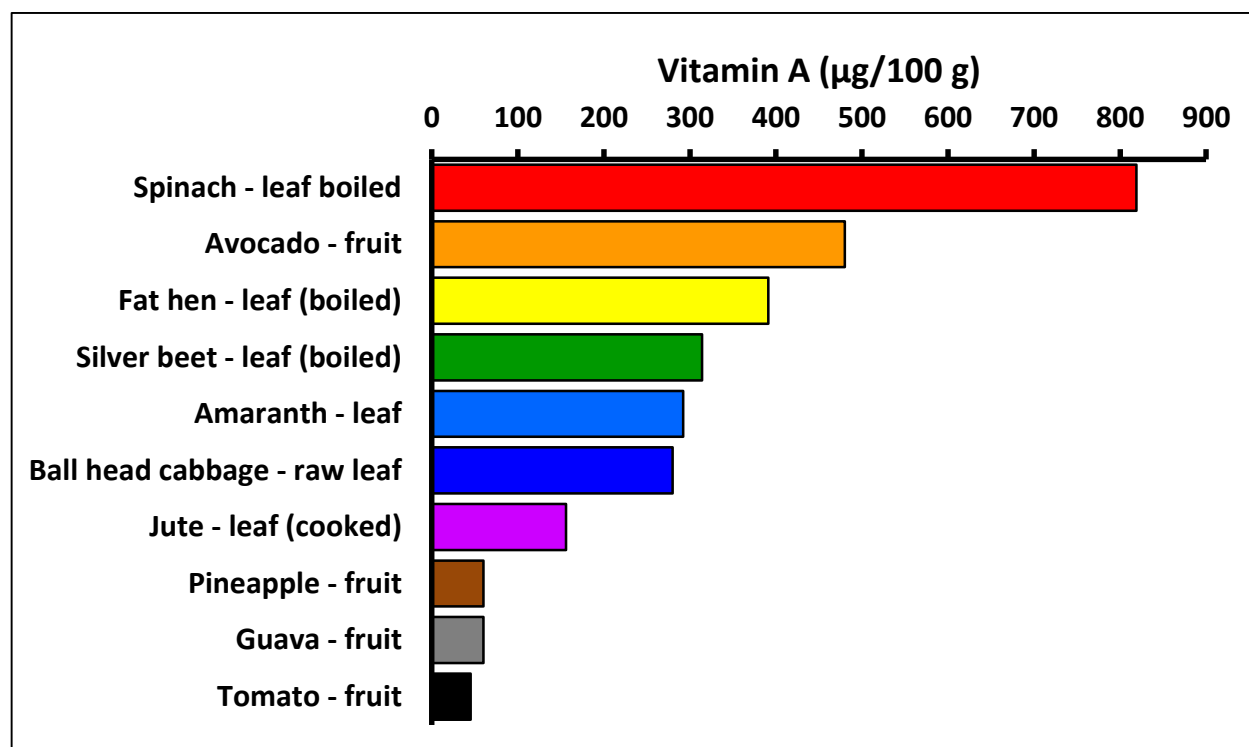
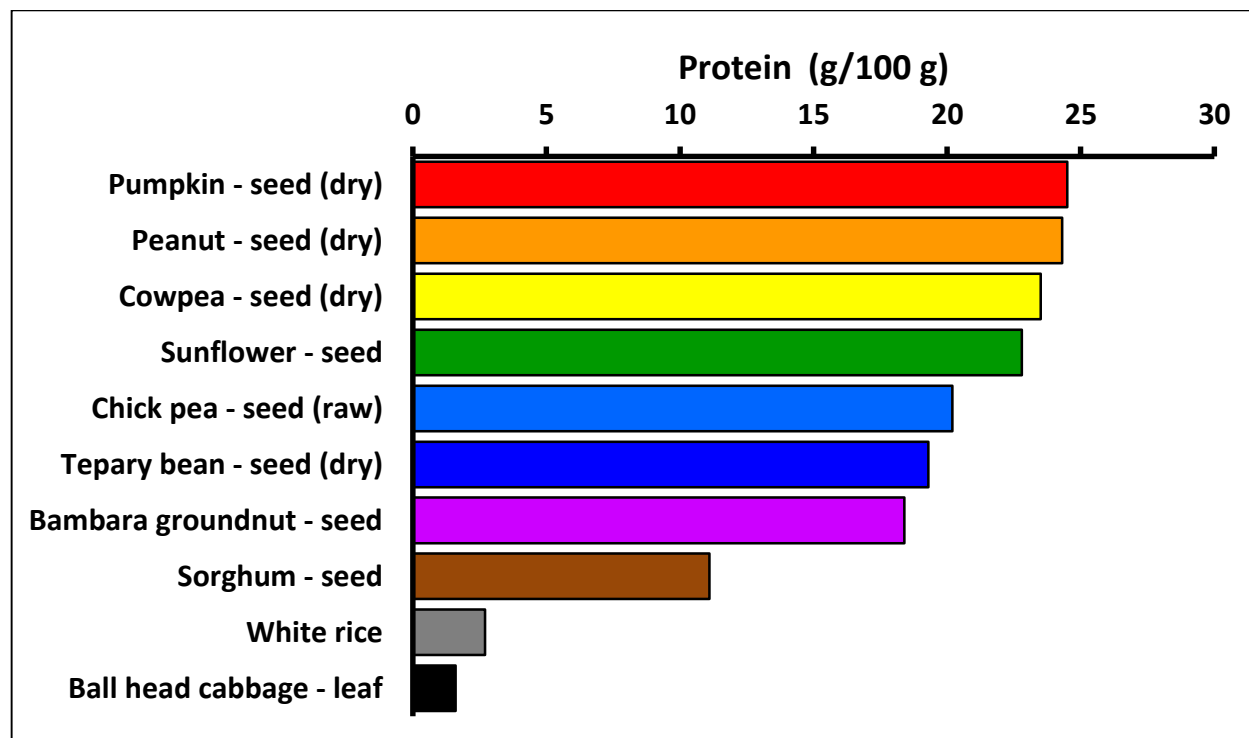
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects 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. Spiders, ladybirds, hover flies and many other insects also feed off the insect pests that attack our crops and should be encouraged.

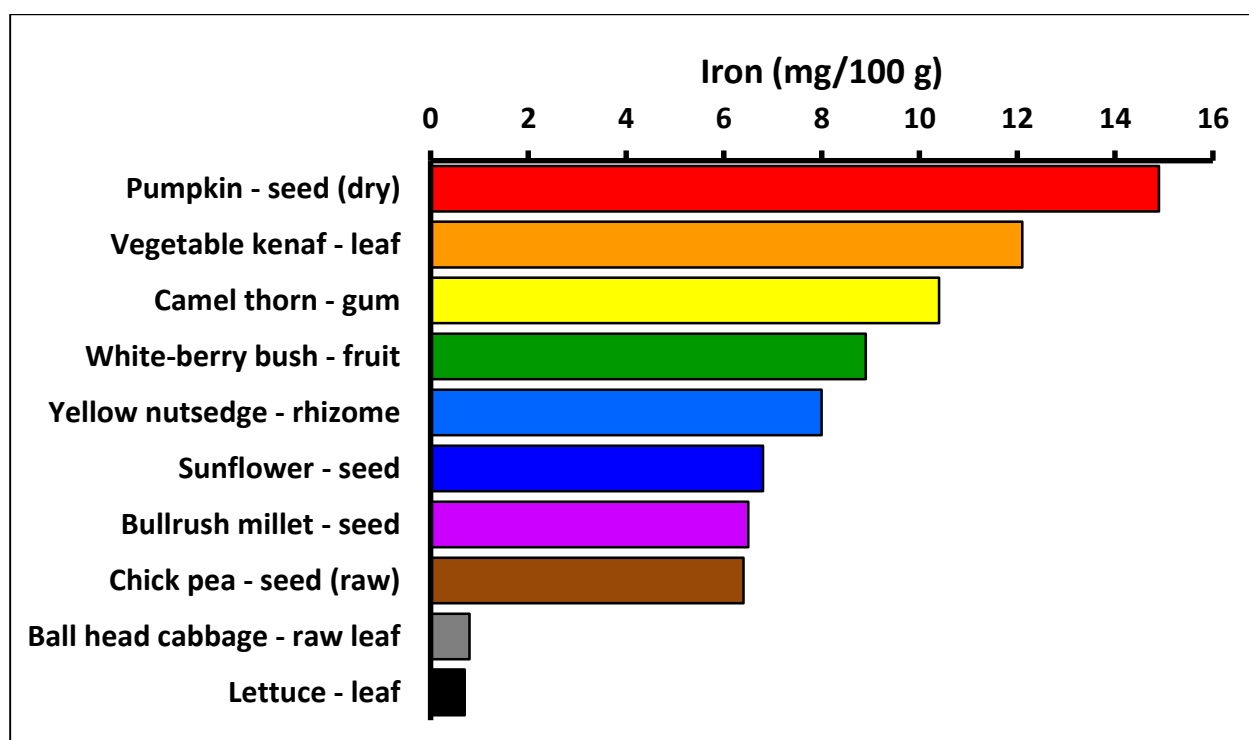
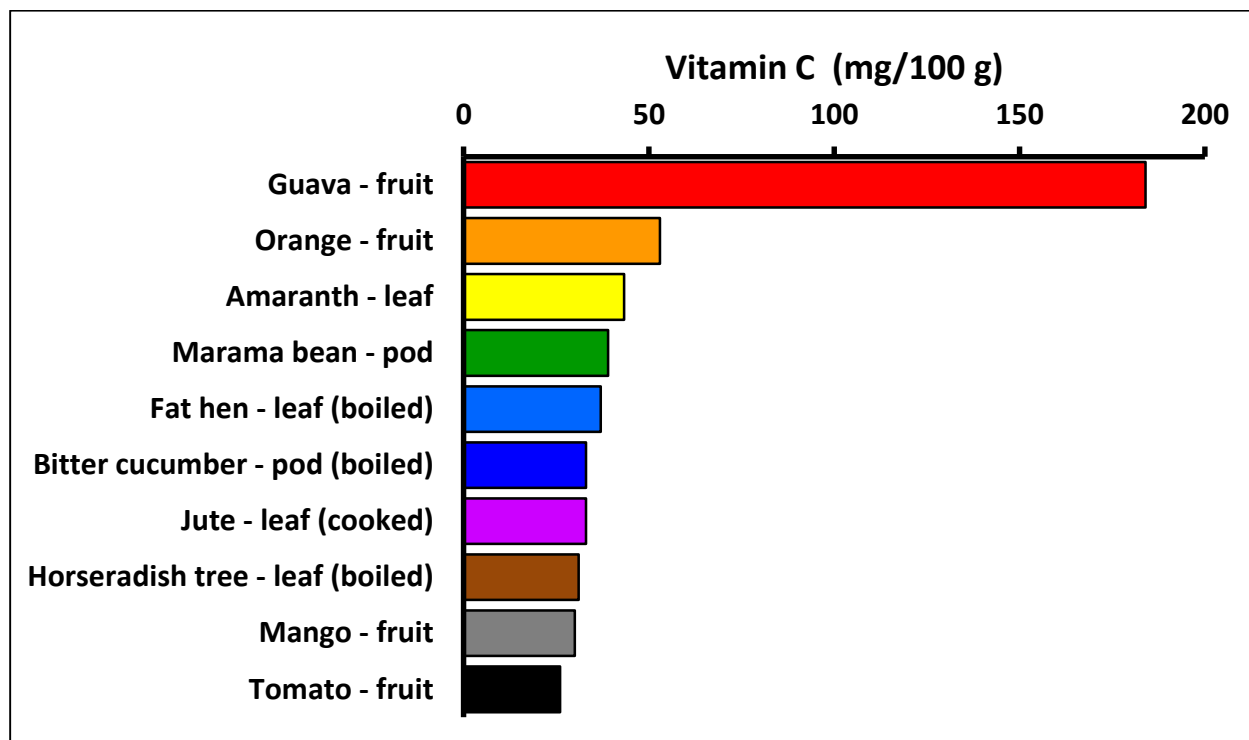
Diseases

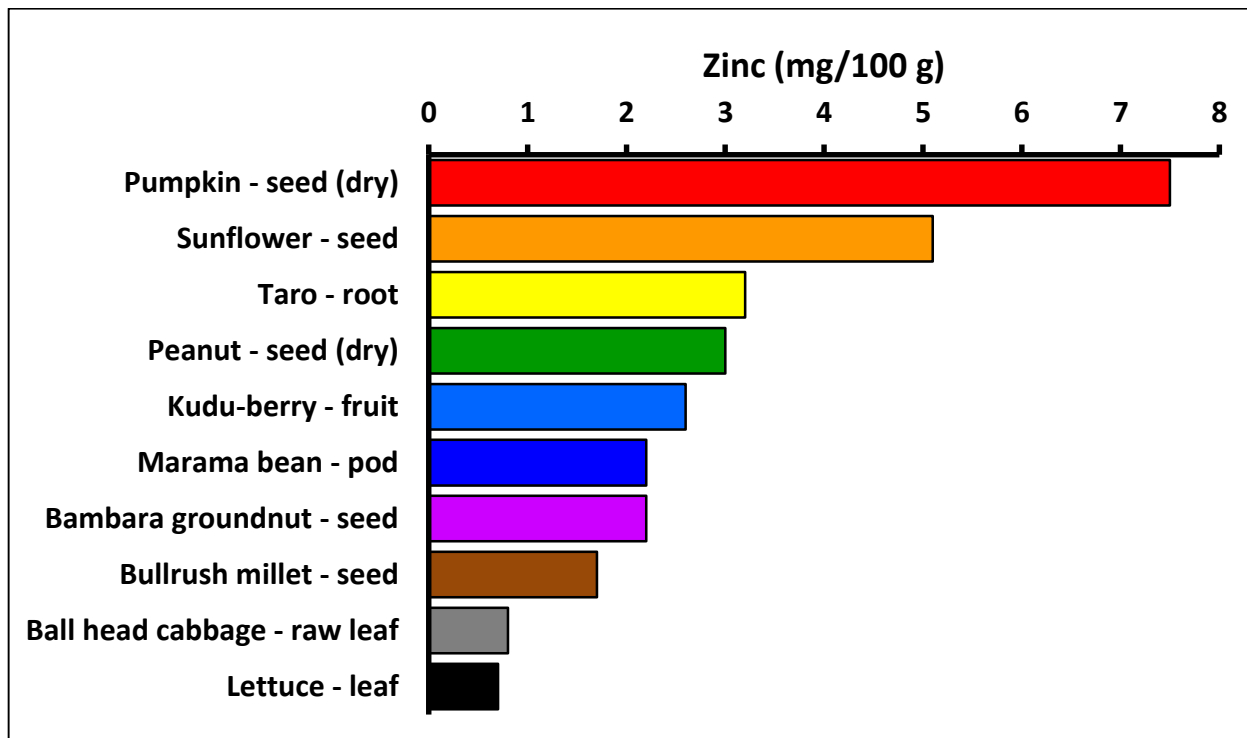
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct 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. Plants infected by viruses are often yellow, and may be stunted, or have curled or unusual shaped leaves. 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 South Africa







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: African bitter yam

Local:

Scientific name: *Dioscorea dumetorum*

Plant family: DIOSCOREACEAE

Description: A climbing yam plant. It can be 10 m long. The vine twines left or clockwise. The vine is robust and has prickles near the base. The leaf has 3 leaflets. The flowers are small and round. Sometimes it forms bulbils or small aerial yams along the stem. Underground the tubers are usually fused together to form a cluster. Some wild forms are very poisonous. The tubers vary in shape and colour. There is often a main tuber with deep lobes then small tubers around it. They are near the soil surface and 3 - 7 cm across. The flesh can be white, pale yellow or dark yellow.



Distribution: A tropical plant that is native to tropical Africa. It grows between 15°N and 15°S. It grows on the edges of forests and along river banks. It occurs between 500 - 1,400 m altitude.

Use: The tuber is boiled, peeled, sliced, pounded, and steeped in running (preferably salt) water then dried. It is also used to make an alcoholic drink. **Caution:** Some forms are poisonous. They must be processed before being used.

Cultivation: Plants are grown from setts or section of the tubers. Sections of the vine can be used.

Production: A crop takes 8 - 10 months to mature. Tubers are collected soon after the rainy season finishes.

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	67	520	3.2	-	-	-	-

Image sourced from www.eastafricanplants.senckenberg.de

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 1,650 m. In Fiji they grow to 900 m. They can grow in poor soil and can survive drought. It is native to tropical America. It grows between 25°N and 25°S and needs a rainfall above 750 mm. It suits hardiness zones 10 - 12.

Use: The tubers are eaten after thorough cooking. They are boiled, roasted or made into flour. The starch is used in puddings, soups and dumplings. Young leaves are edible after cooking. They are also sometimes dried and stored. Seeds are also eaten.

Caution: Bitter kinds of cassava contain poison but this is destroyed on heating. This kind of cassava should be cooked, sun dried, soaked and cooked again.

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

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

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

Because cassava can still grow satisfactorily in poorer soils it is often put last in a rotation after others crops have already been grown on the piece of land. Cassava is more responsive to nitrogen and potassium than phosphorus under many field situations. Nitrogen can increase cyanide levels. Under very acid conditions with high soluble aluminium levels, cassava has been able to achieve and maintain top growth but with significantly reduce root yields. When drainage is good and soil moisture is adequate, cassava stalks can be planted at any orientation from horizontal to vertical, but in very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: 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 1,000 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	0	-	-	-

Starchy staples

English: Potato

Local:

Scientific name: *Solanum tuberosum*

Plant family: SOLANACEAE

Description: A branched annual plant up to 50 cm tall. The stems are soft and 4 angled with compound leaves. The leaves are irregular shape and have 6 - 8 pairs of leaflets as well as small irregular leaflets between the others. It has swollen stem tubers under the ground. The tubers can vary in colour from white to red and purple. The tuber shape can also vary greatly. The flowers are white pink or purple. The fruit is a berry. It is smooth, round and green but often striped.



Distribution: In the tropics they mostly grow at high altitude above 1,500 m, but they are grown between 900 and 2,800 m. Tubers form best when soil temperatures are 15.5°C. Tuber formation stops with a soil temperature of 30°C and decreases with temperatures above 20°C. Potatoes should have a mean temperature below 18°C. They are damaged by frost but slightly more frost tolerant than sweet potato. Short day length helps tuber production. They can grow with a soil pH of 5.2 - 6.6. It suits hardiness zones 7 - 11.

Use: The tubers are cooked and eaten. They are also fried, canned and made into starch. The tubers are boiled, baked, roasted, mashed and used in soups, stews, dumplings, pancakes and potato salads. Potatoes are also used to make alcoholic drinks. The tender leaves are also occasionally eaten.

Caution: The green tubers and leaves contain a poisonous alkaloid solanine.

Cultivation: Plants are grown from tubers. Due to virus diseases, it is necessary to get fresh seed tubers each few years. Large tubers can be cut to include a bud or "eye". A seed piece of 40 - 50 g is suitable. It is best to inter-crop as this stops bacterial wilt spreading. The plant is surrounded by dirt when 20 - 25 cm tall. Later the tubers need to be kept covered with dirt. Providing extra light (4 - 5 hours) allows plants to form flowers and true seed to be collected.

Production: The time to maturity is between 17 and 24 weeks. Yields of 5 - 12 t/ha can be expected. Higher yields can be obtained with good care.

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)	71.2	456	2.3	0	12.9	1.4	0.3
tuber	77.0	344	2.0	25	21	0.8	0.27
leaf	86.1	-	-	3.4	-	-	-

Starchy staples

English: Taro

Local:

Scientific name: *Colocasia esculenta*

Plant family: ARACEAE

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



The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.

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

Use: The corms, petioles and leaves are all edible after cooking. The leaves are also dried and stored. Fresh leaves can be stored for 4 - 5 days.

Caution: Some varieties burn the throat due to oxalate crystals.

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

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

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

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

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

Taro is sensitive to weed competition throughout most of its growth, but it is more critical during early growth up to 3 - 4 months. About 7 - 9 weeding's 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 spacing's 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 spacing's 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	92.2	2.7	424	35.5	1.2	0.2

Starchy staples

English: Yellow nutsedge

Local:

Scientific name: *Cyperus esculentus*

Plant family: CYPERACEAE

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



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

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

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

Production: Yields of 800 - 900 kg per hectare of tubers are achieved on sandy soils. Yields of 8,000 - 14,000 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	-

Legumes

English: Camel thorn

Local:

Scientific name: *Acacia erioloba*

Plant family: FABACEAE

Description: A shrub or tree. It varies greatly. It can be a spiny shrub 2 m high or a tree 16 m high. It can have a wide spreading crown. The bark is dark brown and deeply furrowed. The spines are 6 cm long. Often they have a swollen base. The leaves are compound. They have 2 - 5 pairs of leaf stalks with 8 - 15 pairs of leaflets on each. The flowers are bright golden yellow balls. The fruit is a thickened, short flat pod. It is 11 cm long by 4.7 cm wide.



Distribution: It is a subtropical plant. It grows in dry woodland and arid stony areas. It grows in hot arid places. It can tolerate dry conditions and frost. It grows in areas with an annual rainfall between 40 - 900 mm. It grows between 120 - 1,675 m above sea level. It suits hardiness zones 9 - 11.

Use: The gum is eaten. It has an acrid taste. The roasted seed can be used as a substitute for coffee. The fruit pulp is eaten as a famine food.

Cultivation: Plants can be grown from seeds. The seeds are put into boiling water and soaked for 24 hours. They are then dried and planted 2 cm deep. It has a long taproot so is difficult to transplant. Plants need watering when young.

Production: The plants are slow growing.

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	8.0	1380	25.5	-	-	4.9	3.5
gum	13.9	1308	6.8	-	-	10.4	0.3

Image sourced from: en.wikipedia.org

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 1,800 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

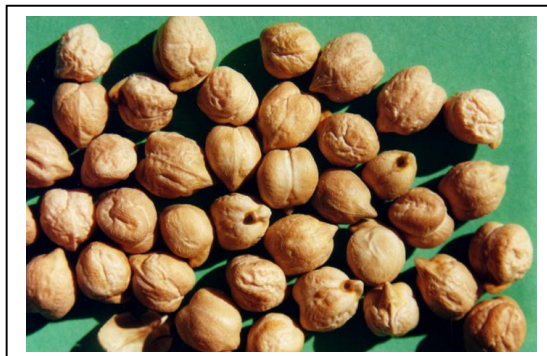
English: Chick pea

Local:

Scientific name: *Cicer arietinum*

Plant family: FABACEAE

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



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

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

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

Production: Yields of 400 – 1,600 kg per hectare of seed are average for chick peas. Plants can reach maturity in 4.5 - 5 months, but 7 months or longer are taken for some types.

Food Value: Per 100 g edible portion

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

Legumes

English: Tepary bean

Local:

Scientific name: *Phaseolus acutifolius*

Plant family: FABACEAE

Description: A twining or sprawling bean plant. It is an annual herb. It grows 45 - 100 cm high and spreads 30 - 60 cm wide. The leaves are compound. They have 3 - 5 narrow, pointed, sword shaped leaflets. The primary leaves do not have stalks. The flowers are white or yellow on short stalks. The fruit are oblong seed pods. These are slightly hairy and green but dry to a straw colour. There are 2 - 10 seeds per pod. These are normally flat.



Distribution: A tropical and subtropical plant. It can grow in hot dry regions. They do not do well in humid weather. It grows between 50 and 1,920 m altitude. It requires an annual rainfall of 250 - 300 mm. It needs well drained soils. It needs a pH of between 6.7 - 7.1. It can grow in arid places. It suits hardiness zones 8 - 11.

Use: The seeds are ground into flour and used for "instant" bean dishes. The seeds are eaten boiled or baked. They are used in soups and stews. The young tender pods are cooked and eaten. The leaves are tough so need to be cooked well.

Cultivation: Plants are grown from seed. Seed stored dry will remain viable for 3 years.

Production: Plants flower 27 - 40 days after germination. They ripen 60 - 80 days after germination. Yields of 200 - 950 kg per ha are achieved. Yields are high with good fertiliser use.

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)	8.6	1476	19.3	-	-	-	-

Legumes

English: Lablab bean

Local:

Scientific name: *Lablab purpureus*

Plant family: FABACEAE

Description: A climbing bean which can have vines 1 - 5 m long. It keeps growing from year to year. The stems can be smooth or hairy. Leaves are made up of 3 almost triangular leaflets. The leaflets are 5 - 15 cm long and 3 - 14 cm wide. The side leaflets are somewhat asymmetrical. Often the plants are flushed purple. The flowering clusters are 5 - 20 cm long. Flowers are often white but can vary from red to blue. The pods are flattened, pointed and up to 12 cm long and 2 cm wide. They can be green, purple or white. Inside there are 3 - 5 white or dark seeds. Seed pods have a wavy margin.



The seeds are 0.5 - 1.5 cm long. (This bean is similar to Lima bean but the keel of the flower is not spirally twisted, the pod ends more bluntly with a long thin style at the end and the hilum on the seed is longer.)

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

Use: The young pods, ripe seeds and young leaves are edible, cooked. Flowers can be eaten raw, steamed or added to soups and stews. Dried seeds can be cooked as a vegetable. The seeds can also be sprouted then crushed and cooked. The large starchy root is edible.

Caution: Many types can be poisonous. They should be boiled and the cooking water thrown away.

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Bambara groundnut

Local:

Scientific name: *Vigna subterranea*

Plant family: FABACEAE

Description: An annual plant that can be either a bunchy bush or a trailing plant. Often the creeping stems are near ground level. It often appears as if bunched leaves arise from branched stems near ground level. It has a well-developed taproot. The leaves have 3 leaflets. The leaf stalk is erect and thickened near the base. The end leaflet is slightly larger than the side leaflets. Leaflets are about 6 cm long by 3 cm across. The flowers are yellowish-white and occur in pairs. The flower/fruit stalk elongates after being fertilised and pushes into the soil. The fruit are pods which are round and have one seed. Some kinds have 3 seeds. This pod develops under the ground on a long stalk. The seeds are hard and are of many colours. Pods can be 3.7 cm long.



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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	7.3	1572	18.4	-	-	4.6	2.2
seed (boiled)	66.4	578	7.7	-	-	1.4	1.1

Legumes

English: 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 1,650 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 or cooked. They are boiled, steamed, roasted, salted or made into peanut butter or flour. The young leaves and unripe pods are edible after cooking. Sprouted seeds can be eaten. 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	-

Legumes

English: Winged bean

Local:

Scientific name: *Psophocarpus tetragonolobus*

Plant family: FABACEAE

Description: A climbing perennial bean up to 4 m tall. It can re-grow each year from the fattened roots. The stems twine around supports or trail over the ground. The leaves have 3 leaflets 8 - 15 cm long with long leaf stalks. The flowers are blue or white and occur on the ends of branches from within the axils of leaves. Pods have wavy wings and are roughly square in cross section. They are 6 - 36 cm long with 5 - 30 seeds. Seeds can be white, yellow, brown or black and are bedded in the solid tissues of the pod. The seeds are round and smooth with a small hilum. The root has large nodules.



Distribution: A tropical plant that grows from sea level up to about 1,850 m altitude in the tropics. It normally only produces tubers at 1,200 - 1,850 m altitude. It is a short day plant and needs a day length less than 12 hours. It will not produce flowers or pods at places far removed from the equator. The main areas of production are between 20°N and 10°S latitudes. It is ideally suited to the tropics including the hot humid lowlands. For maximum seed production, temperatures of 23 - 27°C are needed, and for tubers the temperatures should be 18 - 22°C. Winged beans can grow on a wide variety of soils and have been grown on soils with pH from 3.6 - 8.0. Soils which are very acid have soluble aluminium to which winged beans are sensitive. Soils should not be waterlogged.

Use: The young leaves, flowers, young pods, ripe seeds and root tubers are edible. The seeds can be used to extract an edible oil.

Cultivation: Seeds are sown at the beginning of the rainy season. Seeds germinate and grow slowly for the first 3 - 5 weeks. For tubers, vines are pruned off at about 1 m high (or left unstaked) and some flowers are removed. Cultivation procedures vary slightly depending on which part of the plant is to be eaten. Short podded winged bean are used for tubers and long podded ones have poor tubers. Tuber production is not as efficient in tropical lowland conditions.

Production: The first green pods are ready about 10 weeks after sowing. Tubers are ready after 4 - 8 months. Seed yields of 1.2 tons/ha and tuber yields of 4 tons/ha are possible. A single plant can produce up to 75 pods. Dry bean yields of 45 - 330 g per plant can be produced depending on variety. Tuber yields of 5,500 - 12,000 kg per hectare have been produced. Seeds can contain a trypsin inhibitor which reduces protein digestibility. This inhibitor is destroyed by soaking seeds then boiling them well. Tubers can also contain this chemical and need to be well 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
seed	8.5	1764	41.9	-	-	15.0	4.5
pod (fresh)	92.0	105	2.1	-	-	-	-
leaf	95.0	197	5.0	809	30	6.2	1.3
seed (young)	87.0	205	7.0	13.0	18.3	1.5	0.4
root	57.4	619	11.6	0	0	2.0	1.4

Legumes

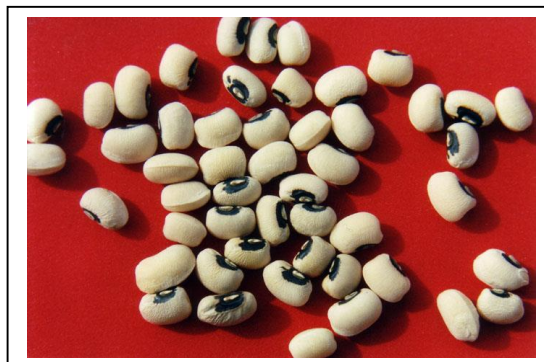
English: Cowpea

Scientific name: *Vigna unguiculata subsp. unguiculata*

Local:

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 1,800 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

Legumes

English: Sword bean

Local:

Scientific name: *Canavalia gladiata*

Plant family: FABACEAE

Description: A climbing or sometimes bushy and upright bean plant. Mostly it is a climber that can grow up to 4 m long. The leaves have 3 large leaflets. The leaflets are oval and 7.5 - 20 cm long by 5 - 12 cm wide. The top of the leaf can narrow abruptly to a tip while the base can be rounded or broadly wedge shaped. The leaves are slightly hairy on both surfaces. The leaf stalk is 5 - 12 cm long. The white flowers occur in a cluster 7 - 12 cm long with a stalk 4 - 20 cm long. The individual flower stalks are 2 mm long. The pods are long (20 - 40 cm) and curved. Seeds are coloured red or pink. The hilum is dark brown and almost as long as the seed.



Distribution: A tropical plant. Temperatures of 20 - 30°C suit it well and it grows from sea level to about 1,000 m altitude in equatorial zones. They are drought and salt resistant. They can grow on lowland tropical nutrient depleted soils and on soils with pH from 4.5 - 7.0. They can tolerate some shade.

Use: Young pods are cooked and eaten. Seeds can be cooked and eaten, but the water should be changed and they should be well boiled. They are also fermented. The leaves are blanched and eaten.

Caution: The seeds can be poisonous due to hydrocyanic acid and saponin. Cooking will remove these.

Cultivation: They are grown from seeds. Seeds germinate readily and the plant is relatively fast growing. Seeds can be sown 5 cm deep. Plants should be 60 - 70 cm apart. Climbing types need support. Often natural supports such as trees, walls and fences are used in backyard production. For large scale production 25 - 40 kg/ha of seed are needed.

Production: Green seeds/pods are produced in 3 - 4 months and mature seeds in 5 - 10 months. Seed yields of 700 - 900 kg/ha are possible. Green pods are handpicked when 10 - 15 cm long before they swell and become fibrous.

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	15.0	1335	27.1	-	-	-	-
pod (fresh)	89.0	142	2.8	-	-	-	-

Legumes

English: Marama bean

Local:

Scientific name: *Tylosema fassoglensis*

Plant family: FABACEAE

Description: A trailing or climbing plant. It is evergreen and shrubby. It can be 6 m long. It has a large tuberous root. This can be to a depth of 2.5 m. Young plant parts have rusty coloured hairs. The leaves are simple and almost round but with two lobes or divided at the tip. Leaves are 5 - 20 cm long by 6 - 23 cm wide. There are rusty hairs on the veins underneath the leaf. The flower clusters are 2 - 42 cm long on stalks 2 - 17 cm long. The flowers have 5 petals. Four of these are yellow and one is reduced to a green stub. The petals are yellow. The outer layer or sepals have wings. Fruit are 7 - 12 cm long and 4 - 7 cm wide. The seeds are not quite round and are 1.7 - 2.8 cm long.



Distribution: It is a tropical plant. It does well in seasonally wet and dry climates. It needs well-drained soil. In Malawi it grows at 900 - 1,200 m altitude, while in Tanzania it grows up to 1,500 m above sea level and in areas with a rainfall between 1,000 - 1,600 mm. It needs full sun. It can grow in arid places. It suits hardiness zones 9 - 12.

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

Cultivation: Plants can be grown from seeds.

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

Food Value: Per 100 g edible portion

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

Image accessed from http://www.africamuseum.be/collections/external/prelude/view_plant?pi=12675

Leafy greens

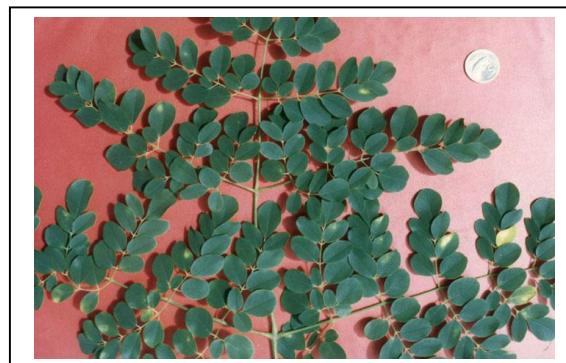
English: Horseradish tree

Local:

Scientific name: *Moringa oleifera*

Plant family: MORINGACEAE

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



Distribution: A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits hardness zones 9 - 12.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	4	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Leafy greens

English: Amaranths

Local:

Scientific name: *Amaranthus tricolor*

Plant family: AMARANTHACEAE

Description: A small, annual, leafy green herb about 1 m high, spreading to 45 cm wide. An upright, much-branched annual with a thin membrane covering the stems. Sometimes the plant lies over. The stems are angular. The plant branches in the upper part of the plant. It does not have thorns and grows from seed each year. Leaves have long leaf stalks which can be 5 - 10 cm long. Leaves vary in shape, size and colour. The leaf blade can be 5 - 25 cm long by 2 - 6 cm wide. Leaves are dull-purplish and the top leaves can be yellow or red. Some types have coloured leaves or patterns on the leaves. It has a clumpy seed head at the top. The flower spike at the top can be 30 cm long. The seeds are 1 - 1.2 mm across and black.



Distribution: It grows in most tropical countries, including the Pacific and Solomon Islands. It will grow in warm, temperate places. Plants grow wild in waste places. Amaranths grow from sea level to 2,400 m altitude in the equatorial tropics. Amaranth seeds need a temperature above 15 - 17°C to germinate. In areas of the equatorial highlands above 1,800 m, average temperatures are probably below this during the cooler months. It may be more difficult to get Amaranths started during these months. It suits hardiness zones 8 - 11.

Use: The young leaves and stems are cooked and eaten as a vegetable. The seeds can be eaten. It is a very important tropical vegetable. It grows quickly, produces well and is nutritious.

Cultivation: The very small seeds of this plant are scattered over ashes or fine soil in fertile ground. The seeds are normally spread by rubbing the dry seed heads between the hands. Some types are self-sown. These plants grow in most tropical countries. The soil must be fertile. If they are put in an old garden, they will grow very poorly. They should either be put in a new garden site, when it is cleared from bush, or in old ground that is had compost added. Small gardens close to a house can often be built up to a good fertility by using food scraps and ashes that are left over near houses. Amaranths need high amounts of two nutrients, nitrogen and potash. The ashes from fires are high in potash, so farmers scatter seeds of Amaranth over areas they have burnt. Normally, the hotter it is, the better they grow. They also like plenty of sunlight and do not suit shaded places. They need to have water most of the time they are growing. This is mostly not an issue in areas with high rainfall.

Production: Plants can be harvested when small by thinning out closely-spaced plants. These can be 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 the next 2 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	91.7	96	2.5	292	43.3	2.3	0.9

Leafy greens

English: Fat hen

Local:

Scientific name: *Chenopodium album*

Plant family: CHENOPODIACEAE

Description: An annual plant that grows to 1 m tall and spreads to 1 m across. The stem is erect and succulent with no hairs. They often have soft mealy lumps which can be rubbed off. The leaves are simple, with one at each node, and occurring alternately up the stem. The leaves are oval and wedge shaped with saw like edges. They are 5 - 12 cm long by 3 - 10 cm wide. The leaf stalk is usually shorter than the leaf blade. The under surface of the leaf often has a white mealy layer which can be rubbed off. The flowers occur in dense white spikes at the tip and ends of branches. The fruit is a small, roundish, papery pod that opens around the tip. The pod contains large numbers of shiny black seeds that are 1.2 - 1.8 mm across.



Distribution: A temperate plant that also grows in the tropics. It grows best on light to medium well drained soil. It suits an open sunny position but can tolerate shade. It is drought and frost resistant. It commonly occurs as a weed in old fields. In Zimbabwe, it grows from 1,100 - 1,600 m above sea level. It can grow in arid places and can tolerate temperatures of 5 - 30°C.

Use: The seeds can be ground into flour. They contain saponin which should be leached out. They are used for bread, pancakes, muffins and biscuits. The tender leaves are cooked and eaten as a vegetable. They are also used in stews. Young flowers are cooked and eaten. The sprouted seeds are edible.

Cultivation: Plants are grown from seed. Seedlings can be transplanted at a spacing of 30 cm. It does well in soils with lots of nitrogen. It is self sown and harvested from potato crops in India.

Production: The tops can be eaten before and after flowering. They are harvested after 40 days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	-	1654	16	-	-	-	-
leaf (boiled)	88.9	134	3.2	391	37.0	0.7	0.3
leaf	87.7	113	5.3	33	108	-	-

Leafy greens

English: Silver beet

Local:

Scientific name: *Beta vulgaris subsp. cicla*

Plant family: CHENOPODIACEAE

Description: A broad-leaf, annual plant. Stalks are smooth and often white with a dark green leaf. A clump of stalks and leaves are produced from the base. Plants can also be blue. The leaves can be 12 - 25 cm long. The flowers are small and greenish and occur in slender clusters. The fruit are dry and spiny.

Distribution: It needs to be over at least 500 m altitude in the tropics, and is mostly grown from 1,000 – 2,600 m altitude. It can tolerate frost.

Use: The leaves and stalks are cooked and eaten. The stalks of leaves can be cut from the leaf and cooked separately as an asparagus substitute. They can be braised and served with buttered breadcrumbs. Some kinds have edible roots.



Cultivation: It is grown from seeds. Under tropical conditions it is not normally possible to save your own seed. In cold climates, plants need to be sown when conditions are warmer so that the plants do not go straight to flower. A spacing of 30 cm between plants is suitable. Seed is sown 2.5 cm deep.

Production: The first leaves are ready after 8 - 10 weeks and can produce for 2 years. Only the outer leaves are picked off.

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 (boiled)	92.7	84	1.9	314	18	2.3	0.3
leaf (raw)	92.0	80	1.8	330	30	2.6	0.4

Leafy greens

English: Bush okra

Local:

Scientific name: *Corchorus olitorius*

Plant family: MALVACEAE

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



Distribution: A tropical plant. It is mostly coastal, below 250 m altitude. Temperatures of 22°-35°C are suitable. It can stand both drought (2 - 3 weeks) and water-logging, except when young. A well drained soil is best. They require humus-rich soils. A soil pH of 5.5 - 7.0 is best, but they can grow in soils with pH up to 8.5. They also need adequate moisture for good leaf production. A rainfall of 1,000 mm is suitable. A high relative humidity (80 - 90%) is best. It produces seeds when day lengths are short. It grows in most African and Asian countries.

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

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

English: Spinach

Local:

Scientific name: *Spinacia oleracea*

Plant family: AMARANTHACEAE

Description: An annual leafy vegetable. It grows 60-90 cm high and spreads 30-45 cm wide. The broad leaves are produced in a clump on short stalks. The leaves at the base are large and leaves on the stalk are smaller. Plants are separately male and female. (So both types are needed if seed is to be produced.) Flowers are greenish in spikes.

Distribution: It is a temperate plant. It does not suit the tropical lowlands and grows best where the temperature varies between 10°C and 20°C or above 2000 m altitude. The kind with very prickly seeds is frost resistant. Plants need a deep well drained soil. It is a cool season, short day plant. In Nepal it grows to about 1400 m altitude. It suits hardiness zones 6-9.



Use: Leaves are cooked in a small amount of water. They are also used in soups and salads. Young leaves are eaten raw and older leaves are cooked. The sprouted seeds can be used in salads.

Caution: Spinach can contain oxalates which affects calcium absorption.

Cultivation: It is normally sown directly by seeds. Plants need to be 25 cm apart.

Production: The older leaves are picked off. They can be harvested starting at 8 weeks.

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	91.6	61	2.9	32	52	2.71	0.5
Leaf boiled	92.9	57	2.4	819	29	2.9	0.8

Fruit

English: Cherimoya

Local:

Scientific name: *Annona cherimola*

Plant family: ANNONACEAE

Description: A small deciduous tree 6 - 10 m tall. In some locations trees keep their leaves throughout the year. It has a brown velvety tomentum on the under surface of the leaves. The leaves are 8 - 20 cm long and up to 10 cm wide. There is a single leaflet. The flowers occur either singly or 2 - 3 together along the branches. The female parts of the flower open first then the male parts. The fruit is 8 - 15 cm across with black or brown seeds in white flesh. The fruit is cone or heart shaped. It can be 10 - 20 cm long by 10 cm wide. Fruit can weigh 0.5 kg. The skin can have finger like markings. The flesh is juicy and each segment has one seed. There can be 20 - 40 large brown seeds in each fruit.



Distribution: A tropical and subtropical plant. It suits the highland tropics. It grows at higher altitudes in the equatorial tropics. It can grow up to 2,000 m altitude in tropical areas. They suit places with cool nights. It is better suited to a dry climate but not desert. It is a subtropical or warm temperate plant. It can only tolerate light frosts. Young trees are very frost sensitive. They need 50 - 100 hours of mild chilling per year to remain productive. Trees do best in a sunny position. A pH of 6.5 - 7.6 is best. It can grow in arid places. It suits hardiness zones 10 - 12.

Use: Fruit can be eaten raw or used to make drinks. They can be used for ice cream, custards, cakes and pies.

Cultivation: Trees are usually grown from seeds but cuttings of ripe wood will root in sand. It can be grafted or budded. Seeds can only be stored for 2-3 days when fresh but can be stored for several years if kept dry. Seeds will then still grow or they can be planted fresh. Seeds are planted about 3 cm deep in fine soil. They will germinate in about 21-40 days. Seedlings are often transplanted into pots or plastics bags after 3-4 months then into nursery beds when one year old. They are easy to transplant and even trees 3 or 4 years old can be transplanted when the leaves have fallen off. It is best done while trees are still dormant.

Fruit setting is often greatly improved by hand pollination. In some places natural pollinating agents do not occur. To hand pollinate take the pollen from male flowers and place it on the partly open female flowers. (Pollen can be stored overnight in a refrigerator if necessary.) Several trees should be planted near each other to allow them to pollinate. Young trees need support. For best growth they need adequate moisture during the growing season and good soil nutrition. Pruning during the dormancy period is done to allow strong branches for fruit bearing.

For better kinds of trees it is necessary to use budding or grafting. Rootstocks of *Annona reticulata* or *A. squamsoa* can be used. Grafted trees fruit after about 6 years while seedling trees fruit after 11 years. Shield budding done at the beginning of the growing season is often used.

Trees can be spaced 8 metres apart. They can be pruned to give a better shaped tree and this should be done when leaves have fallen. Fruit are carried on both current year's growth but also more prolifically on mature wood. Several trees should be planted near each other for pollination. As the roots are very sensitive, fertiliser should not be used at transplanting.

Cherimoya needs to be in areas with high humidity during the flowering period. Otherwise they suit areas that are cool and fairly dry. It is essentially a subtropical fruit and grows in higher altitudes in equatorial regions. Temperatures should be above 14°C. Mature trees can stand light frosts. Good deep soils are best but clays that are well drained are suitable.

Hand pollination of the flowers can give more even shaped fruit and also ensure more fruit are formed. To do this, flowers are gathered in a small brown paper bag and kept till the pollen falls. Then with a small brush the pollen is put on freshly open flowers. The three petals of the flower are gently held open and the pollen spread around on the female flower parts (pistils).

As fruit ripen they develop a bloom on the skin and the carpels begin to separate. Fruit can be stored under refrigeration. The stalk should be cut from the tree and fruit need to be handled carefully.

Production: Trees are fairly fast growing. Trees can fruit in 4 years. Trees mostly only produce fruit every second year. Fruit turn a pale green or cream colour as it ripens. Fruit can only be stored for short periods. They need to be stored above 13°C. The fruit weigh 200 - 300 g. They are 17 - 18% sugar.

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 (raw)	73.5	395	1.3	1	9	0.5	-

Fruit

English: Large-leafed rock fig

Local:

Scientific name: *Ficus abutilifolia*

Plant family: MORACEAE

Description: A shrub or medium sized tree. It loses its leaves during the year. It grows 6 - 10 m high and spreads 6 m wide. It can also be a bush 3 - 4 m high. The crown can spread widely and the bush is almost round. The bark is smooth and creamy-white. The trunk is twisted and branches low down. The branches are stout. The leaves are large and almost round. The leaves are alternate and leathery. They have a deep notch in the base. They are bright green and the veins are red. The leaves are 5 - 15 cm long by 5 - 17 cm wide. The figs are on the ends of small branches in the axils of leaves. They are 1 - 1.6 cm across. They are smooth or slightly hairy. The fruit are figs produced either singly or in small groups. They are green with cream spots. They are red when ripe. They have a very short stalk.



Distribution: It is a tropical and subtropical plant. It normally grows over rock outcrops in full sun. It is damaged by frost. It grows in dry areas. It can grow in arid places. It grows in savannah and is often on rocky sites. It grows from cracks and crevices and splits the rocks. In Zimbabwe it grows up to 1,360 m above sea level. It suits hardiness zones 9 - 12.

Use: The fruit is eaten raw. Figs can be dried and stored. Leaves are occasionally eaten. Aerial roots are eaten.

Cultivation: Plants can be grown from seeds or cuttings. The seeds are small and need to be mixed with sand for sowing. Fresh seeds should be used. Seedlings transplant well.

Production: Seedlings grow slowly at first.

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	85.2	205	0.7	-	17.0	0.1	0.1

Image sourced from: www.plantzafrica.com

Fruit

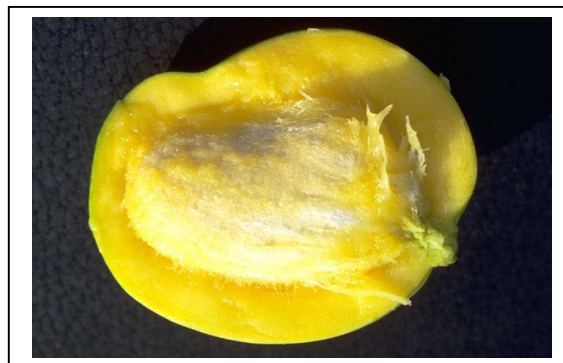
English: Mango

Local:

Scientific name: *Mangifera indica*

Plant family: ANACARDIACEAE

Description: An erect, branched evergreen tree. It can grow to 10 - 40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10 - 30 cm long and 2 - 10 cm wide. They are arranged in spirals. The leaf stalk is 1 - 10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which



are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10 - 50 cm long and branching. Up to 6,000 flowers can occur on a stalk. Most of these are male and up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5 - 30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.

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

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

Caution: The sap from the tree or fruit can cause skin problems with some people.

Cultivation: Trees are grown by planting fresh seed and they can be transplanted. Mangoes vary in their ability to breed true from seed. When more than one seedling emerges from the seed some of these are asexual and breed true. Clean seed germinate best if they are treated at 50°C for 20 minutes, then planted on their edge with the round bulge upwards and near the soil surface. The husk around the seed should be removed. Seeds germinate in 3 - 6 weeks. The strongest growing seedlings from this seed are used and the others thrown away. The seedlings from the folds of the seed are vegetative while the seedling from the centre of the seedling near the stalk end may be sexual and show variation from type. Other seeds only produce one seedling and these normally vary and can be different from the parent tree. Plants can be propagated by budding, or by grafting using in-arching. This is not easy and care is required. In wetter places, flowers need to be protected with fungicides to enable fruit to form. If organic manure is used this should not be directly in the planting hole nor immediately against the new plant. Young transplanted seedlings need regular watering. A spacing

of 6 - 12 m between plants is used. Wind protection is advisable to prevent fruit rubbing and getting damaged. Trees should only ever be lightly pruned as fruit develop on new growth and heavy pruning can reduce flowering. Flowering can be brought about by foliar sprays of potassium nitrate.

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

Food Value: Per 100 g edible portion

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

Fruit

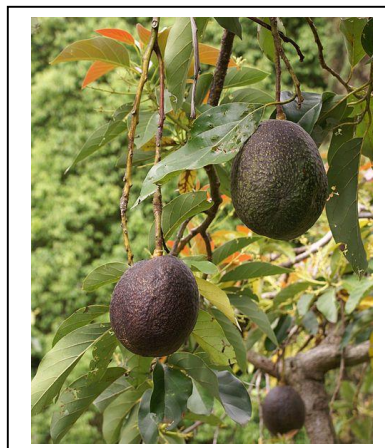
English: Avocado

Local:

Scientific name: *Persea americana*

Plant family: LAURACEAE

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



Distribution: A subtropical plant that grows from sea level up to 2,250 m in the tropics. It cannot stand water-logging. Branches are easily damaged by wind. It needs a frost free location or where frosts are rare. West Indian varieties thrive in humid, tropical climates, freeze at or near 0°C and can stand some salinity. Mexican types come from dry subtropical plateaus and thrive in a Mediterranean climate. They are hardy to -7° C. They are salt sensitive, have the smallest fruits and the thinnest skin. The best daytime temperature is 25 - 33°C. Guatemalan types come from cool, high-altitude tropics and are hardy to -3° C. It does best with neutral or slightly acid and well aerated soil. Growth is disrupted when soil temperature is below 13°C. It needs high humidity at flowering and fruit set. It can grow in arid places.

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

Caution: Some people are allergic to avocado.

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: White-berry bush

Local:

Scientific name: *Flueggea virosa*

Plant family: EUPHORBIACEAE

Description: A shrub or small tree. It grows 4 m high. It is densely leafy. The leaves are alternate and simple. The leaf blade is round or broadly oval. They are 3 cm long by 1.5 cm wide. The male and female flowers are small and on separate plants. They are creamy-green. The fruit are slightly fleshy. They are round and white. They are 5 mm across. They are on slender stalks 4 mm long. The seeds are 2 mm long.



Distribution: It is a tropical and subtropical plant. It grows on river flats and well drained rocky slopes. It can grow in hot arid places. It needs an annual rainfall above 150 mm. It can grow in stony and sandy soils. It needs a sunny position. In Ethiopia it grows between 400 - 2,050 m altitude. It can grow in arid places.

Use: The ripe fruit are eaten raw. **Caution:** The fruit should probably not be eaten in large amounts due to the presence of alkaloids.

Cultivation: Plants can be grown from seed.

Production: It is fast growing.

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	75.9	476	1.4	-	1	8.9	0.3
fruit (stewed)	85.7	96	1.1	-	31	0.8	-

Image sourced from: www.plantzafrica.com

Fruit

English: Guava

Local:

Scientific name: *Psidium guajava*

Plant family: MYRTACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: Pineapple

Local:

Scientific name: *Ananas comosus*

Plant family: BROMELIACEAE

Description: A perennial herb with a rosette of long, thick, spiky leaves, up to 1 m high and spreading 1 - 1.5 m. The leaves are arranged in spirals. Some kinds have thorns along the edges of the leaves. The plant produces suckers, both near the base of the stem and also higher up the stem near the fruit. These are called slips, or suckers, and are broken off and used for planting. The main plant dies after producing a fruit, but the suckers keep growing. The plant produces a flower and fruit at the end. The fruit is made up of about 150 berry-like fruitlets that are almost fused together. There is a small crown of leaves on top of the fruit. The fruit can be 25 cm long and weigh 0.5 - 4 kg. There are two main types of pineapples. The rough-leaved variety has spines on the leaves and produces a smaller but sweeter fruit. The smooth leaf variety has spineless leaves and larger fruit.



Distribution: The plant has been taken to most tropical and subtropical places. It is a tropical plant. It grows up to 1,800 m altitude near the equator. It can survive brief periods down to freezing, but cold retards growth, delays fruiting, and causes fruit to be more acid. A loose, well-drained soil with high organic matter is best. It can survive drought, but adequate soil moisture is necessary for good fruit production. Pineapples need an annual average temperature of 17.2 - 26.9°C. Growth ceases below 20°C. In the equatorial tropics, this is mostly between sea level and 1,800 m altitude. Pineapples need well-drained and fertile soil. It suits an acid soil and can develop roots in soils where lime has been added. The soil acidity can be between pH 3.3 - 6.0. The best range is pH 4.5 - 5.5. Soils which are not sufficiently acid can be treated with sulphur. It suits hardiness zones 9 - 10.

Use: The fruit is eaten fresh or used for juice. Unripe fruit are also cooked and eaten. The young, heart-leaves can be eaten. It is an attractive and popular snack food.

Cultivation: The suckers, slips, and the top of the fruit, can be used for planting. The time to maturity is the fastest for the suckers near the bottom of the plant and slowest when the top of the fruit is planted. Therefore, use suckers that grow from the stem near the ground for earliest yield. Pineapple flowering hormone can be used for fruit production with thorny varieties and calcium carbide for smooth varieties. Fruiting is less seasonal in the highlands than in the lowlands. Pineapples can be planted with 35,000 - 43,000 plants/ha or 3 - 4 plants per square metre. If plants are spaced more widely, they produce more suckers. Fruits become more acid where plants are closely spaced. If too many suckers are left growing from the main plant, then smaller fruit will be produced. They can grow in partial shade and, in this situation, the plants are normally more green. The red colouring of pineapple leaves is due to a deficiency of the nutrient nitrogen. This shows up more quickly in plants in full sunlight. When the plant is sufficiently large, it responds to changes, such as less available nutrients or water, and starts to produce a flower, then a fruit. The number of hours of sunlight, as well as reducing temperature and reduced sunlight, also help the flowers form. The result of this is that flowering and fruiting is often seasonal. This can easily be changed by using a fruiting hormone which allows fruit to be produced at times to suit the grower. Pineapples can grow in semi-arid conditions because the leaves can store some water. They also tend to lose only small amounts of water from evaporation through their leaves, but they can grow well with plenty of water. The roots are very sensitive to water-logging, so the soil must be well-drained. Pineapples do not cover the soil well, so it is good to use a mulch of plant material to help weed control, provide some nutrients and to stop soil erosion.

Production: Plants usually produce for about 4 years. Fruiting is less seasonal in the highlands than in the lowlands in the tropics. The growth rate for pineapples slows at cooler temperatures. Plants grown in the highlands, or at higher latitudes, take longer to mature. It takes 60 days from when the flower starts to form until the fruit appears, then a further 5 months until the fruit is ready for harvest. The time from planting to harvesting ranges from 11 - 32 months, depending on temperature. The fruit are smaller, poorer shape and more acid where the temperatures are lower or there is less sunlight.

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	84.3	194	0.5	60	25	0.4	0.1

Fruit

English: Sycamore fig

Local:

Scientific name: *Ficus sycomorus*

Plant family: MORACEAE

Description: A deciduous tree. It grows to 13 - 25 m high and spreads to 14 m across. It has a rounded crown. The stem is erect. Sometimes the stem has buttresses. The base of the tree commonly spreads over the ground. The bark is yellowish. The leaves are olive green, oval or almost round. They are 5 - 12 cm long and 3 - 10 cm wide. The leaves are rough and leathery. They are hairy. The edge of the leaf is wavy and roughly toothed. The leaf stalk is 3 cm long. In dry seasons the tree may lose its leaves. The flowers are 2 cm across and roundish. The fruit are small and edible. They are 3 cm across. They grow in dense clusters in the axils of leaves or on main branches and on the trunk. The fruit are yellow-red when ripe.



Distribution: A tropical plant. They will grow on most soils. Soils need to be well drained. They prefer a sunny open position. It is drought and frost resistant. It is probably damaged by frost when in leaf. It can grow in hot and arid regions. It grows well near rivers. In Africa trees are commonly near rivers in dry regions. It grows in areas with an annual rainfall between 200 - 1,800 mm. It can grow in salty soils. It can grow in arid places. It grows in Miombo woodland in Africa. It suits hardiness zones 10 - 12.

Use: Fruit are eaten fresh. They can also be dried. They are used for jam. They are eaten with millet and used to make an alcoholic drink. Young leaves are cooked for food. They are used in soups or peanut dishes. The latex is used as a vegetable rennet.

Cultivation: In the Mediterranean region sycamore figs do not set seed because the more tropical fig wasp does not occur there. In tropical places it can be grown from seeds. It can be grown by cuttings or layering. Trees can be pruned or lopped.

Production: Trees are fairly fast growing. The young fruit are gashed to assist ripening. In Tanzania fruit are collected at the end of the rainy season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	82.7	210	1.4	-	7.3	1.7	0.4

Fruit

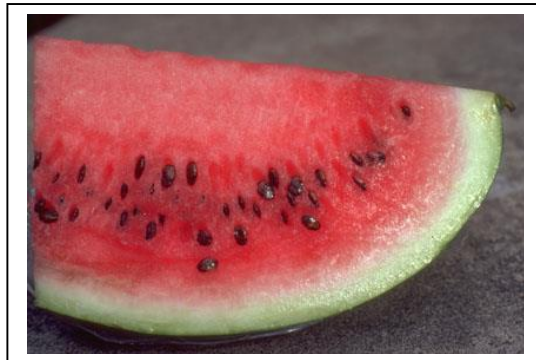
English: Watermelon

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

Fruit

English: Kudu-berry

Scientific name: *Pseudolachnostylis maprouneifolia*

Local:

Plant family: EUPHORBIACEAE

Description: An attractive rounded tree. It grows 4 - 6 m high. It can be 12 m high. The bark is light brown and cracked. The leaves are alternate and simple. They are roundly oval. They are 2.5 - 8 cm long by 2 - 6 cm wide. They are blue green and paler underneath. The leaf stalk is 1.5 cm long. The flowers are greenish-white in clusters of a few flowers in the axils of leaves. These are 2 - 3 cm long. The sexes are separate on different trees. The fruit is round and 2 cm across. They are pale yellow when mature. There are 3 varieties.



Distribution: A tropical plant. It grows in deciduous woodland and wooded grassland and on rocky outcrops. It will grow over a range of altitudes. It grows from 200 - 1,600 m altitude. It will re-grow after fire. It can grow in arid places.

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

Cultivation: Plants are grown from seed. Soaking seed in hot water and allowing it to cool for 24 hours improves germination. Plants can be pruned or cut back and allowed 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
fruit	60	147	3.3	-	-	2.7	2.6

Image sourced from: www.eastafricanplants.senckenberg.de

Vegetables

English: Choko

Local:

Scientific name: *Sechium edule*

Plant family: CUCURBITACEAE

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



Distribution: A tropical and subtropical plant. Choko requires relative humidity of 80 - 85%, annual rainfall of at least 1,500 - 2,000 mm and average temperatures of 20 - 25°C with limits of 12 - 28°C. In equatorial tropical regions, chokos will grow from sea level to about 2,200 m altitude. In the lowlands it grows best in shade. Chokos need a reasonably well drained soil. It can grow in arid places. It suits hardiness zones 9 - 12.

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Asparagus

Local:

Scientific name: *Asparagus officinalis*

Plant family: ASPARAGACEAE

Description: A perennial plant with fern-like leaves and underground root stock. It grows to 1.5 m tall and spreads to 1 m across. The stems are erect but often hang over at the tips. The branches are soft. The leaves are feathery and a rich, green colour. The flowers are small and greenish. They are of both sexes and occur either singly or in clusters of 2 - 4. The fruit are red berries and are produced on female plants. They are 7 - 8 mm across and have 2 or 3 seeds.



Distribution: This is a temperate or mediterranean plant grown in some places in the tropics. It needs a temperature of 16 - 24°C for good growth. It needs a lower temperature for 60 - 100 days when the plants are dormant. In Papua New Guinea, it is grown mainly in the highlands at over 1,000 m altitude but will grow up to 2,600 m. It can be grown on the tropical coast with special management. It prefers humus-rich, moist, well-drained soils. A soil pH of 6 - 6.8 is suitable. It does best in an open, sunny position. It is frost-resistant but drought-tender. It grows naturally on the steppes in NW Xinjiang, China. It suits hardiness zones 4 - 8.

Use: The young shoots are eaten cooked. They should be washed only just before cooking. The tuberous roots of some wild asparagus plants are eaten in China. Young roots should be used. The seeds have been used as a substitute for coffee.

Cultivation: Plants can be grown from seed. It is best to soak the seeds for 24 hours, then sow them in a nursery. They are transplanted after 8 - 12 months. A spacing of 1 m x 1 m is suitable. If white shoots are required, the shoots need to be kept covered with soil. Shoots turn green in sunlight. Plants can also be grown by division of the clump. These are planted 15 cm deep. For seed production, a male plant is needed for each 4 female plants. Bees help pollination.

Production: The first harvest is 18 - 24 months after planting. The shoots are cut before they open out into the ferny, erect stems. They are cut below ground level when about 15 - 20 cm high.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
shoot	95.4	52	1.7	50	16	0.6	0.3

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

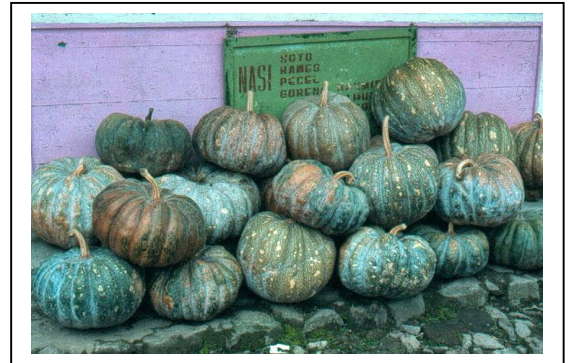
English: Pumpkin

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 and 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 2,400 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: 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 1,000 m altitude in tropical regions. They require a well drained soil preferably rich in organic matter. Seeds do not germinate below 15°C. Plants grow best with temperatures of 18 - 35°C. A soil pH of 6.5 is best. It suits hardiness zones 9 - 12.

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

Caution: The leaves are considered to cause diarrhoea and vomiting.

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Fennel

Local:

Scientific name: *Foeniculum vulgare*

Plant family: APIACEAE

Description: A green leafy perennial herb. It can be 2 m high and 45 cm wide. The leaves are very fine. They have a feathery appearance. The stems are ribbed and at the bottom of the stalks there is a broad green section. When the leaves are crushed, they smell like aniseed. The flower at the top is a group of small yellow flowers. The seeds are oval and ribbed and about 5 mm long. Ripe fruit are wingless which distinguishes it from dill. There are several named cultivated varieties.



Distribution: A temperate plant. It grows well in a Mediterranean climate. It grows well on dry and stony calcareous soils. It grows up to at least 2,200 m altitude in the tropics. It grows better during the drier season at altitudes over 500 m. It is cultivated but also easily grows wild. It is frost hardy. It grows in Nepal to about 2,400 m altitude. It suits hardiness zones 5 - 10.

Use: The top leaves can be boiled and eaten as a flavouring. The young tender central portion and the leaf bases can be chopped and eaten. The root can be cooked and eaten. It is used in medicine. The seeds can be used as a flavouring in bread, cakes and stuffings. It is used in sauces, sausages, stews and salads.

Cultivation: Plants can be grown from seed. These can be transplanted. The rootstock of established plants can be used to start new plants. A spacing of 50 cm apart between plants is suitable. (Dill and fennel can cross pollinate and the flavours mix.)

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	8.8	1443	15.8	14	21	18.5	3.7
bulb (raw)	90.2	130	1.2	13.4	12	0.7	0.2
leaf	89.2	130	2.9	-	-	2.9	-

Nuts, seeds, herbs and other foods

English: Bunya pine

Local:

Scientific name: *Araucaria bidwillii*

Plant family: ARAUCARIACEAE

Description: A large tree. It can be 50 m high. They spread 10 - 20 m across. The branches radiate out in a symmetrical fashion. The lowest branches droop towards the ground. The leaves are simple and 2 - 6 cm long by 0.5 - 1.5 cm wide. They do not have leaf stalks. The leaves are oval and leathery. They are spiny at the tip. The fruit are large seed cones. They are up to 20 - 30 cm long by 15 - 20 cm wide and occur at the ends of twigs. These contain numerous seeds which are up to 5 cm long. The seeds are edible.

Distribution: It is native to Queensland, Australia. They grow naturally in rainforest in south-east Queensland. They can grow in tropical, subtropical and temperate regions. They need a moist well drained soil. In Nepal they grow at 1,200 - 1,300 m altitude. It cannot tolerate frost. It suits hardiness zones 9 - 11.

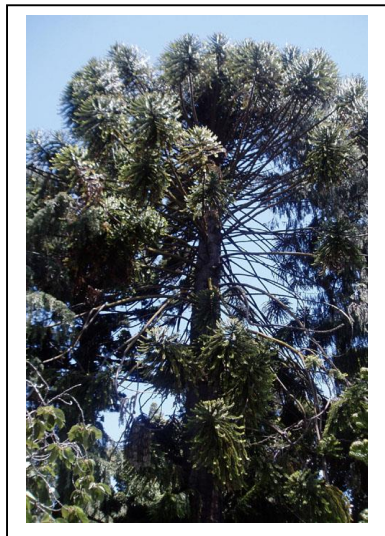
Use: The seeds are roasted and eaten.

Cultivation: Plants are grown from seed. Seed should only be half covered with soil. Plants can also be grown from cuttings of upright shoots of young plants. They can also be grown from suckers near the base.

Production: Plants are slow growing. A cone can weigh 4 kg.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	43.9	856	11	-	-	2.1	0.7



Nuts, seeds, herbs and other foods

English: Sunflower

Local:

Scientific name: *Helianthus annuus*

Plant family: ASTERACEAE

Description: An upright annual plant that varies 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 using 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. Seed 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: 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 1,500 - 2,100 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	-

English: Bullrush millet

Local:

Scientific name: *Pennisetum glaucum*

Plant family: POACEAE

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

Distribution: A tropical plant that suits regions with a short growing season. It grows in areas with less than 600 mm of rainfall. It is replaced with sorghum between 600 - 1,200 mm rainfall and then by finger millet or maize above 1,200 mm rainfall. It is important in the drier areas of India and Pakistan. It can grow in arid places.



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

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

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

Food Value: Per 100 g edible portion

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

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 tricolor</i>	Amaranth	leaf	91.7	96	2.5	292	43.3	2.3	0.9	34
AMARANTHACEAE	<i>Spinacia oleracea</i>	Spinach	leaf boiled	92.9	57	2.4	819	29	2.9	0.8	38
ANACARDIACEAE	<i>Mangifera indica</i>	Mango	fruit	83.0	253	0.5	54	30	0.5	0.04	42
ANNONACEAE	<i>Annona cherimola</i>	Cherimoya	raw fruit	73.5	395	1.3	1	9	0.5	-	39
APIACEAE	<i>Foeniculum vulgare</i>	Fennel	bulb raw	90.2	130	1.2	13.4	12	0.7	0.2	57
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	19
ARAUCARIACEAE	<i>Araucaria bidwillii</i>	Bunya pine	seed	43.9	856	11	-	-	2.1	0.7	58
ASPARAGACEAE	<i>Asparagus officinalis</i>	Asparagus	shoot	95.4	52	1.7	50	16	0.6	0.3	53
ASTERACEAE	<i>Helianthus annuus</i>	Sunflower	seed	5.4	2385	22.8	5	1.4	6.8	5.1	59
BROMELIACEAE	<i>Ananas comosus</i>	Pineapple	fruit	84.3	194	0.5	60	25	0.4	0.1	47
CHENOPODIACEAE	<i>Beta vulgaris</i> subsp. <i>cicla</i>	Silver beet	leaf (boiled)	92.7	84	1.9	314	18	2.3	0.3	36
CHENOPODIACEAE	<i>Chenopodium album</i>	Fat hen	leaf (boiled)	88.9	134	3.2	391	37.0	0.7	0.3	35
CUCURBITACEAE	<i>Cucurbita maxima</i>	Pumpkin	seed (dry)	6.9	2264	24.5	38	1.9	14.9	7.5	55
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	56
CUCURBITACEAE	<i>Sechium edule</i>	Choko	fruit (boiled)	93.4	100	0.6	5	8	0.2	0.3	52
CUCURBITACEAE	<i>Citrullus lanatus</i>	Watermelon	fruit	94	92	0.4	20	5	0.3	0.1	50
CYPERACEAE	<i>Cyperus esculentus</i>	Yellow nutsedge	rhizome	36.5	1262	3.5	-	-	8.0	-	21
DIOSCOREACEAE	<i>Dioscorea dumetorum</i>	African bitter yam	tuber	67	520	3.2	-	-	-	-	14
EUPHORBIACEAE	<i>Flueggea virosa</i>	White-berry bush	fruit	75.9	476	1.4	-	1	8.9	0.3	45
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	15
EUPHORBIACEAE	<i>Pseudolachnostylis maprouneifolia</i>	Kudu-berry	fruit	60	147	3.3	-	-	2.7	2.6	51
FABACEAE	<i>Acacia erioloba</i>	Camel thorn	gum	13.9	1308	6.8	-	-	10.4	0.3	22
FABACEAE	<i>Arachis hypogea</i>	Peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	28
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 gladiata</i>	Sword bean	pod (fresh)	89.0	142	2.8	-	-	-	-	31
FABACEAE	<i>Cicer arietinum</i>	Chick pea	seed (raw)	9.9	1362	20.2	3	3	6.4	-	24
FABACEAE	<i>Phaseolus acutifolius</i> var <i>acutifolius</i>	Tepary bean	seed (dry)	8.6	1476	19.3	-	-	-	-	25
FABACEAE	<i>Psophocarpus tetragonolobus</i>	Winged bean	seed (young)	87.0	205	7.0	13.0	18.3	1.5	0.4	29
FABACEAE	<i>Tylosema fassoglensis</i>	Marama bean	pod	72.5	446	6.4	-	39	0.5	2.2	32
FABACEAE	<i>Vigna subterranea</i>	Bambara groundnut	seed	7.3	1572	18.4	-	-	4.6	2.2	27
FABACEAE	<i>Vigna unguiculata</i> subsp. <i>unguiculata</i>	Cowpea	seed (dry)	11.2	1189	23.5	-	1.5	6.4	-	30
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	seed (young)	86.9	209	3.0	14	5.1	0.8	0.4	26
LAURACEAE	<i>Persea americana</i>	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	44
MALVACEAE	<i>Abelmoschus esculentus</i>	Okra	fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6	54
MALVACEAE	<i>Corchorus olitorius</i>	Jute	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	37
MALVACEAE	<i>Hibiscus cannabinus</i>	Vegetable kenaf	leaf	79.0	280	5.5	34	-	12.1	-	60
MORACEAE	<i>Ficus abutilifolia</i>	Large-leafed rock fig	fruit	85.2	205	0.7	-	17.0	0.1	0.1	41

MORACEAE	<i>Ficus sycomorus</i>	Sycamore fig	fruit	82.7	210	1.4	-	7.3	1.7	0.4	49
MORINGACEAE	<i>Moringa oleifera</i>	Horseradish tree	leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2	33
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	46
POACEAE	<i>Sorghum bicolor</i>	Sorghum	seed	-	1459	11.1	0	-	-	-	17
POACEAE	<i>Pennisetum glaucum</i>	Bullrush millet	seed	11.6	1442	10.5	-	-	6.5	1.7	61
SOLANACEAE	<i>Solanum tuberosum</i>	Potato	tuber (baked)	71.2	456	2.3	0	12.9	1.4	0.3	18



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