Potentially Important Food Plants of Zambia

Solution to Malnutrition and Food Security

www.foodplantsolutions.org
Victorite General Dealers (VGD) is a start up social enterprise Business founded in May 2016 and registered on 09 November, 2016 under the Act No 16 of 2011 of the laws of Zambia with registration number 320160012479 and commenced its operations in January, 2018. We are into poultry and horticulture farming.

Part of our corporate social responsibility is working with rural small scale farmers teaching them best farming practices and how to improve their yield. It is for this reason that we saw it fit to partner with Food Plants Solutions. This field guide will help many Zambians especially woman and youths in rural areas to acquire knowledge on edible plants that will help fight poverty at household level, resulting in food security and healthier communities that will be well informed.

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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 Lyndie Kite working in a voluntary capacity using the selection criteria developed by Food Plant Solutions. These selection criteria focus on the local plants from each of the main food groups with the highest levels of nutrients important to human nutrition and alleviation of malnutrition. It is intended as a Draft Guide only to indicate some important food plants that serve as examples for this purpose. Other important nutritious plants may be equally useful, and it is recommended that the FPI database be used to source information on the full range of plants known to occur in Zambia. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Zambia, 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 the more common food plants of Zambia. 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 and grow more of the introduced vegetables, such as ballhead cabbage. These do not have the same food value as many traditional, tropical, dark green, leafy vegetables.

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

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

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

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

Naming of plants
Many food plants have local names, as well as a common English name. Every type of plant also has its own scientific name. Although the scientific name might not be widely recognised, this is the link by which people in different countries and with different languages can recognise the same plant. We know that many plants are grown in many different countries, but relying on local or common names, we might not recognise the same plant grown in different places. By using scientific names to accurately identify plants, we can get useful information from people in other countries. Wherever possible, plants in this book are named by their common English name and their scientific name.
Local food plants are often very good
People sometimes think that local food plants are not very special and that any food plant that is new or comes from another country must be a lot better. This is often not true. Many of the newer or introduced food plants, such as the round or ballhead cabbages, have very little food value. Many traditional tropical green, leafy vegetables and ferns have 10 times or more food value as ballhead cabbage or lettuce. It is important to find out more information about the food value of different foods if we want to eat well. Citrus fruit, such as lemons and oranges, are often grown for vitamin C that helps keep people healthy. These fruits do not grow well in the tropics - the common guava fruit has three times as much vitamin C and is loved by children. This is just one example that there are often much better choices of local foods with higher levels of important nutrients.

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

A healthy balanced diet
Good nutrition, or eating a healthy balanced diet, is really very simple. If people eat a wide range of food plants, their bodies will normally get a balanced amount of all the different nutrients they require. If a nutrient is lacking in one food plant, then they are likely to get it from another plant if they are eating a range of food plants. For this reason, everybody should eat a range of different food plants every day. The food group that is especially important for young people is the dark green leaves. Everyone should eat a good serving of dark green leaves every day. They have many vitamins and minerals, as well as protein. There are many spices or flavouring plants that can improve the taste of foods, but taste should be considered separately from food value.
Learning to cook well
Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Many plants in the tropics develop cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) only become available when food is cooked in oil.

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

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

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

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

**Growing a garden of mixed plants**

In nature, one variety of one plant never grows alone. There are always lots of different plants of different kinds and sizes, all growing together. Anyone who has ever walked into a tropical jungle will know this very well. The reason people all over the world want to save the rainforest is because it has so many different kinds of plants all growing together. Growing plants in a food garden in a way similar to how they grow in nature, as a mixed group of plants, is very good agriculture. Mixing plants in a garden usually gives more reliable food production, as any disease from one plant will wash off in the rain onto a different plant, where it cannot survive. Small plants fill the gaps and reduce the need for weeding.

**Different types of plants for food security**

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

**Looking after the soil**

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

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

**Building up the soil**

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

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

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

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

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

**Making compost**
Compost is old plant material that has been allowed to rot down into a fine, sweet smelling mulch that is full of nutrients that can be put back on the soil to grow new plants. Making good compost is very simple. A simple heap of plant material can be made in the corner of a garden or near a house. The composting process is carried out by small bacteria that live in the soil and feed on decaying plants. They break down old plant material into compost. These bacteria are living, so they need air, water and food. A good compost heap must have air, so don’t cover it with plastic or put it in a container. This makes a foul smelling compost, as different bacteria that don’t need air turn it into an acid mixture that preserves it. Good compost must have moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off. As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil.
Pests
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move “like an army” into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth than damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage.

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

### Protein (g/100 g)

- **African locust bean - seed (dry)**: 30-35 g
- **Flower-of-an-hour - leaf**: 20-25 g
- **Sand apple - nut**: 15-20 g
- **Spreading pigweed - leaf (dry)**: 15-20 g
- **Desert date - nut (dry)**: 20-25 g
- **African pumpkin - seed**: 10-15 g
- **Peanut - seed (fresh)**: 10-15 g
- **Soybean - seed (immature)**: 5-10 g
- **White rice**: <5 g
- **Ball head cabbage - leaf**: <5 g

### Vitamin A (µg/100 g)

- **Sweet potato - tuber (baked)**: 1000-1200 µg
- **Fat hen - leaf (boiled)**: 800-1000 µg
- **Pawpaw - fruit**: 400-600 µg
- **Ball head cabbage - leaf (raw)**: 400-600 µg
- **Canteloupe - fruit**: 200-400 µg
- **Prickly amaranth - leaf**: <200 µg
- **Pineapple - fruit**: <200 µg
- **Guava - fruit**: <200 µg
- **Okra - fruit (cooked)**: <200 µg
- **Tomato - fruit**: <200 µg
Flower-of-an-hour - leaf
Goat’s horns - leaf
Rose-pink sesame - leaf
African locust bean - seed (dry)
Yellow ipomoea - leaf
Prickly amaranth - leaf
Coffee senna - leaf
Spreading pigweed - leaf (dry)
Ball head cabbage - leaf (raw)
Lettuce - leaf

Iron (mg/100 g)

Boabab - fruit
Cashew - fruit
Guava - fruit
Key apple - fruit
Indian jujube - fruit
Mobola plum - fruit
Pawpaw - fruit
Orange - fruit
Bird plum - fruit (fresh)
Tomato - fruit

Vitamin C (mg/100 g)
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.
**Description:** A pumpkin family plant. It is a climbing woody vine. It can be 30 m or more long. The leaves are smooth and alternate. They are divided like fingers on a hand. Male and female flowers are on separate plants. The flowers are purple. The seeds are inside a long gourd like a pumpkin. The seeds are flat and round. They are 4 cm across and 1 cm thick. There can be 500 seeds in a fruit.

**Distribution:** It is a tropical plant. It cannot tolerate frost when young. In Malawi it is cultivated at about 1,200 m altitude. It can grow from sea level to 2,000 m altitude.

**Use:** The seeds are usually roasted and eaten. They can be eaten raw. They are a substitute for almonds in confectionary. They can also be pressed for oil, which is edible if the shells have been removed. The leaves and young shoots are commonly eaten as a pot herb.

**Cultivation:** Plants are easily grown from fresh seed. Seed germinate in a week. The soft ripe fruit falls from the plant and bursts releasing the nuts. There are 100 - 400 seeds per fruit.

**Production:** Plants grow vigorously. Fruit are produced in the seventh year. Fruit can be 12 kg each and there can be several fruit per vine.

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

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<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A μg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
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Image accessed from: [http://gardenbreizh.org/photos/galeries.html](http://gardenbreizh.org/photos/galeries.html) © Paul Latham
Starchy staples

**English:** Greater yam

**Local:** Busala

**Scientific name:** *Dioscorea alata*

**Plant family:** DIOSCOREACEAE

**Description:** A long angular vine with square stems that twine to the right around support sticks. The stem does not have spines and is often coloured green or purple. The leaves are heart shaped and borne in pairs along the vine. The leaves vary in shape, size and colour with different varieties. Leaves can be 10 - 30 cm long by 5 - 20 cm wide. The leaf stalk is 6 - 12 cm long. The flowers occur in the axils (where the leaf joins the stem) of the upper leaves. The male flowers are in small heads along branched stalks. These can be 25 cm long and green. The female flowers are in shorter spikes. Many cultivated varieties do not produce fertile seed. The fruit are 3-winged and 2.5 cm long by 3.5 cm wide. The seeds, when they occur, have wings right around them. One large, but often irregular-shaped, tuber occurs under the ground. There are many different varieties. The tubers can vary in shape, size, colour, texture and other ways. Some varieties produce bulbils, or small bulbs, along the vine.

**Distribution:** It grows in many tropical countries, growing from sea level up to about 1,800 m in the tropics. Yams are most important in seasonally dry areas. They need a well-drained soil with reasonable fertility and are, therefore, often planted first in rotations. The maximum temperature is >30°C while the minimum is 20°C. The best temperature range is 25 - 30°C. Rainfall is often seasonal in yam areas and the maximum needs to be 14 - 20 weeks rain, with the best being 1,150 mm during the growing season. Yams can tolerate drought, but give best yields with high rainfall. The critical rain period is during the first 5 months. They cannot tolerate water-logging. Yams are influenced by the number of hours of sunlight. Short days (less than 10 - 11 hours of sunlight) favour tuber development. Yams suit hardiness zones 10 - 12.

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

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

In some kinds, the bulbils that grow along the vine can be used for planting. By using staggered plantings of male and female plants, and then hand-pollinating the flowers, it is possible to get seeds to develop and these can be used to establish new plants. It is common practice in many areas to plant the yam piece upside down. The probable reason for this is to give the shoot and roots time to develop and get established away from the sun and wind so that the plant does not dry out. People in yam areas have their varieties classified as to whether they are planted at the top or the
bottom of the hole, and whether the shoot is pointed up or downwards. A planting depth of 15 cm is best. Normally top pieces give a higher yield than middle pieces of the tubers and these are better than bottom pieces. Top pieces of the yam tuber give earlier and more reliable shoots and the yams mature earlier. These top pieces are also the less attractive part of the tuber for eating, so they are preferred for planting. The larger the sett, the earlier it develops shoots and the larger the yield. Putting plants more closely gives smaller yams, but more total food. Closer spacing is normally used on lighter soils.

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

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

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

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

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<th>Zinc mg</th>
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Starchy staples

**English:** Finger millet  
**Local:** Amale  
**Scientific name:** *Eleusine coracana*  
**Plant family:** POACEAE

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

**Distribution:** It is a very drought resistant tropical plant. For good yields, it needs good soil drainage and adequate moisture. It cannot stand water-logging. It is an important crop in areas where annual rainfall is 900 - 1,250 mm. It especially suits areas with long hot summers. It needs a minimum temperature above 18°C and does best where temperatures are above 27°C. It grows from sea level to 2,400 m altitude in Africa. It is a short day length plant and does best where day length is 12 hours. It can grow in arid places.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy (kJ)</th>
<th>Protein (g)</th>
<th>proVit A (µg)</th>
<th>proVit C (mg)</th>
<th>Iron (mg)</th>
<th>Zinc (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>11.7</td>
<td>1594</td>
<td>6.2</td>
<td>-</td>
<td>-</td>
<td>5.3</td>
<td>-</td>
</tr>
</tbody>
</table>
Starchy staples

English: Sorghum  
Local: Amasaka or Mabele  

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
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<td>1459</td>
<td>11.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
Starchy staples

**English:** African yam bean

**Local:** Cilemba U Waibela

**Scientific name:** *Sphenostylis stenocarpa*

**Plant family:** FABACEAE

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

**Distribution:** It is a tropical plant that grows from sea level up to 1,800 m altitude. It grows in grassland and woodland and sometimes in marshy sites. It can grow in arid places.

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

**Cultivation:** It can be grown from seed or tubers.

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
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</thead>
<tbody>
<tr>
<td>seed</td>
<td>9.0</td>
<td>1470</td>
<td>19.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>seed (boiled)</td>
<td>67.9</td>
<td>542</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>tuber</td>
<td>64.0</td>
<td>542</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Starchy staples

English: Taro
Local: Ndholoyu or Insofu

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 in beneficial. Setts from corms normally give higher yield than that from cormels. The greater leaf area and root production may be responsible for this. Setts of about 150 g are optimum.

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

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

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

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

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

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

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

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

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

English: Sweet potato
Local: Kandolo or Cimbwali

Scientific name: Ipomoea batatas
Plant family: CONVOLVULACEAE

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

Distribution: A tropical and subtropical plant. They grow from sea level up to about 2,700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can’t stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow with a pH between 5.2 - 6.8. Sweet potato are not tolerant to shading. It suits hardiness zones 9 - 12.

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

Cultivation: Vine cuttings are used for planting. In grassland soils it is grown in mounds, ridges or other raised beds. In bush fallow, it is mostly planted in undug loose soils. It needs a sunny position. Tubers won't form if the ground is waterlogged when tubers start to develop. Sweet potato is grown by cuttings of the vine. About 33,000 cuttings are required per hectare. These weigh about 500 kg. Vine lengths of about 30 cm are optimum. As long as the vine is adequately inserted in the soil, the length of vine inserted does not significantly affect yield. Fresh sweet potato seeds germinate relatively easily and lead to continuous production of new cultivars under tropical conditions. Excess nitrogen restricts storage root initiation and therefore excess leaves are produced without significant tuber yield. Dry matter percentage increases with increasing age of the crop. Higher dry matter tubers are normally preferred.

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

Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar, but once ground coverage has occurred, weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing
aeration can result in poor tuber production. For this reason, sweet potatoes are often grown on
mounded beds. In well drained or high organic matter soils, digging or mounding is not as essential.
Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is
low due to low soil fertility. To reduce sweet potato weevil damage, plants need to be hilled or have
the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

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

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

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

English: Rice  
Local: Umupunga  
Scientific name: *Oryza sativa*  
Plant family: **POACEAE**

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

**Distribution:** A tropical plant. It grows in tropical and subtropical countries. Plants are grown in both flooded and dryland sites. It will grow over a range of conditions but is normally between sea level and 900 m altitude in the tropics. Occasionally it is grown up to 1,600 m. It needs a frost free period of over 130 days.

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

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

**Production:** The glumes are removed to produce husked rice. Polishing removes the integument giving polished rice. Rice development takes 90 - 200 days depending on variety.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed (white)</td>
<td>11.4</td>
<td>1530</td>
<td>6.4</td>
<td>-</td>
<td>0</td>
<td>1.9</td>
<td>-</td>
</tr>
<tr>
<td>seed (brown)</td>
<td>13.5</td>
<td>1480</td>
<td>7.6</td>
<td>-</td>
<td>-</td>
<td>2.8</td>
<td>-</td>
</tr>
</tbody>
</table>
Legumes

English: Marama bean
Local: Cilemba Uwakantuka

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>7.5</td>
<td>452</td>
<td>43.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>pod</td>
<td>72.5</td>
<td>446</td>
<td>6.4</td>
<td>-</td>
<td>39</td>
<td>0.5</td>
<td>2.2</td>
</tr>
<tr>
<td>tuber</td>
<td>79.4</td>
<td>237</td>
<td>1.6</td>
<td>-</td>
<td>6.5</td>
<td>0.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Legumes

English: Winged bean
Local: Cilemba Wanakabala

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. Stems twine around supports or trail over the ground. Leaves have 3 leaflets 8 - 15 cm long with long leaf stalks. 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 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. Very acid soils have soluble aluminium to which winged beans are sensitive. Soils should not be waterlogged.

**Use**: 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 is 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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>8.5</td>
<td>1764</td>
<td>41.9</td>
<td>-</td>
<td>-</td>
<td>15.0</td>
<td>4.5</td>
</tr>
<tr>
<td>pod (fresh)</td>
<td>92.0</td>
<td>105</td>
<td>2.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>leaf</td>
<td>95.0</td>
<td>197</td>
<td>5.0</td>
<td>809</td>
<td>30</td>
<td>6.2</td>
<td>1.3</td>
</tr>
<tr>
<td>seed (young)</td>
<td>87.0</td>
<td>205</td>
<td>7.0</td>
<td>13.0</td>
<td>18.3</td>
<td>1.5</td>
<td>0.4</td>
</tr>
<tr>
<td>root</td>
<td>57.4</td>
<td>619</td>
<td>11.6</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>1.4</td>
</tr>
</tbody>
</table>
**Description:** A deciduous tree that grows up to 35 m tall. It has a spreading flat crown. The trunk has small rounded buttresses. The grey to yellow-brown bark can be scaly or smooth, and becomes dark and cracked with age. The bark has an orange coloured resin. The leaves are feathery. A leaf is made up of 6 - 9 pairs of leaflets each divided into 16 - 24 pairs of smaller leaflets. These are about 2 cm long and 5 - 8 mm wide. The flowers are small and in bright red club shaped heads. These hang down on stalks 30 cm long. The flower heads are up to 8 cm long. The fruit are dark brown to purple pods which hang down in clusters. They are 30 - 60 cm long and 2 cm wide with their stalk. The pod is narrowed slightly between the seeds. The seeds are red-brown in a dry, mealy, edible, yellow pulp.

**Distribution:** A tropical and subtropical tree of lowland rainforests. It grows in Africa in forests near streams. It occurs in sub-humid and humid places with an annual rainfall of 950 - 1,750 mm annually. It grows from 250 - 1,370 m above sea level. It can grow in arid places.

**Use:** The pods and the pulp are eaten. The seeds are boiled and fermented then eaten. This has a strong smell but is removed by frying or roasting. The seeds can also be powdered and used for flavouring soups and rice dishes. The leaves are cooked as used as a vegetable.

**Cultivation:** Plants can be grown from seed. The pod is crushed and the seed removed from the pulp. The seed they should be boiled briefly, then allowed to cool and soaked for 12 hours, before sowing.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed (dry)</td>
<td>7.0</td>
<td>1780</td>
<td>32.3</td>
<td>-</td>
<td>6</td>
<td>33.2</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>13.2</td>
<td>1263</td>
<td>3.4</td>
<td>-</td>
<td>-</td>
<td>3.6</td>
<td>-</td>
</tr>
</tbody>
</table>

Image accessed from [http://farm8.staticflickr.com/7277/7804911110_92bcd0012a_b.jpg](http://farm8.staticflickr.com/7277/7804911110_92bcd0012a_b.jpg)
Legumes

English: Cowpea
Local: Ilanda Lyanceta

Scientific name: Vigna unguiculata subsp. unguiculata
Plant family: FABACEAE

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

Distribution: It grows in tropical and subtropical climates. It grows from sea level to 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

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

English: Mung bean
Local: Intongwe

Scientific name: Vigna radiata
Plant family: FABACEAE

Description: An upright hairy bean plant which can grow to 1 m tall. It has many branches. The leaves have 3 leaflets, are dark green and grow on long leaf stalks. There are oval stipules at the base of the leaf. Flowers are pale yellow and small. They occur in bunches of 10 - 20 on the ends of long hairy flower stalks. Pods are black and straight. They do not have a beak. Pods contain 10 - 20 seeds which are usually green or golden yellow. They are smaller than black gram. The beans can be black. They have a flat white hilum. There are 2,000 varieties.

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

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

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

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

Food Value: Per 100 g edible portion

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>11.0</td>
<td>1432</td>
<td>22.9</td>
<td>55</td>
<td>4</td>
<td>7.1</td>
<td>-</td>
</tr>
<tr>
<td>seed (cooked)</td>
<td>-</td>
<td>439</td>
<td>7.0</td>
<td>2.4</td>
<td>1.0</td>
<td>1.4</td>
<td>-</td>
</tr>
<tr>
<td>seed (sprouted)</td>
<td>90.4</td>
<td>126</td>
<td>3.0</td>
<td>2</td>
<td>13.2</td>
<td>0.9</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Legumes

**English:** Lablab bean

**Local:** Cilemba Wampanga

**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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed (dry)</td>
<td>10.0</td>
<td>1428</td>
<td>22.8</td>
<td>-</td>
<td>-</td>
<td>9.0</td>
<td>-</td>
</tr>
<tr>
<td>seed (young)</td>
<td>86.9</td>
<td>209</td>
<td>3.0</td>
<td>14</td>
<td>5.1</td>
<td>0.8</td>
<td>0.4</td>
</tr>
<tr>
<td>pod (fresh)</td>
<td>86.7</td>
<td>203</td>
<td>3.9</td>
<td>-</td>
<td>1.0</td>
<td>2.4</td>
<td>-</td>
</tr>
</tbody>
</table>
Legumes

**English:** Lima bean

**Local:** Intongwe Sha Mumpanga

**Scientific name:** *Phaseolus lunatus*

**Plant family:** FABACEAE

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

**Distribution:** It suits warm and subtropical areas. In the tropics it is common from 500 - 2,100 m altitude but grows to the limit of cultivation (2,700 m). For germination it must have a soil temperature above 15.5°C and cannot withstand frost. In very hot weather seeds often do not set. It does best in a temperature range 14 - 21°C. It is sensitive to a pH less than 6. It can grow in arid places.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
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<tbody>
<tr>
<td>seed</td>
<td>12.0</td>
<td>1407</td>
<td>19.8</td>
<td>-</td>
<td>-</td>
<td>5.6</td>
<td>-</td>
</tr>
<tr>
<td>seed (young, cooked)</td>
<td>67.2</td>
<td>515</td>
<td>6.8</td>
<td>37</td>
<td>10.1</td>
<td>2.5</td>
<td>0.8</td>
</tr>
<tr>
<td>seed (young, raw)</td>
<td>70.2</td>
<td>473</td>
<td>6.8</td>
<td>30</td>
<td>23.4</td>
<td>3.1</td>
<td>0.8</td>
</tr>
</tbody>
</table>
Legumes

**English:** Soybean

**Local:** Chilembe Yamituntula

**Scientific name:** *Glycine max*

**Plant family:** FABACEAE

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

**Distribution:** It is a temperate plant that suits lowland areas. It can be grown from sea level to 2,000 m altitude. Many varieties will not flower in the tropics (short days). It needs fertile soil. The best soil acidity is pH 5.5 - 7.0. It is damaged by frost.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>9.0</td>
<td>1701</td>
<td>33.7</td>
<td>55</td>
<td>-</td>
<td>6.1</td>
<td>-</td>
</tr>
<tr>
<td>seed (immature)</td>
<td>68.0</td>
<td>584</td>
<td>13.0</td>
<td>16</td>
<td>27</td>
<td>3.8</td>
<td>0.9</td>
</tr>
<tr>
<td>sprout</td>
<td>79.5</td>
<td>339</td>
<td>8.5</td>
<td>1.0</td>
<td>8.3</td>
<td>1.3</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Leafy greens

English: Yellow ipomoea
Scientific name: Ipomoea obscura
Local: Matuwa
Plant family: CONVOLVULACEAE

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

Distribution: It is a tropical plant. It grows up to 1,800 m above sea level. It grows in woodland, grassland, savannah and coastal sands. It can grow in arid places.

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

Food Value: Per 100 g edible portion

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>56.6</td>
<td>569</td>
<td>8.8</td>
<td>-</td>
<td>-</td>
<td>28.8</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Image sourced from: https://en.wikipedia.org/wiki/Ipomoea_obscura
Leafy greens

English: Flower-of-an-hour
Local: Nacilasa

Scientific name: *Hibiscus trionum*
Plant family: MALVACEAE

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

**Distribution:** It suits tropical, subtropical and temperate regions. It does best in a sunny position. It does not occur in hot humid tropical rain forest zones. It suits drier warmer places. It can grow in hot arid zones with a marked dry season. It grows up to 2,635 m above sea level. It can grow in arid places. It suits hardiness zones 10 - 12.

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>6.3</td>
<td>1263</td>
<td>26.7</td>
<td>-</td>
<td>-</td>
<td>79.8</td>
<td>5.7</td>
</tr>
<tr>
<td>shoot</td>
<td>-</td>
<td>-</td>
<td>21.0</td>
<td>-</td>
<td>-</td>
<td>21.8</td>
<td>9.4</td>
</tr>
</tbody>
</table>

Image accessed from: L. von Richter ©The Royal Botanic Gardens & Domain Trust
Leafy greens

English: Goat’s horns  Scientific name: *Sida cordifolia*
Local: Lumanda  Plant family: MALVACEAE

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

**Distribution:** A tropical plant that grows in open waste places in the tropics and sub-tropics. It is common and widely distributed in the Philippines. It grows in hot arid places with a marked dry season. It grows in places with an annual rainfall below 520 mm. It grows in dry sandy soils and can grow in salty soils. It grows below 1,100 m altitude. It can tolerate shade and can grow in arid places.

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>6.6</td>
<td>1296</td>
<td>24.2</td>
<td>-</td>
<td>-</td>
<td>79.8</td>
<td>-</td>
</tr>
</tbody>
</table>

Leafy greens

**English:** Hibiscus
**Local:** Umulembwe Wacisungu

**Scientific name:** *Hibiscus rosa-sinensis*
**Plant family:** MALVACEAE

**Description:** A shrubby, evergreen, woody, shrub used for hedges. It grows 2 - 5 m tall. The bark is grey and flaky and has fine stripes. The leaves are bright green and oval with long tips. The edges are entire on the lower leaves. The upper leaves are coarsely toothed. The flowers occur singly in the axils of leaves. Flowers can be single or double. They are bell shaped and 10 - 15 cm across. There are a range of colours. The fruit are rounded capsules with many seeds inside. The capsules are beaked. Plants usually do not produce fruit in the hot humid tropics.

**Distribution:** A tropical and subtropical plant, common as an ornamental throughout the tropics. It originally came from China. It thrives on any type of soil. Different types are adapted to sunny or shady places. It grows in open, moist places. It grows where average temperatures are 15 - 30°C. It is very sensitive to frost and can grow from sea level to 1,000 m altitude. It requires a minimum rainfall of 700 mm per year and suits hardiness zones 9 - 11.

**Use:** The leaves are eaten cooked. In some places they are pounded before cooking. The flowers are eaten raw or pickled. They are also added to drinks. They are used to colour foods including preserved fruit, sliced pineapple, agar-agar jellies, and cooked vegetables. The fresh flower ovary is eaten.

**Cultivation:** It is mostly grown from cuttings.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf (dry)</td>
<td>6.4</td>
<td>1339</td>
<td>25.9</td>
<td>-</td>
<td>-</td>
<td>19.6</td>
<td>8.9</td>
</tr>
<tr>
<td>leaf (fresh)</td>
<td>76.0</td>
<td>321</td>
<td>2.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Leafy greens

**English:** Prickly amaranth  
**Local:** Bondwe Yamyunga  
**Scientific name:** *Amaranthus spinosus*  
**Plant family:** AMARANTHACEAE

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

**Distribution:** A tropical plant that grows worldwide from the tropics to the warm temperate zone. It can grow in sun or light shade. In Tanzania it grows from sea level to 1,800 m altitude, in areas with 800 - 1,300 mm annual rainfall. It grows well in moist, damp soil and can also grow in arid places.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy (kJ)</th>
<th>Protein (g)</th>
<th>proVit A (μg)</th>
<th>proVit C (mg)</th>
<th>Iron (mg)</th>
<th>Zinc (mg)</th>
</tr>
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<td>46</td>
<td>14.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

34
Leafy greens

English: Coffee senna
Local: 

Scientific name: *Senna occidentalis*

Plant family: FABACEAE

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

**Distribution:** A tropical plant. It grows in monsoon forest as well as arid areas. In Africa it grows up to 2,400 m altitude. It can grow in acid, neutral or alkaline soils. It can grow in arid places. Temperatures which average 12.5 - 28°C are suitable. It grows in areas with rainfalls between 500 and 4,000 mm per year. A rainfall of 500 to 1,000 mm is enough.

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf (dry)</td>
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<td>31.7</td>
<td>-</td>
<td>-</td>
<td>3.1</td>
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</tr>
<tr>
<td>leaf</td>
<td>84.9</td>
<td>205</td>
<td>5</td>
<td>-</td>
<td>17.9</td>
<td>12.7</td>
<td>-</td>
</tr>
</tbody>
</table>
Leafy greens

**English:** Spreading pigweed  
**Local:** Bondwe Lyabuta  
**Scientific name:** *Amaranthus graecizans*  
**Plant family:** AMARANTHACEAE

**Description:** An annual plant that grows up to 50 cm high. The plant sprawls over the ground and has a taproot. The branches do not have hairs. The flowering shoots are leafy and the greenish flowers are in small clusters.

**Distribution:** It is a Mediterranean and tropical plant. In Ethiopia, it grows from 900 - 2,380 m altitude. It can grow in arid places.

**Use:** The leaves and seeds are eaten cooked. The seeds can be ground and made into flat bread.

**Caution:** This plant can accumulate poisonous nitrates if grown with high nitrogen inorganic fertilisers. The plant will cause diarrhoea if eaten in large amounts.

**Cultivation:** Plants can be grown from seed if the soil is warm. Seeds are small and grow easily. They need to be planted near the soil surface. Cuttings of growing plants root easily.

**Production:** It grows after rain and the first leaves can be harvested after 12 days.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf (dry)</td>
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<td>903</td>
<td>26.1</td>
<td>-</td>
<td>-</td>
<td>9.8</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Leafy greens

**English:** Rose-pink sesame  
**Local:** Bwengo  
**Scientific name:** *Sesamum calycinum*  
**Plant family:** PEDALIACEAE

**Description:** A herb that grows for one or a few years. The stem can be single or branched. The leaves at the top are long and thin and with almost no stalk. Lower leaves can have stalks and be divided into lobes. The flowers are 2-5 cm long and purple or pink. The fruit is a narrow capsule.

**Distribution:** A tropical plant. In Kenya it grows from sea level to 3,000 m altitude. It grows in light clay and sandy soils. It can grow in arid places.

**Use:** The young leaves are cooked and eaten. They are often cooked with other leaves such as Corchorus.

**Cultivation:** Plants can be grown from seeds. A spacing of 20 cm is suitable.

**Production:** The tender leaves are plucked off the bush.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
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<tbody>
<tr>
<td>leaf</td>
<td>76.5</td>
<td>-</td>
<td>5.6</td>
<td>-</td>
<td>47.0</td>
<td>35.2</td>
<td>-</td>
</tr>
</tbody>
</table>

Image accessed from: [http://www.zimbabweflora.co.zw/speciesdata/images/15/152550-2.jpg](http://www.zimbabweflora.co.zw/speciesdata/images/15/152550-2.jpg)
**Fruit**

**English:** Guava  
**Scientific name:** *Psidium guajava*  
**Local:** Amapela  
**Plant family:** MYRTACEAE

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>fruit</td>
<td>77.1</td>
<td>238</td>
<td>1.1</td>
<td>60</td>
<td>184</td>
<td>1.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Fruit

**English:** Key apple  
**Local:** Umwangashi

**Scientific name:** *Dovyalis caffra*  
**Plant family:** *SALICACEAE*

**Description:** A spiny shrub. It grows up to 6 - 9 m tall. It has long straight spines on the trunk and branches. They are about 3 cm long. The bark is white when young. The leaves are simple and carried one after another along the stem. The edges of the leaves roll back slightly. The leaves are dark green and glossy. Plants are separately male and female. The female flowers are 3 mm long and light green. They occur as 1 - 3 together in the axils of leaves. The male flowers are in dense short clusters in the axils of leaves. The fruit are medium sized and yellow. They are round and 2.5 - 4 cm across. The skin is tough. The fruit are edible.

**Distribution:** It is native to Southern and Eastern Africa. It is subtropical. It can withstand drought but cannot tolerate frosts. They grow naturally in areas with temperatures in the range 14 - 22°C. They grow between 800 m and 1200 m altitude but grow up to 2450 m altitude in Kenya. The rainfall where it grows naturally is 1000 - 1700 mm per year. It needs well drained soils. It is often on termite mounds. It can grow in arid places. It suits hardiness zones 9 - 10.

**Use:** The fruit are eaten fresh and used in jams and desserts. The fruit are acidic. Because the fruit are high in pectins they can be added in small amounts to help jams to jell and set. The green fruit are also pickled.

**Cultivation:** Plants are grown from seed. Seed are collected from fruit. The ripe fruit are cracked and allowed to rot for one week before removing the seed. There are about 20 seeds in each fruit. The seeds should be sown immediately in a nursery bed. Seedlings come through the soil in 12 days. When bushes are established they need to have their crown thinned out to allow more fruit to be produced. The trees can be used as a fence or hedge. Trees can be grown from cuttings, air layering and grafting.

**Production:** Trees produce fruit in 5 - 6 years from seed and 2 - 3 years from cuttings. Fruit need to be fully ripe when harvested. Fruit can be harvested after they fall. Fruit mature in 90 days.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>provitamin A μg</th>
<th>provitamin C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>fruit</td>
<td>85.9</td>
<td>238</td>
<td>0.4</td>
<td>-</td>
<td>117</td>
<td>0.1</td>
<td>-</td>
</tr>
</tbody>
</table>
Fruit

English: Indian jujube  
Scientific name: *Ziziphus mauritiana*  
Local:  
Plant family: RHAMNACEAE

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

**Distribution:** A tropical plant that grows well on sandy soils. It can survive droughts. It grows rapidly in dry places such as the Sahel. It can tolerate temperatures up to 44°C as well as periodic frosts once the trees are mature. It grows best when the mean annual temperature is 22 - 30°C. It thrives in hot dry climates. It needs adequate water during the fruiting season. It can grow at elevations up to 1,000 m in the tropics but does best below 600 m. It grows in areas with annual rainfall of 150 - 900 mm and is most common where annual rainfall is 300 - 500 mm. It does not like excessive humidity for fruiting. It will grow on a range of soils but deep sandy loams with a pH of 7 or slightly higher are best. It can tolerate some salinity and.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A μg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>fruit</td>
<td>77.0</td>
<td>360</td>
<td>0.8</td>
<td>21</td>
<td>71</td>
<td>0.4</td>
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<tr>
<td>fruit (dry)</td>
<td>17.4</td>
<td>1201</td>
<td>4.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

40
Fruit

**English:** Bird plum

**Local:** Muzinzila

**Scientific name:** Berchemia discolor

**Plant family:** RHAMNACEAE

**Description:** A tree. It grows 12 - 18 m tall. It usually loses its leaves during the year. The branches are spreading. The crown is dense and round. The leaves are simple and nearly opposite. They are dark green above and paler underneath. They are 2.5 - 10 cm long and 8 cm wide. They are oval with pointed tips. The flowers are in small stalked clusters in the axils of leaves. The fruit are like small pointed plums. They are about 2 cm long. They are yellow or red. They have a sweet yellow pulp and a kernel with 2 seeds. The fruit are edible.

**Distribution:** A tropical plant. It grows in dry forest. It grows at low altitude in South Africa. In East Africa it grows from sea level to 1,600 m altitude. It is damaged by frost or cold winds. It is drought resistant. It grows in areas with an annual rainfall between 300 - 635 mm. It can grow in arid places. It is often on termite mounds. It grows in the lowlands and along rivers.

**Use:** The fruit are eaten raw or dry. They are also used to flavour porridge. The dried fruit can be stored. The dried fruit (after the kernel is removed) are pounded with millet seeds and made into a biscuit dough and baked. The fruit are also fermented into an alcoholic drink.

**Cultivation:** Plants can be grown from fresh seeds. The seeds germinate easily. Seedlings can then be transplanted. Seeds can also be sown directly in the field. Plants can also be grown from root suckers.

**Production:** Plants grow very slowly. When dry, the fruit can be stored for a long time. Fruit are normally available in the wet season.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>fruit (fresh)</td>
<td>78.8</td>
<td>305</td>
<td>1.1</td>
<td>-</td>
<td>50.3</td>
<td>2.2</td>
<td>0.3</td>
</tr>
<tr>
<td>fruit (dry)</td>
<td>38.7</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>116</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Fruit

**English:** Pineapple  
**Local:** Icinanashi  
**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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>fruit</td>
<td>84.3</td>
<td>194</td>
<td>0.5</td>
<td>60</td>
<td>25</td>
<td>0.4</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Fruit

English: Pawpaw
Local: Ipapawa

Scientific name: Carica papaya
Plant family: CARICACEAE

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

Distribution: It is a tropical plant that grows from sea level up to about 1,700 m altitude in the equatorial tropics. In cooler regions they have to be planted but in humid tropical regions are commonly self-sown. Sunlight allows germination when forest is cleared. It cannot stand frost. It needs a night temperature above 12°C and don’t tolerate water-logging. Plants die after 48 hours in standing water. It needs a pH between 5 - 8 and suits hardiness zones 11 - 12.

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

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

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

Food Value: Per 100 g edible portion

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kj</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>75.4</td>
<td>378</td>
<td>8.0</td>
<td>-</td>
<td>140</td>
<td>0.77</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>88.0</td>
<td>163</td>
<td>0.5</td>
<td>290</td>
<td>54</td>
<td>0.4</td>
<td>0.18</td>
</tr>
<tr>
<td>fruit (unripe)</td>
<td>92.1</td>
<td>109</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
<td>-</td>
</tr>
</tbody>
</table>
**Fruit**

**English:** Canteloupe  
**Local:** Namunwa Wacisungu  
**Scientific name:** *Cucumis melo*  
**Plant family:** CUCURBITACEAE

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

**Distribution:** A tropical plant, but not suited to places with high rainfall. It suits hot dry places with a fertile well drained soil. It needs a sheltered sunny position. It is drought and frost tender. A temperature range of 24 - 28°C is best but much higher temperatures are tolerated. Mostly they are grown below 500 m altitude in the tropics. A pH of 6 - 6.7 is best. Acid soils are not suitable. It can grow in arid places. It suits hardiness zones 9 - 12.

**Use:** The ripe fruit are eaten raw. They are also dried, candied and made into jams, jellies and preserves. The seeds are sometimes eaten roasted. The seeds are blended with fruit juice to form a drink. Sometimes the immature fruit are cooked as a vegetable. The seeds contain an edible light oil. The young leaves are eaten as a potherb.

**Cultivation:** They are grown from seed planted about 1 - 4 cm deep. Plants need to be 1 - 2 m apart. Seedlings can be transplanted when about 10 - 15 cm high.

**Production:** Plants are ready 3 - 4 months after planting. Yields of 20 kg per 10 sq m is average.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>7.0</td>
<td>2319</td>
<td>15.8</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>leaf</td>
<td>85.0</td>
<td>172</td>
<td>4.2</td>
<td>72</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>93.0</td>
<td>109</td>
<td>0.5</td>
<td>169</td>
<td>30</td>
<td>0.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Fruit

English: Boabab
Local: Umubuyu

Scientific name: *Adansonia digitata*
Plant family: BOMBACACEAE

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

**Distribution:** It is a tropical plant that grows in the lowlands. It grows in the hot dry regions of tropical Africa, such as the Sahel. It survives well in dry climates. It grows where rainfall is 100 - 1,000 mm a year. It can tolerate fire. It grows where the annual temperatures are 20 - 30°C. In most places it grows below 900 m altitude but occasionally grows to 1,500 m altitude. It requires good drainage. It can grow in arid places and suits hardiness zones 11 - 12.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>nut (dry)</td>
<td>7.8</td>
<td>1832</td>
<td>33.7</td>
<td>-</td>
<td>-</td>
<td>13.9</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>16.0</td>
<td>1212</td>
<td>2.2</td>
<td>-</td>
<td>360</td>
<td>7.4</td>
<td>6.7</td>
</tr>
<tr>
<td>leaf</td>
<td>77.0</td>
<td>290</td>
<td>3.8</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
**Vegetables**

**English:** Bottle gourd  
**Local:** Inkombo  
**Scientific name:** *Lagenaria siceraria*  
**Plant family:** CUCURBITACEAE

**Description:** A pumpkin family plant. It is an annual vine with large leaves. It can grow 3 - 9 m long and spread 3 - 6 m wide. The thick stems have furrows along them. It can climb over logs by attaching the tendrils which grow out of the stem near the leaf. The leaves are large and have soft hairs especially underneath. Flowers of both sexes are borne in the same plant. The plant produces male flowers first and these are on long stalks. Next it produces female flowers on short stalks. Flowers are large and white. They can be 10 cm across. They are mainly pollinated by insects. Fruit vary in shape and can be 8 - 90 cm long. They have brown seeds in a whitish green pulp. There are several varieties.

**Distribution:** A tropical plant that grows from sea level up to 2,700 m altitude in the tropics. It grows best in a warm humid climate. It is sensitive to frost and prefers full sunlight. It grows best with a night temperature of 17 - 23°C and day temperatures of 28 - 36°C.

**Use:** The young fruit are boiled as a vegetable. The skin and seeds are removed and can also be steamed, fried or pickled. Young tips and leaves are edible. They are often cooked with milk or coconut milk to improve the flavour. They are also mixed with other edible leaves. The seeds are sometimes eaten and provide an edible oil. Old fruit are used as containers, and the seeds are not normally edible.

**Cultivation:** To achieve fast and uniform emergence, seed should be soaked overnight. Seeds are best sown in raised beds. Seedlings emerge in 5 - 7 days. Seedlings can be transplanted is required. Because plants cross pollinate, plant and fruit types vary. Removing the young fruit to use as a vegetable will prolong the life of the plant. Large fruit can be obtained by removing some of the small fruit. A spacing of 1 - 2 m is suitable. It prefers a trellis to climb. Because it is shallow rooted, weeding needs to be done carefully.

**Production:** It is fast growing and flowers 2 months after seeding.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>provit A µg</th>
<th>provit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>bean (dry)</td>
<td>3.2</td>
<td>2399</td>
<td>28.2</td>
<td>-</td>
<td>-</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>leaf</td>
<td>83.0</td>
<td>180</td>
<td>4.4</td>
<td>66</td>
<td>-</td>
<td>7.4</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>93.0</td>
<td>88</td>
<td>0.5</td>
<td>25</td>
<td>10</td>
<td>2.4</td>
<td>-</td>
</tr>
</tbody>
</table>
**Vegetables**

**English:** African eggplant  
**Local:** Impwa  
**Scientific name:** *Solanum macrocarpon*  
**Plant family:** SOLANACEAE

**Description:** An annual plant with dark green, glossy leaves. The leaf stalk is not well defined as the leaf blade runs down into the stalk. Leaves are generally not very hairy. The large flowers are purple or sometimes white. The fruit are round and greenish white but become orange-yellow or brown when fully ripe. They are hard or firm with long calyces around the fruit.

**Distribution:** A tropical plant that suits hot, humid climates. It grows up to 1,765 m above sea level. It can grow in arid places.

**Use:** The leaves are cooked and eaten. They are boiled or steamed and served as a side dish with rice. The fruit are eaten cooked. They are used in soups and sauces.

**Cultivation:** Seeds can be grown in a nursery and then transplanted.

**Production:** Plants produce fruit over 60 - 120 days from planting.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy (kJ)</th>
<th>Protein (g)</th>
<th>proVit A (μg)</th>
<th>proVit C (mg)</th>
<th>Iron (mg)</th>
<th>Zinc (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>86.0</td>
<td>176</td>
<td>4.6</td>
<td>-</td>
<td>65</td>
<td>6.0</td>
<td>-</td>
</tr>
<tr>
<td>fruit (mature)</td>
<td>89.0</td>
<td>168</td>
<td>1.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Vegetables

**English:** Marrow

**Scientific name:** *Cucurbita pepo*

**Local:** Plant family: CUCURBITACEAE

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

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

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

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

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

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

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

English: Pumpkin
Local: Ifipushi Mutakalala
Scientific name: Cucurbita maxima
Plant family: CUCURBITACEAE

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

Distribution: A subtropical plant that grows from sea level to 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

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

**English**: Bitter cucumber

**Local**: Ifibimbi Ilyalula

**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

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

**English:** Fat hen

**Local:** Nsululu

**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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy (kJ)</th>
<th>Protein (g)</th>
<th>proVit A (µg)</th>
<th>proVit C (mg)</th>
<th>Iron (mg)</th>
<th>Zinc (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td></td>
<td>1654</td>
<td>16</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>leaf (boiled)</td>
<td>88.9</td>
<td>134</td>
<td>3.2</td>
<td>391</td>
<td>37.0</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>leaf</td>
<td>87.7</td>
<td>113</td>
<td>5.3</td>
<td>33</td>
<td>108</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Vegetables

**English:** Horseradish tree  
**Local:** Moringa  

**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 hardiness zones 9 - 12.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>76.4</td>
<td>302</td>
<td>5.0</td>
<td>197</td>
<td>165</td>
<td>3.6</td>
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<tr>
<td>flower</td>
<td>84.2</td>
<td>205</td>
<td>3.3</td>
<td>-</td>
<td>-</td>
<td>5.2</td>
<td>-</td>
</tr>
<tr>
<td>leaf (boiled)</td>
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<td>pod (raw)</td>
<td>88.2</td>
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<td>7</td>
<td>141</td>
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<td>0.5</td>
</tr>
<tr>
<td>seed</td>
<td>6.5</td>
<td>-</td>
<td>46.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Vegetables

English: Okra
Local: Umulembwe Utali

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 or 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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>9.2</td>
<td>1721</td>
<td>23.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>leaf</td>
<td>81.0</td>
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<td>4.4</td>
<td>116</td>
<td>59</td>
<td>0.7</td>
<td>-</td>
</tr>
<tr>
<td>pod (fresh)</td>
<td>88.0</td>
<td>151</td>
<td>2.1</td>
<td>185</td>
<td>47</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>fruit (cooked)</td>
<td>90.0</td>
<td>134</td>
<td>1.9</td>
<td>58</td>
<td>16.3</td>
<td>0.5</td>
<td>0.6</td>
</tr>
</tbody>
</table>
**Nuts, seeds, herbs and other foods**

**English:** Sand apple  
**Local:** Canamika Wamenshi

**Scientific name:** *Parinari capensis*  
**Plant family:** CHRYSOBALANACEAE

**Description:** A shrub with underground stems that are woody and up to 1 cm thick. These form a branching network. Aerial stems arise from these. These can be 20 cm high. There are a few erect leaves. The leaf blade is sword shaped and 8 cm long by 1.5 cm wide. The lower surface has a white felt. The flowers are in loose clusters. They are cream coloured. The fruit is oval and fleshy. They are 1.8 cm long and have one seed. The fruit has a strong smell.

**Distribution:** A tropical plant. It grows amongst rocks and in sand and clay soils. It can be in seasonally flooded grassland. It grows between 900 - 1,200 m above sea level. In Zimbabwe it grows between 1,200 - 1,600 m above sea level. It can grow in arid places.

**Use:** The sweet outer layer of the fruit is eaten. It is buried in the sand to become ready to eat. It can be dried and eaten as a soft cake. It is also used to make beer. Juice of the fruit can be drunk fresh or boiled to a firm consistency. The crushed kernels are eaten as a relish with meat.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A μg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>nut</td>
<td>1.9</td>
<td>2919</td>
<td>26.3</td>
<td>-</td>
<td>-</td>
<td>4.7</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Nuts, seeds, herbs and other foods

English: Cashew
Local: Ndongo Yasimbangala

Scientific name: Anacardium occidentale
Plant family: ANACARDIACEAE

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

Distribution: It is a tropical plant that suits the lowland tropics but will grow up to about 1,200 m altitude. It only bears well in dry areas because of blight of the flowers. It grows best in temperatures of 22 - 26°C. A rainfall of 1,750 mm per year is considered suitable but good yields have been obtained with rainfall of 750 mm. It can grow on poor soils but needs good drainage.

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

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

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

Food Value: Per 100 g edible portion

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
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<tbody>
<tr>
<td>nut</td>
<td>4.0</td>
<td>2478</td>
<td>17.5</td>
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<td>2.8</td>
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<tr>
<td>leaf</td>
<td>69.9</td>
<td>418</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>84.7</td>
<td>213</td>
<td>0.8</td>
<td>0.12</td>
<td>265</td>
<td>1.0</td>
<td>0.2</td>
</tr>
</tbody>
</table>
**Nuts, seeds, herbs and other foods**

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A μg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed (dry)</td>
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<td>2364</td>
<td>24.3</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>seed (fresh)</td>
<td>45</td>
<td>1394</td>
<td>15</td>
<td>-</td>
<td>10</td>
<td>1.5</td>
<td>-</td>
</tr>
<tr>
<td>leaf</td>
<td>78.5</td>
<td>228</td>
<td>4.4</td>
<td>-</td>
<td>-</td>
<td>4.2</td>
<td>-</td>
</tr>
</tbody>
</table>

57
Nuts, seeds, herbs and other foods

English: Sebastan tree
Local: Ifafisa Ishabuta

Scientific name: Cordia myxa
Plant family: BORAGINACEAE

Description: A shrubby, evergreen tree that grows to 12 m tall. The trunk can be 1 - 1.5 m wide. The leaves are broad and pointed and have teeth along the edges. The male and female flowers are white or cream and in loose panicles at the ends of branches. The fruit are small and nutlike. They are yellow, orange-pink or black and have sweet, sticky flesh.

Distribution: A tropical plant that grows on rocky soils.

Use: The leaves are boiled in water then mixed with salt and chilli peppers. The flowers, young and ripe fruit and seed kernels are eaten. They are mixed with honey to make a sweetmeat. The young fruit are pickled.

Cultivation: Plants can be grown from seed. Seeds are soaked in cold water for 6 hours before planting and then germinate in 40 - 60 days. Seedlings in a nursery can be planted out after 4 - 6 months. Stem cuttings can also be used to grow plants.

Production: It is fairly fast growing. It starts flowering when 3 - 5 years old. It flowers and fruits all year round. Fruit ripen in 30 - 45 days.

Food Value: Per 100 g edible portion

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>nut (dried)</td>
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<td>2103</td>
<td>34.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>66.4</td>
<td>577</td>
<td>2.1</td>
<td>-</td>
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<td>272</td>
<td>5.1</td>
<td>-</td>
<td>-</td>
<td>7.2</td>
<td>-</td>
</tr>
</tbody>
</table>
Nuts, seeds, herbs and other foods

**English:** Sunflower

**Local:** Malanga Zuba

**Scientific name:** *Helianthus annuus*

**Plant family:** ASTERACEAE

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>5.4</td>
<td>2385</td>
<td>22.8</td>
<td>5</td>
<td>1.4</td>
<td>6.8</td>
<td>5.1</td>
</tr>
</tbody>
</table>
### Nuts, seeds, herbs and other foods

**English:** Desert date  
**Local:**  
**Scientific name:** *Balanites aegyptiaca*  
**Plant family:** ZYGOPHYLLACEAE

#### Description:
A small, spiny, evergreen tree that grows 6 - 15 m tall. It produces a rounded crown of tangled thorny branches. The bark is dark brown or grey and has patterns on it. It becomes corky and cracked with age. The branches are stiff and brittle and have stout, single spines up to 8 cm long. The thorns are soft at first then become woody. The leaves occur as distinctive pairs of grey-green leaflets. They are 2.5 - 6 cm long by 1.5 - 4 cm wide and are leathery and slightly hairy. The leaves are slightly different shape in each half. There are 4 - 6 prominent veins which are clearly seen on the underside of the leaf. The flowers are in small, hairy clusters. They are 1.4 cm across. They are yellow-green and have a sweet smell. The fruit is yellowish-green and 5 cm long by 2.5 cm wide. The fruit are date like. Both ends of the fruit are rounded. There is a hard pointy seed about 4 cm long by 2 cm wide. The flesh around the seed is yellow and bittersweet. The seed is easily separated from the flesh.

#### Distribution:
A tropical plant that is found all over Africa. It grows in the lowlands and Miombo woodland in Africa. It occurs from arid to sub-humid areas. It suits hot, dry areas, such as the Sahel. It grows from sea level to 2,000 m altitude. It prefers valley soils but will grow on a range of soils. It suits a rainfall of 200 - 800 mm. It needs an average temperature of 20 - 30°C.

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

#### Cultivation:
It is grown from seed, either in a nursery in pots, or direct. Root suckers can also be used. There are 600 - 1,200 seeds per kg. Seed removed from the fruit can be stored for a year. Seed should be sown vertically with the stem end down for best results. Seeds germinate in 1 - 4 weeks. Soaking the seed helps them germinate. They can be soaked in cold water for 2 days with the water being changed after 24 hours. Seedlings are slow growing but root suckers are faster.

#### Production:
Trees produce after 5 - 8 years. Fruit mature in 60 days. In Tanzania, fruit are collected between April and June. A good tree can produce 10,000 fruit in one year. Ripe fruit can be sun dried and stored. Seed kernels can be 60% oil.

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf</td>
<td>63.5</td>
<td>249</td>
<td>10.5</td>
<td>-</td>
<td>-</td>
<td>4.9</td>
<td>0.4</td>
</tr>
<tr>
<td>nut (dry)</td>
<td>5.0</td>
<td>2286</td>
<td>23.0</td>
<td>-</td>
<td>-</td>
<td>7.0</td>
<td>-</td>
</tr>
<tr>
<td>fruit (dry)</td>
<td>19.0</td>
<td>1150</td>
<td>5.0</td>
<td>-</td>
<td>-</td>
<td>3.1</td>
<td>-</td>
</tr>
<tr>
<td>fruit</td>
<td>64.0</td>
<td>510</td>
<td>2.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Nuts, seeds, herbs and other foods

**English:** Mobola plum

**Local:** Impundu or Imbula

**Scientific name:** *Parinari curatellifolia*

**Plant family:** CHRYSOBALANACEAE

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

**Distribution:** A tropical plant native to tropical Africa. It is common on sandy soils and in open deciduous woodland. It is very sensitive to frost and cold. It grows in areas with an annual rainfall between 700 - 1,500 mm. It is often in poorly drained soils with a high water table. Plants can regrow after fire. It grows in areas between sea level and 2,100 m above sea level. It can grow in arid places. It grows in Miombo woodland in Africa.

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

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

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

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

<table>
<thead>
<tr>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>proVit A µg</th>
<th>proVit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>nut</td>
<td>2.6</td>
<td>2737</td>
<td>28.7</td>
<td>-</td>
<td>-</td>
<td>5.5</td>
<td>3.1</td>
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<td>fruit</td>
<td>64.6</td>
<td>533</td>
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### Nutritional values of food plants by plant Family

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<th>Plant Family</th>
<th>Scientific name</th>
<th>English name</th>
<th>Local name</th>
<th>Edible part</th>
<th>Moisture %</th>
<th>Energy kJ</th>
<th>Protein g</th>
<th>Vit A µg</th>
<th>Vit C mg</th>
<th>Iron mg</th>
<th>Zinc mg</th>
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<tbody>
<tr>
<td><strong>AMARANTHACEAE</strong></td>
<td><em>Amaranthus spinosus</em></td>
<td>Prickly amaranth</td>
<td>Bondwe Yamyunga</td>
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<td>Bondwe Lyabuta</td>
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<td>tuber (baked)</td>
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63
Solutions to Malnutrition and Food Security