

Potentially Important Food Plants of Burundi



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



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

www.foodplantsolutions.org

Potentially Important Food Plants of Burundi

Dedication

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

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

This publication has been made possible through funding provided by Rotary Club of Cobourg,
Canada

Preface

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

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

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

Disclaimer: Unless otherwise indicated, the information and images in this Field Guide have been obtained from the Food Plants International “Edible Plants of the World” database under the provisions of the Creative Commons Attribution 3.0 Licence ([Creative Commons — Attribution-NonCommercial-NoDerivs 3.0 Unported — CC BY-NC-ND 3.0](https://creativecommons.org/licenses/by-nc-nd/3.0/)). Minor editing may have occurred to meet the requirements of page formatting. Although great care has been taken by Food Plants International and Food Plant Solutions, neither organisation, or the people involved in the compilation of the database or this Field Guide:

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

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

Contents

INTRODUCTION	1
STARCHY STAPLES.....	10
LEGUMES.....	22
FRUIT.....	30
VEGETABLES	42
LEAFY GREENS	53
NUTS, SEEDS, HERBS AND OTHER FOODS	63
NUTRITIONAL VALUES OF FOOD PLANTS BY PLANT FAMILY	72

Introduction

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

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

Growing food

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

A country with very special plants

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

In many countries, some of the traditional food plants are only harvested from the wild and others are only known in small areas. Others have hundreds of varieties and are the main food for people in different regions. Information on all these plants, their food value and the pest and diseases that damage them is available in the Food Plants International database. The selection and use of plants adapted to a range of growing conditions is becoming even more important as climate change impacts production in a variety of ways in different regions.

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. There are lots of unique things about every plant and learning about these helps a good gardener produce more food.

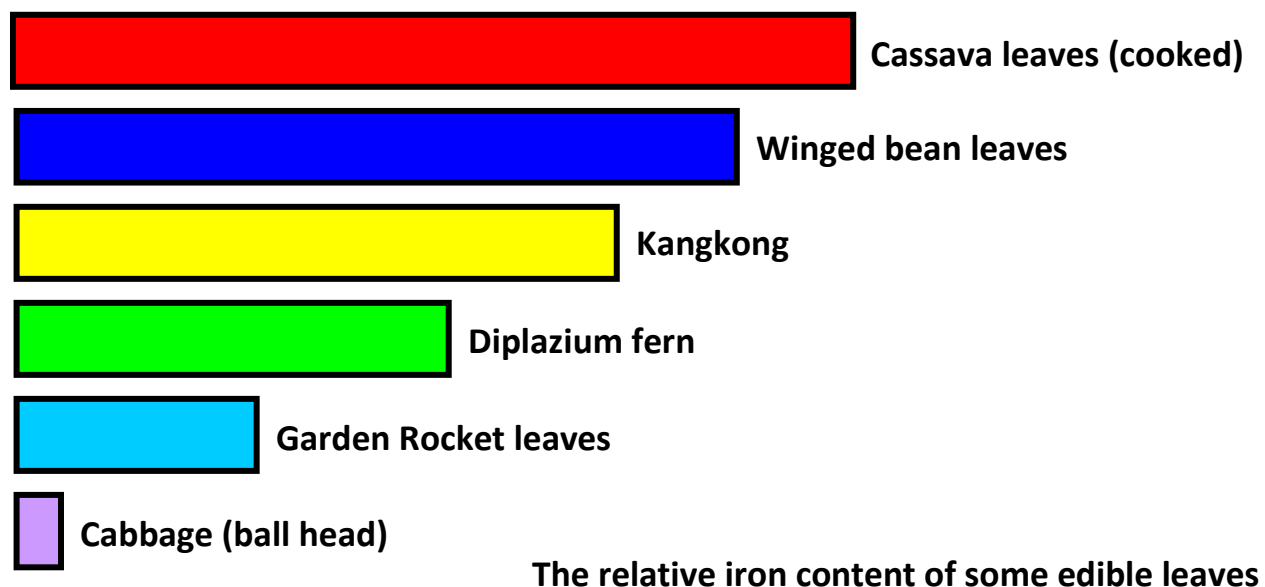
Naming of plants

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 possible even with limited resources, space or means. 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, it is recommended to eat a range of different plant foods every day. For example, an important plant group for humans, particularly young people, is dark green leaves. A good serving of dark leafy greens per day provides the body with many vitamins and minerals, and fibre. There are many spices or flavouring plants that can improve the taste of foods, which helps save money on artificial taste enhancers. 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. It is recommended that tubers are peeled, soaked and then boiled for 15-30 minutes. Leaves should be pounded to a mash and then cooked in boiling water for 10 mins. 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) can only be absorbed or absorption is increased when consumed with a little oil or fat.

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 will not 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. Maize 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 familiar with natural environments will know this very well. The reason people all over the world want to save natural environments is because they have 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 may not 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. 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 will not 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 maize, 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 will not 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.

Maize 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 do not cover it with plastic or put it in a container. This makes a foul-smelling compost, as different bacteria that don't need air turn it into an acid mixture that preserves it. Good compost must have moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off. As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil.

Pests

There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What

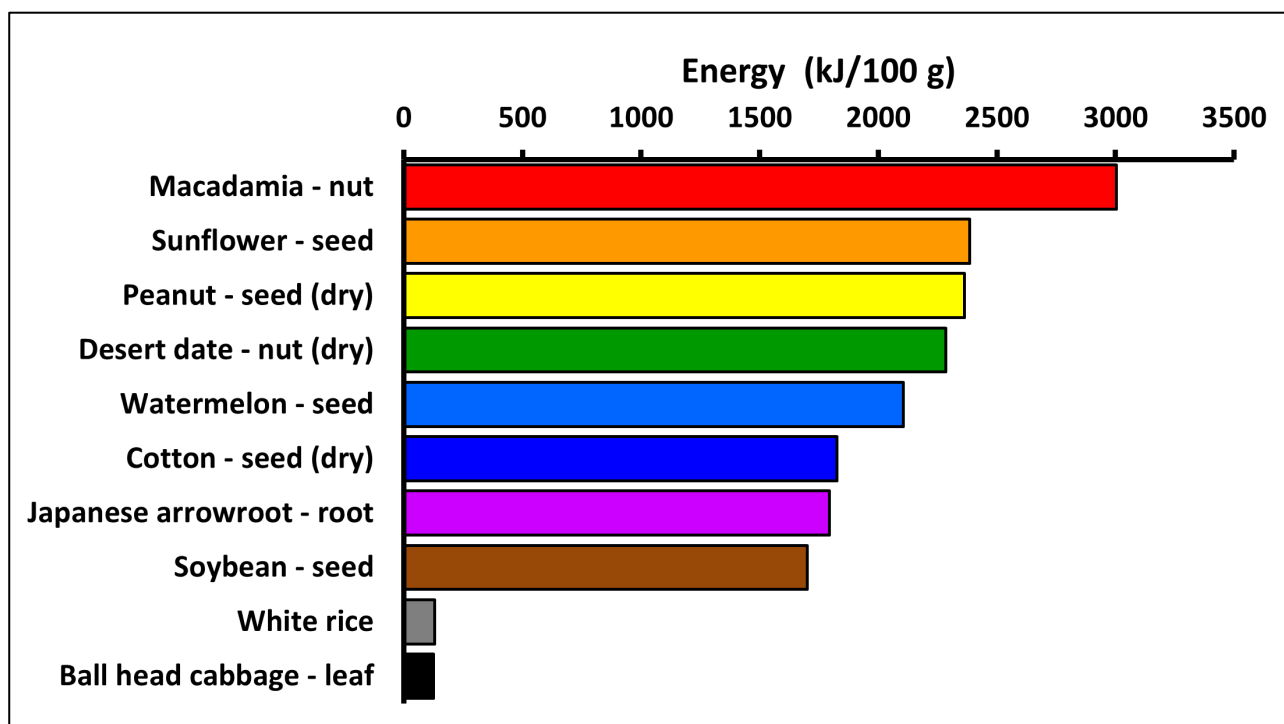
we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move “like an army” into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth that damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage.

Diseases

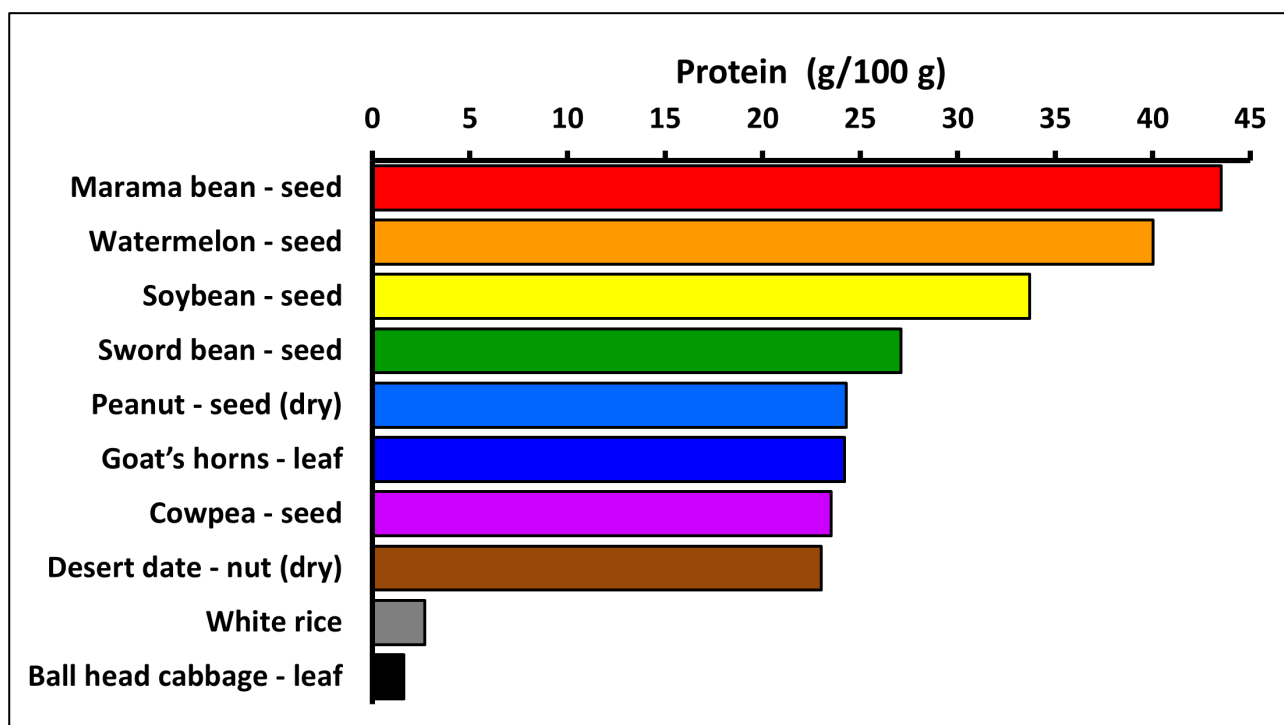
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct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

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

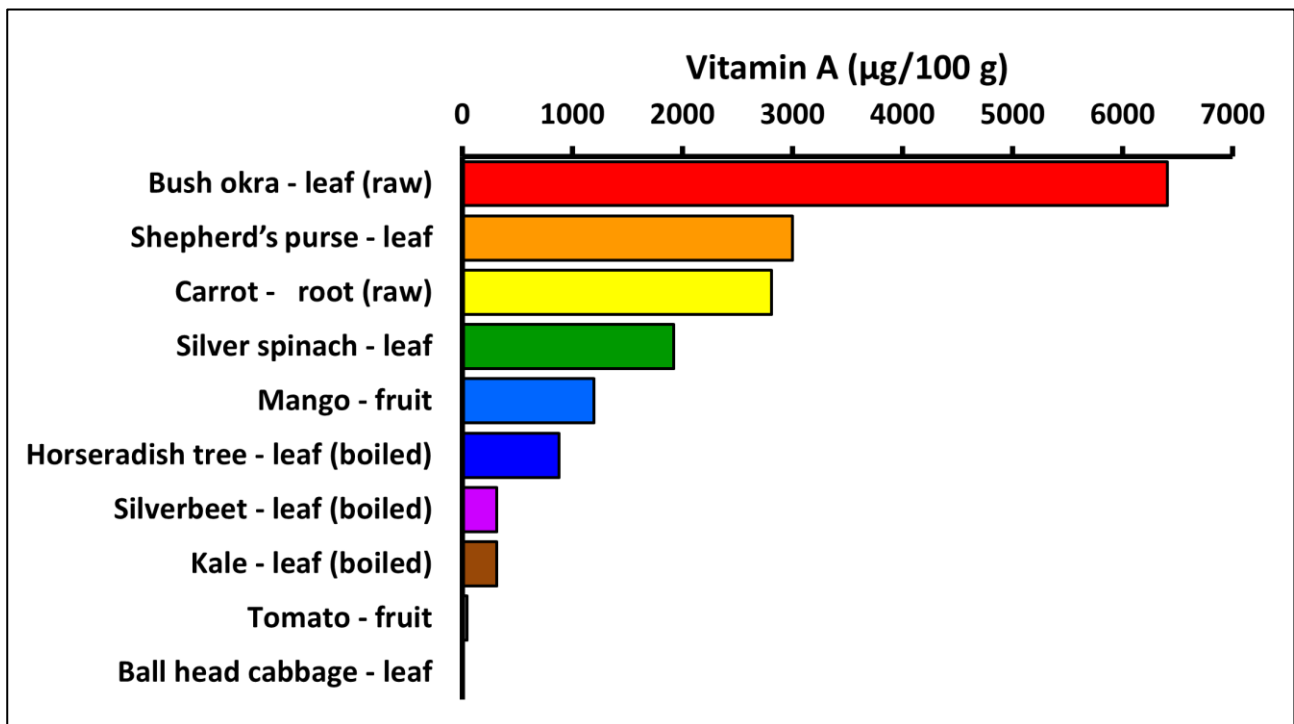
Food value charts for a selection of plants from Burundi



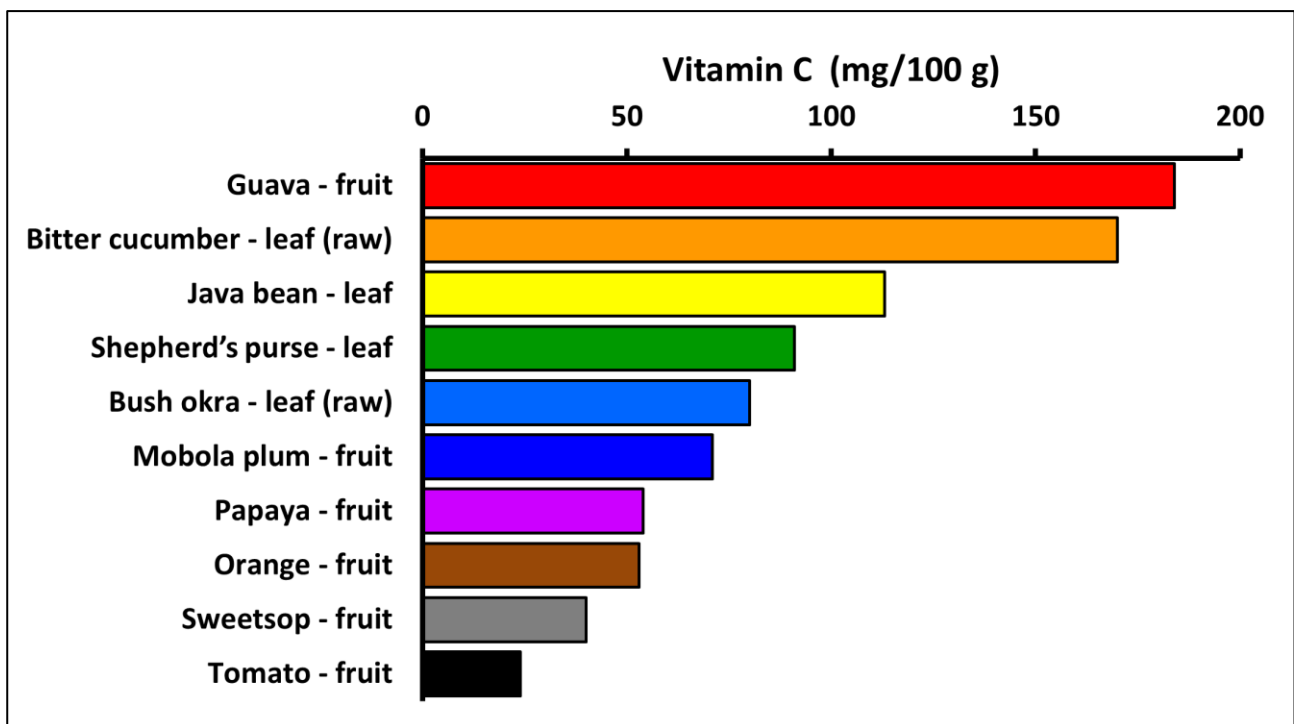
Energy is important for growth and repair of the body, blood flow and movement for work, exercise and play. All foods provide energy but foods containing oils, such as oil seeds, and starch, such as cereal grains and tubers, are particularly high in energy.



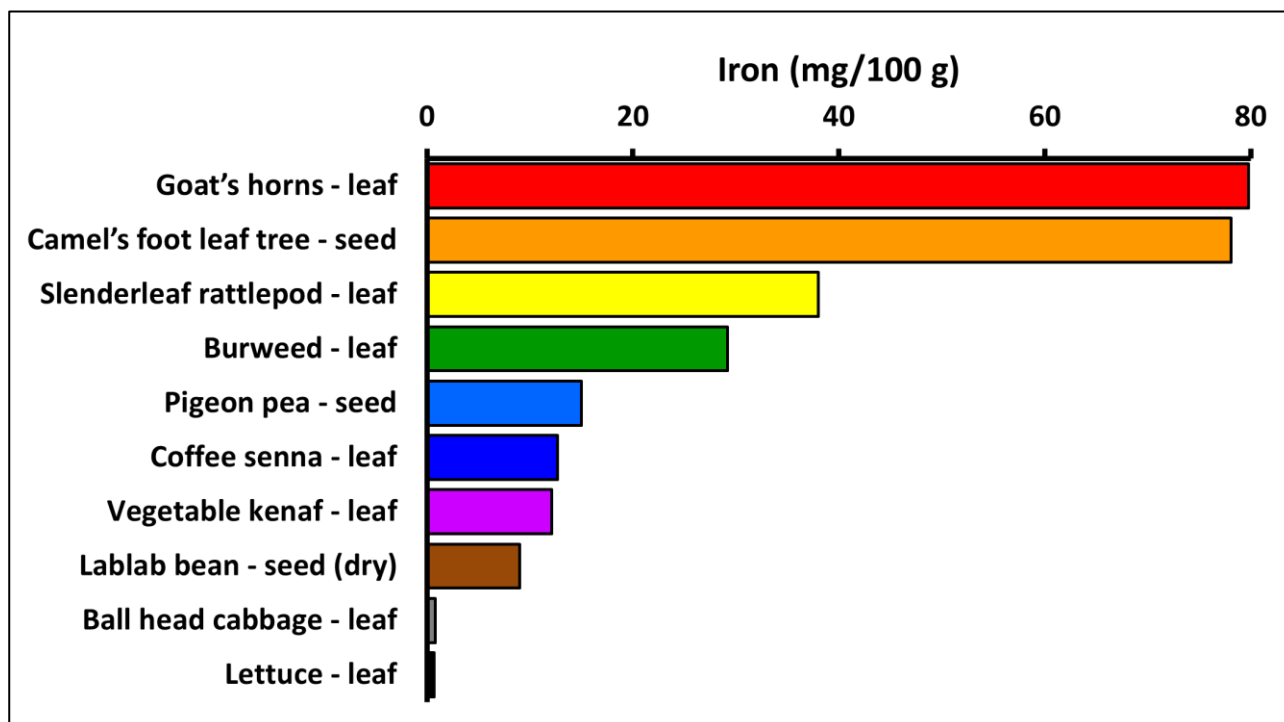
Protein helps the body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women. Symptoms of protein deficiency include wasting and shrinkage of muscle tissue, and slow growth (in children).



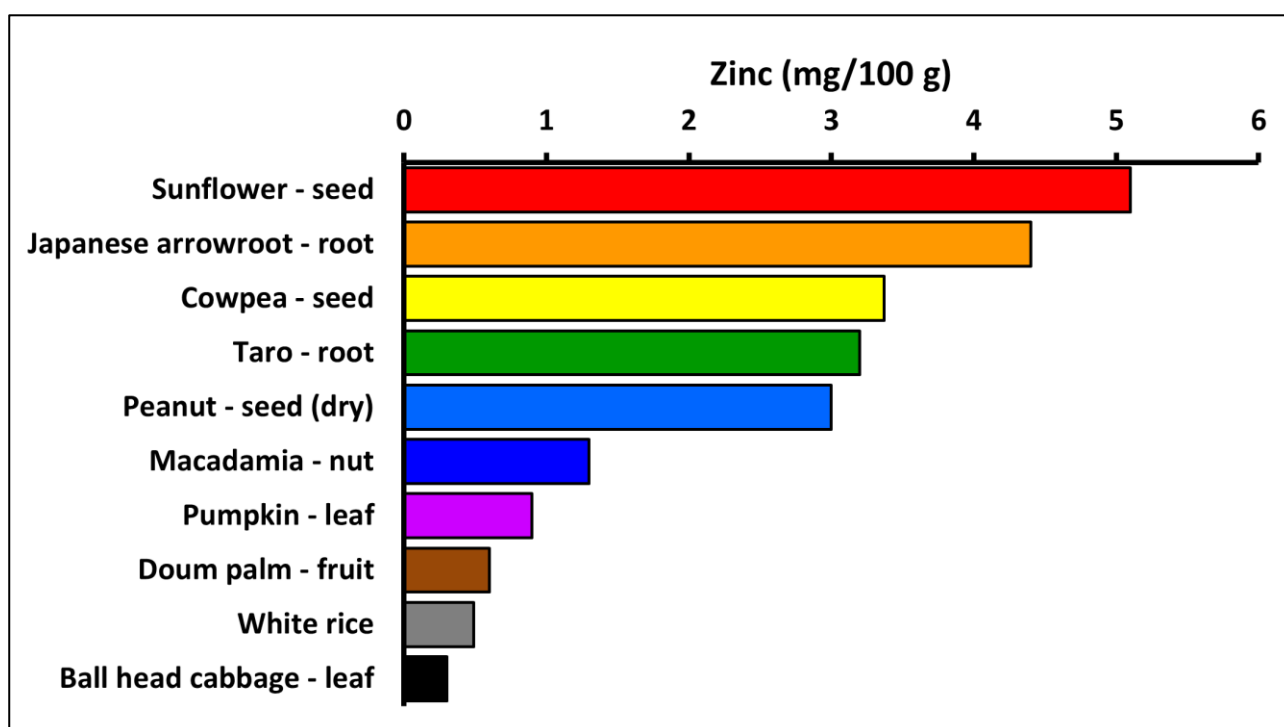
Vitamin A is very important for eyesight and fighting disease, particularly in infants, young children and pregnant women. People who are short of vitamin A have trouble seeing at night.



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



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



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

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

Starchy staples

Common name: Taro

Local:

Scientific name: *Colocasia esculenta*

Plant family: ARACEAE

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



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

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

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

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

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

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

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

Taro is sensitive to weed competition throughout most of its growth, but it is more critical during early growth up to 3-4 months. About 7-9 weeding 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 corms. They require good moisture conditions and have little tolerance for drought. Taro residue has an allelopathic factor which can reduce the germination and growth of other plants, for example, beans.

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Finger millet

Local:

Scientific name: *Eleusine coracana*

Plant family: POACEAE

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



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

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

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

Production: It is self-pollinating and pollination occurs over 8-10 days. Millet seed stores very well and can be stored without damage for 10 years. Often it is stored on the head. Yields of about 450-900 kg of dried grain per hectare are usual. This can easily be increased to 1650 kg per hectare. Crops take 3-6 months until harvest.

Food Value: Per 100 g edible portion

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

Starchy staples

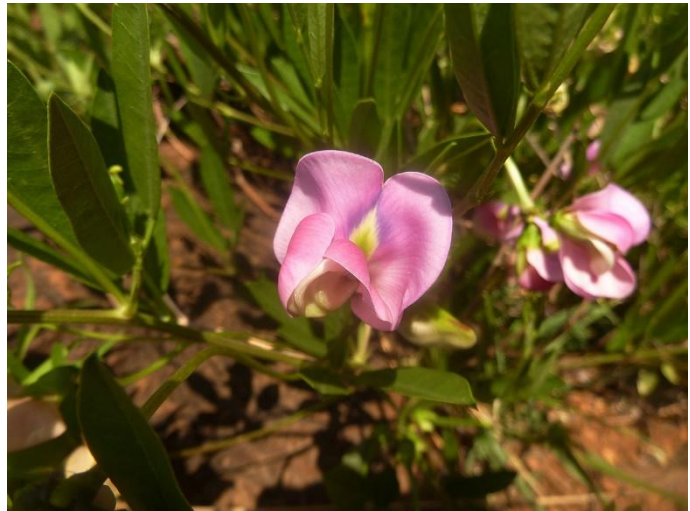
Common name: African yam bean

Local:

Scientific name: *Sphenostylis stenocarpa*

Plant family: FABACEAE

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



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

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

Cultivation: It can be grown from seed or tubers.

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

Food Value: Per 100 g edible portion

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

Image accessed from:

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

Starchy staples

Common name: Wheat

Local:

Scientific name: *Triticum aestivum*

Plant family: POACEAE

Description: An annual grass that easily forms tillers to produce a clump of shoots. Plants grow 30-80 cm tall. The stems are erect and simple. They are usually without hairs. The stems have 5-7 nodes and are hollow between these. The leaf sheath is wrapped around the stem. It is entire at the lower section but split further up. The strap like part where the leaf blade forms is colourless and jagged. The blade is flat, narrow and pointed. It is about 20-37 cm long and 1.2 cm wide. The veins are parallel. The flower stalk or ear is at the end of the stem



as a compound spike. It is 5-10 cm long. There are 2 rows of spikelets along each side. Usually 2 grains per spike develop and these are oval with a groove along the centre. There is a tuft of hairs at the end. There are more than 25000 cultivated varieties.

Distribution: A temperate plant that is grown at higher altitudes in the subtropics and tropics. In East Africa, most wheat is grown between 1600 m and 3000 m altitude. The best temperature for germination is about 29°C and the minimum temperature is about 4°C. Under good conditions, seeds germinate in about 4-5 days. In Nepal, it grows to about 3000 m altitude. Wheat can be grown to 57°N in Britain. Most wheat is grown between latitudes 30° and 60° north and between 30° and 40° south. It suits hardiness zones 9-11.

Use: It is used in fermented and unfermented products. Chapati flour usually comes from low gluten varieties. The seeds can be eaten as a cereal. It can be made into flakes, puffed, shredded and other forms or breakfast cereal. Wheat that is parboiled, dried and cracked is sold as *tabouli*. Young seedlings are juiced and used as wheatgrass drink.

Cultivation: Seed should be sown into a clean weed free seedbed. Seeds can be broadcast or drilled. Seed should be 2.5-5 cm deep and plants 20-25 cm apart.

Production: Spring wheat has a growing period of 100 days or more. The rainfall of most wheat growing areas is 750 mm per year or less. In the tropics, maturity varies from 95-150 days. Yields of 1,420 kg per ha are the world average.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	12.5	1387	11.7	-	-	3.3	-

Starchy staples

Common name: Japanese arrowroot

Local:

Scientific name: *Dolichos trilobus*

Plant family: FABACEAE

Description: A bean plant. It is a twining herb that keeps growing from year to year from root tubers. The leaves are compound with 3 leaflets. The leaf stalks are 2-3 cm long. The leaflets are 4 sided and 2-6 cm long by 2-5 cm wide. The flowering shoots are in the axils of leaves and there are 1-4 flowers in a group. The fruit is a pod 6 cm long by 8 mm wide. It is slightly curved. There are 6-7 seeds.



Distribution: It is a tropical plant that grows in grassland and bushland. It grows from sea level to 1200 m above sea level in Tanzania.

Use: The seeds are edible. They are collected and cooked while fresh or after being dried in the sun.

Cultivation: It can be grown from fresh seed.

Production: Dried seeds can be stored for several months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
root	72.4	1794	7.1	-	-	0.2	4.4

Image accessed from: <http://www.pittwateronlinenews.com/resources/Dipogon-lignosus1.jpg?timestamp=1398817248961>

Starchy staples

Common name: Cassava

Local:

Scientific name: *Manihot esculenta*

Plant family: EUPHORBIACEAE

Description: A plant which can re-grow year after year from the thickened roots. It has several stems. The stems are woody and have some branches. Plants grow up to 3 metres tall. Stalks have distinct scars where leaves have fallen. The leaves tend to be near the ends of branches. The leaves are divided like the fingers on a hand. The leaves have long leaf stalks. The leaves have 3-7 long lobes which can be 20 cm long. These are widest about 1/3 of the distance from the tip and taper towards the base. The colour varies. It produces several long tubers. These can be 50 cm long by 10 cm across. The flowers are on short stalks around a central stalk. They are produced near the ends of branches. The female flowers are near the base of the flower stalk and the male flowers higher up.



Distribution: A tropical plant. Plants grow from sea level up to about 1650 m. In Fiji they grow to 900 m. They can grow in poor soil and can survive drought. It is native to tropical America. It grows between 25°N and 25°S and needs a rainfall above 750 mm. It suits hardiness zones 10-12.

Use: The tubers are eaten after thorough cooking. They are boiled, roasted or made into flour. The starch is used in puddings, soups and dumplings. Young leaves are edible after cooking. They are also sometimes dried and stored. Seeds are also eaten. **Caution:** Bitter kinds of cassava contain poison but this is destroyed on heating. This kind of cassava should be cooked, sun dried, soaked and cooked again.

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

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

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

Because cassava can still grow satisfactorily in poorer soils it is often put last in a rotation after others crops have already been grown on the piece of land. Cassava is more responsive to nitrogen

and potassium than phosphorus under many field situations. Nitrogen can increase cyanide levels. Under very acid conditions with high soluble aluminium levels, cassava has been able to achieve and maintain top growth but with significantly reduce root yields. When drainage is good and soil moisture is adequate, cassava stalks can be planted at any orientation from horizontal to vertical, but in very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

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

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

Spacing and plant density varies with soil climatic conditions and variety. Plant densities from 10000 to 30000 plants per hectare are used. Plants from the higher density crops have been shown to have quick post-harvest deterioration. Mulching has given significant yield increases in some conditions. It also reduces the incidence and damage of some root boring insects.

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Maize

Local:

Scientific name: *Zea mays*

Plant family: POACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (mature)	10.4	1528	10.0	100	4	4.9	2.2

Starchy staples

Common name: Rice

Local:

Scientific name: *Oryza sativa*

Plant family: POACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (white)	11.4	1530	6.4	-	0	1.9	-
seed (brown)	13.5	1480	7.6	-	-	2.8	-

Starchy staples

Common name: Sorghum

Local:

Scientific name: *Sorghum bicolor*

Plant family: POACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Common millet

Local:

Scientific name: *Panicum miliaceum*

Plant family: POACEAE

Description: An annual grass which grows up to 1 m high. It spreads to 15 cm across. It has a fibrous root system. The stalks are tufted. They are hairy at the base and on the nodes. The leaves are 30-50 cm long by 1-5 cm wide. They are narrow and flat. The edge is slightly rough with a few long hairs near the base. The seed head is much branched. The flower is yellow. The fruit is a grain. There are several races.



Distribution: It is a temperate plant. It requires a moderately fertile well-drained soil in full sunlight. Once established it can tolerate heat and drought. It suits warm temperate and subtropical climates. Plants are frost sensitive. In Nepal it grows up to 2200 m altitude. It can grow in arid places. It suits hardiness zones 5-9.

Use: The seeds can be cooked and eaten whole or ground into flour. They can be used in bread, pasta or dumplings. They are often browned in a skillet before using in casseroles, stews and for stuffings. They are fermented into *tempeh* or *miso*. The seed can be sprouted and added to soups and salads.

Cultivation: It is grown from seed which takes one week to germinate.

Production: Seeds for harvest can be produced in 10 weeks.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	9.6	1548	11	-	-	-	-

Legumes

Common name: Pigeon pea

Local:

Scientific name: *Cajanus cajan*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

Common name: Soybean

Local:

Scientific name: *Glycine max*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

Common name: Lablab bean

Local:

Scientific name: *Lablab purpureus*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Camel's foot leaf tree

Local:

Scientific name: *Piliostigma thonningii*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

Common name: Marama bean

Local:

Scientific name: *Tylosema fassoglensis*

Plant family: FABACEAE

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



Distribution: It is a tropical plant. It does well in seasonally wet and dry climates. It needs well-drained soil. In Malawi it grows at 900-1200 m altitude, while in Tanzania it grows up to 1500 m above sea level and in areas with a rainfall between 1000-1600 mm. It needs full sun. It can grow in arid places. It suits hardiness zones 9-12.

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

Cultivation: Plants can be grown from seeds.

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

Food Value: Per 100 g edible portion

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

Image accessed from: https://live.staticflickr.com/3680/11668753985_8e6df5c180_b.jpg

Legumes

Common name: Mung bean

Local:

Scientific name: *Vigna radiata*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

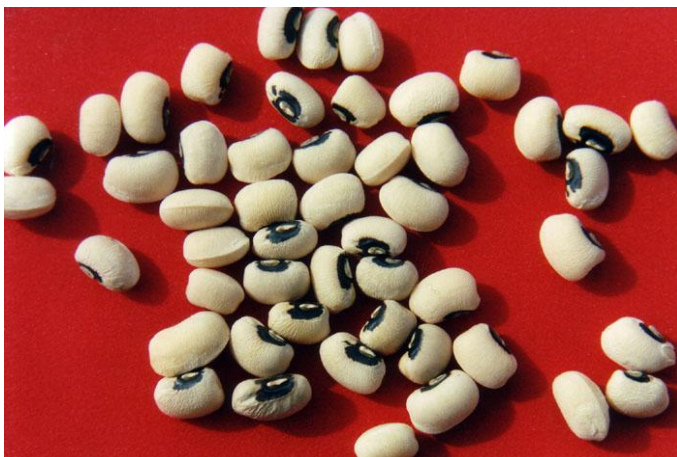
Common name: Cowpea

Local:

Scientific name: *Vigna unguiculata*

Plant family: FABACEAE

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



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

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

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

Food Value: Per 100 g edible portion

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

Legumes

Common name: Sword bean

Local:

Scientific name: *Canavalia gladiata*

Plant family: FABACEAE

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



Distribution: A tropical plant. Temperatures of 20-30°C suit it well and it grows from sea level to about 1000 m altitude in equatorial zones. They are drought and salt resistant. They can grow on lowland tropical nutrient depleted soils and on soils with pH from 4.5-7.0. They can tolerate some shade.

Use: Young pods are cooked and eaten. Seeds can be cooked and eaten, but the water should be changed and they should be well boiled. They are also fermented. The leaves are blanched and eaten. **Caution:** The seeds can be poisonous due to hydrocyanic acid and saponin. Cooking will remove these.

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	15.0	1335	27.1	-	-	-	-
pod (fresh)	89.0	142	2.8	-	-	-	-

Fruit

Common name: Sweetsop

Local:

Scientific name: *Annona squamosa*

Plant family: ANNONACEAE

Description: A bushy, deciduous tree, growing up to 6 m tall. It has irregular, spreading branches. The leaves are oblong and narrow, often 12 cm long by 4 cm wide. The leaves have fine hairs underneath. The leaves are dull green and smell when crushed. The flowers droop or hang from branches either singly or in groups of 2 or 3. The flowers are greenish-colour. The fruit are 8-10 cm across and greenish in colour. The fruit is covered with round, fleshy scales which drop off as the fruit ripens. Inside the fruit are several shiny, black seeds about 1.5 cm long. The fruit flesh is white and soft.



Distribution: It has been taken to most tropical countries. It suits drier, lowland climates. The trees will probably grow satisfactorily up to about 1000 m altitude in equatorial zones. Sweetsop cannot stand frost, but is able to survive droughts better than many fruit trees. Trees do not like wet soils. Sweetsop can grow in fairly poor, dry, stony soils. It suits areas with an annual rainfall of 500-1000 mm per year. It suits hardness zones 10-12.

Use: The fruit is eaten raw. The sweet, soft, fleshy layer around the seeds can be eaten raw. It is also used in ice cream. The juice is used for drinks. **Caution:** The seeds, leaves and roots are poisonous. An alkaloid, and hydrocyanic acid, occur in these parts of the plant.

Cultivation: It is normally grown from seeds and the seeds retain their viability (usefulness) for several years. It is better to grow sweetsop from fresh seeds and it is best to soak seeds for 3 days before sowing. Seeds germinate and start to grow 50-70 days after planting. The fruit is borne on old and new wood. As the fruit is more common on new wood, pruning is an advantage. Trees can be budded or grafted. A small branch of a selected variety is grafted onto another seedling sweetsop. Plants are very hard to get to grow from cuttings. A spacing of 6 m apart is suitable for sweetsop trees. When the fruit is ripe, it is easy to separate the different soft fleshy parts of the fruit. It is often easiest and best to harvest the fruit when they are nearly ripe and then let them ripen in a warm place.

Production: The tree is slow growing. Trees can start to produce fruit two years after they are planted. Fruit are often 200-300 g each. The pulp is 20% sugar.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	76.4	441	2.1	1	40	0.6	0.1

Fruit

Common name: Chewing gum tree

Local:

Scientific name: *Azanza garckeana*

Plant family: MALVACEAE

Description: A bushy shrub or small evergreen tree that grows 3-10 m tall. The bark is brown and rough. The small branches have shaggy, woolly hairs. The leaves are alternate and simple, with 3-5 lobes. They can be 20 cm long by 20 cm wide. There are hairs on both surfaces. The leaf stalk is 13 cm long. The flowers are yellow and turn orange with age. They have a maroon patch at the base of each petal. They are 6 cm across. They occur singly in the axils of leaves. The fruit is an almost round, woody capsule. It is 2.5-4 cm across. They have dense short hairs. They are divided into 5 sections. They are yellowish to brownish-green when mature. The fruit are edible.



Distribution: It is a lowland tropical plant. It grows in most types of woodland from sea level to 1,700 m altitude in South Africa. It grows in savannah country. It grows in hot arid places and in areas with an annual rainfall of 255-1270 mm. In Zimbabwe it is found mostly in areas with an annual rainfall of 750-900 mm per year. It often grows in termite mounds. It grows in Miombo woodland in Africa.

Use: The whole fruit, except the seeds, is chewed like chewing gum. A sweet slime is produced. The seeds are not edible. The fruit need to be fully ripe. The hard outer layer is peeled off. Dried fruit are used for jellies. They are cooked and eaten in large quantities during famines. The fruit can be boiled, and dried with a little salt added, and then stored for about 4 months.

Cultivation: Plants can be grown from seeds. It is best to remove the seed coat. Seeds germinate in 20-60 days. Seedling trays should not be kept too moist. Seedlings can be transplanted at the 3 leaf stage. Often seeds are sown directly in the field.

Production: It is reasonably slow growing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	14.8	1042	5.0	-	-	5.0	0.4

Fruit

Common name: Cantaloupe

Local:

Scientific name: *Cucumis melo*

Plant family: CUCURBITACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	7.0	2319	15.8	-	-	-	-
leaf	85.0	172	4.2	72	-	-	-
fruit	93.0	109	0.5	300	30	0.4	0.2

Fruit

Common name: Monkey guava

Local:

Scientific name: *Diospyros mespiliformis*

Plant family: EBENACEAE

Description: An evergreen tree that grows 15-20 m tall. It can grow to 45 m tall in forests. It has a dense wide spreading round crown. The trunk sometimes has buttresses. Young branches have soft hairs. The bark is dark grey. The bark is smooth in young trees and becomes rough in older trees. The small twigs are pink. The leaves are simple. They are 4-17 cm long and 1.5-5.5 cm wide. The midrib is sunken on top and prominent underneath. The flowers occur as male and female flowers on separate trees. The male flowers occur in clusters and the female flowers occur singly. The fruit are round and 3 cm across. They have sweet edible pulp. The fruit are green and with hairs when young and become yellow or purple when ripe. They contain 4-6 seeds. The seeds are brown. They are oblong and flattened.



Distribution: A tropical plant. It can grow in the tropical lowlands. It occurs in tropical Africa south of the Sahara and grows in the Sahel. It grows in semi-arid and Miombo woodland in Africa. It occurs where the mean temperatures are 16°C-27°C. In Tanzania it grows from 350-1250 m altitude. It is more common where rainfall is 500-1270 mm per year. It does best on heavy soils. It often grows near streams and freshwater. It can grow on termite mounds.

Use: The fruit are eaten fresh or dried. They are also made into a porridge. The fruit can be dried and stored. The seeds are also edible. The fruit are also used to make beer or wine.

Cultivation: Plants are grown from seed. Seeds take about one month to germinate. Seeds can be covered in boiling water and left to soak overnight before planting. They can also be grown by coppicing and by root suckers. Seeds need plenty of moisture to germinate well. Fruit are often collected from the ground but can be picked from the tree.

Production: Small plants are slow growing but they grow taller after a few months. Flowering occurs during the rainy season and fruiting during the dry season. It takes 6-8 months from flowering to mature fruit. Fruit mature faster in hot dry places.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	64.5	523	1.1	-	-	2.0	-

Fruit

Common name: Doum palm

Local:

Scientific name: *Hyphaene petersiana*

Plant family: ARECACEAE

Description: A tall, usually unbranched, palm. The trunk is usually swollen in the middle. It is woody and 15-20 m tall. The crown is made up of fan shaped leaves. The leaves are large and fan shaped and grey-green. They are folded along the centre and deeply divided into fine stiff segments. The leaves are 2 m across. The leaf stalk is 1.3 m long. The leaf stalk has thorns which curve backwards. The bases of the leaflets are unequal. The flowers are of separate sexes on separate trees. The male flowers are



produced in short, tangled spikes amongst the leaves. The female flowers are larger than the male and have short stalks. The fruit are round and borne in clusters. The fruit can be 4-5 cm across or larger. They have a hard shiny brown shell. The base of the fruit is not narrowed. The fruit have a layer of sweet, edible flesh around a hard bony kernel. The kernel can be soaked then eaten.

Distribution: A tropical plant. It grows in tropical southern Africa. It grows in open savannah and along streams and rivers. It can grow in salty soil and can re-grow after fire. It grows 275-1300 m above sea level. It can grow in arid places. It grows in Miombo woodland in Africa. It suits hardiness zones 10-12.

Use: The flower bud and the stem can be tapped for sap used to make wine. Tapping the stem kills the palm. The palm heart is edible. The core of young trunks can be used as a vegetable. The layer around the fruit is eaten raw. The young fruit are boiled and eaten. The nut or kernel is soaked and eaten raw.

Cultivation: Plants can be grown from seeds.

Production: For sap, all the leaves are removed and the stem tip cut at an angle to start the sap flowing. The flow can be continued for 7 weeks by regularly cutting. The yield can be 8-60 litres. One tree can produce 20-50 kg of fruit.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	6.6	1265	4.9	-	19.7	2.0	0.6

Fruit

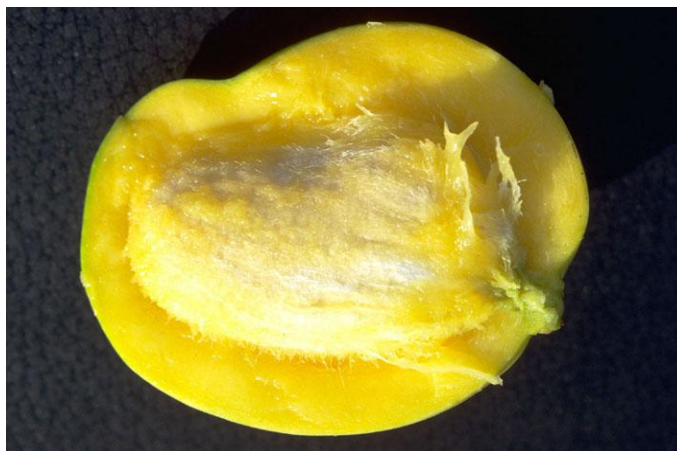
Common name: Mango

Local:

Scientific name: *Mangifera indica*

Plant family: ANACARDIACEAE

Description: An erect, branched evergreen tree. It can grow to 10-40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10-30 cm long and 2-10 cm wide. They are arranged in spirals. The leaf stalk is 1-10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10-50 cm long and branching. Up to 6000 flowers can occur on a stalk. Most of these are male and up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5-30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.



The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.

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

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

Cultivation: Trees are grown by planting fresh seed and they can be transplanted. Mangoes vary in their ability to breed true from seed. When more than one seedling emerges from the seed some of these are asexual and breed true. Clean seed germinate best if they are treated at 50°C for 20 minutes, then planted on their edge with the round bulge upwards and near the soil surface. The husk around the seed should be removed. Seeds germinate in 3-6 weeks. The strongest growing seedlings from this seed are used and the others thrown away. The seedlings from the folds of the seed are vegetative while the seedling from the centre of the seedling near the stalk end may be sexual and show variation from type. Other seeds only produce one seedling and these normally

vary and can be different from the parent tree. Plants can be propagated by budding, or by grafting using in-arching. This is not easy and care is required. In wetter places, flowers need to be protected with fungicides to enable fruit to form. If organic manure is used this should not be directly in the planting hole nor immediately against the new plant. Young transplanted seedlings need regular watering. A spacing of 6-12 m between plants is used. Wind protection is advisable to prevent fruit rubbing and getting damaged. Trees should only ever be lightly pruned as fruit develop on new growth and heavy pruning can reduce flowering. Flowering can be brought about by foliar sprays of potassium nitrate.

Production: Seeds germinate after about 20 days. Seedling trees produce after 4-6 years and increase in production up to 20 years. Trees often bear better each second year. Rain at flowering reduces fruit setting. Fruiting is at the end of the year. Fruit take 4-5 months to mature. Fruit vary in weight from 200-1000 g. Trees can produce one million flowers but only 500 fruit. Trees last for many years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	83.0	253	0.5	180	30	0.5	0.04
leaf	82.1	226	3.9	-	60	2.8	-

Fruit

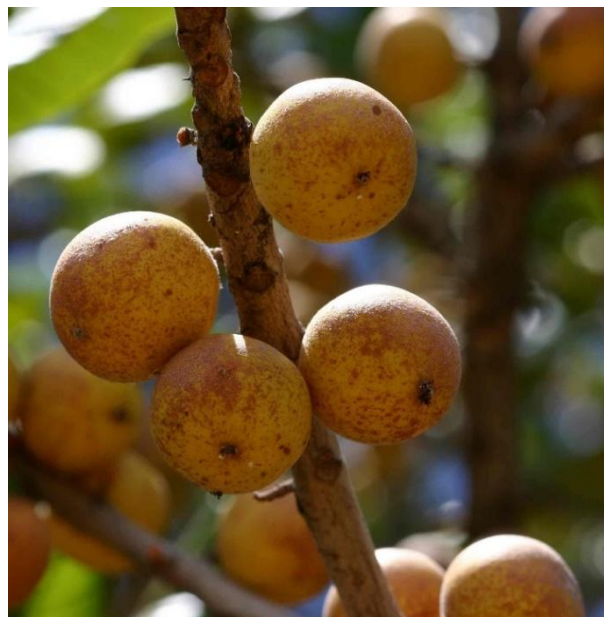
Common name: Mobola plum

Local:

Scientific name: *Parinari curatellifolia*

Plant family: CHRYSOBALANACEAE

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



Distribution: A tropical plant native to tropical Africa. It is common on sandy soils and in open deciduous woodland. It is very sensitive to frost and cold. It grows in areas with an annual rainfall between 700-1500 mm. It is often in poorly drained soils with a high water table. Plants can re-grow after fire. It grows in areas between sea level and 2100 m above sea level. It can grow in arid places. It grows in Miombo woodland in Africa.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
nut	2.6	2737	28.7	-	-	5.5	3.1
fruit	64.6	533	1.6	-	70.9	0.9	0.4

Image sourced from: <http://1.bp.blogspot.com/-4xS96YPShms/VqrsB0ZAqpl/AAAAAAAAAWI/RIYLyPiX3JA/s1600/parinari1.jpg>

Fruit

Common name: Water berry

Local:

Scientific name: *Syzygium cordatum*

Plant family: MYRTACEAE

Description: A medium sized evergreen tree. It grows to 8-15 m high. The trunk sometimes has buttresses. The crown of the tree is rounded. The bark is dark brown and rough with cracks along its length. The small branches are angular and the edges of them is winged. The leaves tend to be near the ends of branches and occur in large numbers. They clasp the stem in opposite pairs. The following leaf pair are at right angles. The leaves are leathery and blue-green. They are oblong to circular and 3-8 cm long by 2-8 cm across. The base of the leaf is heart shaped. The edges of the leaves are often wavy. The new leaves are bright red. The flowers occur



in dense branched clusters. These can be 10 cm across. They are white or pink and the stamens show up clearly. The flowers contain both sexes. The flowers produce abundant nectar. They are also scented. The fruit is 1.3 cm long. They are purple. The fruit is edible. It has one seed inside.

Distribution: A tropical plant. It occurs in lowland forests always near streams and swamps. It can grow up to 1680 m above sea level in South Africa. In swamp forests it can form a very large fern covered tree while in drier areas is a much smaller rounded shrub. It grows in areas with an annual rainfall above 500 mm. It can re-grow after fire. It can grow in arid places.

Use: The fruit is eaten raw. It is also used for drinks and jams. An alcoholic drink is made from the fruit.

Cultivation: It is grown from fresh seed. The seeds can be germinated in pots for transplanting or sown directly. There are 400-500 seeds per kg. The seeds germinate well and evenly. Most have germinated in 25 days. Seed cannot be dried out and will only remain viable for a day.

Production: The tree is fairly fast growing. It can be cut back and allowed to re-grow. In the southern hemisphere the fruit are ripe November to March.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	85.8	204	0.6	-	11.6	1.4	0.2

Image sourced from: http://www.zimbabweflora.co.zw/cult/image-display.php?species_id=142310&image_id=3

Fruit

Common name: Pawpaw

Local:

Scientific name: *Carica papaya*

Plant family: CARICACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

Common name: Guava

Local:

Scientific name: *Psidium guajava*

Plant family: MYRTACEAE

Description: A small evergreen tree 8-10 m tall with smooth, mottled bark which peels off in flakes. It is shallow rooted and branches close to the ground. The branches are four-angled. The leaves are opposite, dull green, and somewhat hairy. They are oval and somewhat pointed at both ends, 15 cm long by 2-5 cm wide with short leaf stalks. The showy flowers are white and borne in loose, irregular arrangements of 1-3 flowers that grow in the axils of leaves on new growth. The petals are 1.5-2 cm long. Both self and cross-pollination occurs. The



fruit are rounded and 4-5 cm long. They are green, turning yellow when ripe. The skin is firm and encloses a pink, or nearly white, sweet-smelling, edible pulp with many seeds. In better selected varieties, the skin and the seeds are fully edible. Fruit vary from very acid to very sweet.

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Silver beet

Local:

Scientific name: *Beta vulgaris* subsp. *cicla*

Plant family: CHENOPODIACEAE

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



Distribution: It needs to be over at least 500 m altitude in the tropics, and is mostly grown from 1000-2600 m altitude. It can tolerate frost.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf (boiled)	92.7	84	1.9	314	18	2.3	0.3
leaf (raw)	92.0	80	1.8	330	30	1.8	0.4

Vegetables

Common name: Java bean

Local:

Scientific name: *Senna obtusifolia*

Plant family: FABACEAE

Description: An annual or perennial herb that grows 0.6-2.5 m tall. The leaf has leaflets in 3 pairs that are oval and 1-6 cm long by 0.5-3.9 cm wide. The top of the leaf is rounded but with a sharp tip. It is wedge shaped at the base. The flower stalks have 1 or 2 flowers. The stalk for the flower cluster is very short, but the stalk for the individual flowers is 1-3.5 cm long. The flower petals are orange-yellow and 1-2 cm long. The fruits are thin, slightly curved and tapering pods. They are 13-23 cm long and 4-7 mm wide. The seeds are brown. They are 4.5-6.5 cm long by 2-4mm wide.



Distribution: A tropical plant that grows throughout the tropics. It is mostly a weed of roadsides and waste places. It grows from sea level to 2000 m altitude. It grows along rivers and near lakes. In Africa it grows up to 1700 m altitude. It can grow in arid places.

Use: The young leaves are cooked and used as a vegetable. The leaves are fermented into a high protein supplement to meat. The juice during fermentation is made into a stew with okra, beef and salt. The seeds are occasionally dried and ground into powder and cooked and eaten. Seeds are also roasted and used as a coffee substitute. **Caution:** Older leaves can cause diarrhoea. The seeds are possibly poisonous and should be well cooked.

Cultivation: It can be grown from seed.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	79.7	251	5.6	-	113	5.9	-

Image accessed from: <https://tse2.mm.bing.net/th?id=OIP.ZJkno9RQyqSH5azcrmABAwHaFj&pid=Api>

Vegetables

Common name: Pumpkin

Local:

Scientific name: *Cucurbita maxima*

Plant family: CUCURBITACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Bottle gourd

Local:

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 2700 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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (dry)	3.2	2399	28.2	-	-	5.3	-
seed (fresh)	97.0	-	0.2	-	-	0.1	0.2
leaf	83.0	180	4.4	66	-	7.4	-
fruit	93.0	88	0.5	25	10	2.4	-

Vegetables

Common name: Bitter cucumber

Local:

Scientific name: *Momordica charantia*

Plant family: CUCURBITACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Moringa

Local:

Scientific name: *Moringa oleifera*

Plant family: MORINGACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name:

Local:

Scientific name: *Talinum portulacifolium*

Plant family: TALINACEAE

Description: A stout herb that keeps growing from year to year. It can be softly woody. The stems are grey and sprawling and the root is thickened. The flowering stems are succulent. It grows 1 m high or 2 m long if lying over. The leaves are slightly fleshy. They are broadly oval and 2-8 cm long by 1-3 cm wide. The flowers are in groups at the top of the plant. They are along a 30 cm long stalk. Flowers have both sexes. The fruit is a round capsule that has 3 valves.



Distribution: It is a tropical plant that grows 300-1850 m above sea level. It grows in dry soils often over limestone material. It can grow in arid places. It also grows in the lowlands.

Use: The whole plant is cut and boiled and used as a vegetable. It is also eaten raw in salads. The leaves can be dried for later use.

Cultivation: It can be grown by seeds or cuttings.

Production: Leaves are collected during the rainy season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	90	-	1.9	-	175.6	1.4	0.5

Image sourced from: https://commons.wikimedia.org/wiki/Category:Talinum_portulacifolium

Vegetables

Common name: Eggplant

Local:

Scientific name: *Solanum melongena*

Plant family: SOLANACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Carrot

Local:

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

Plant family: APIACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Kale

Local:

Scientific name: *Brassica oleracea* var. *acephala*

Plant family: BRASSICACEAE

Description: A cabbage plant. The leaves are ruffled or crinkled but some are more smooth than normal kales. The leaf shape and colour varies considerably. The flowers are yellow or white.

Distribution: It is a warm temperate to subtropical plant. The leaves grow best in cool weather. It suits hardiness zones 8-11.

Use: The leaves are eaten boiled, steamed, used in soups and stews. The unopened flower buds are used like broccoli.



Cultivation: Plants are grown from seed or transplanted. Plants should be spaced 30-45 cm apart no more than 1cm deep.

Production: Leaves are harvested 40-60 days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf (raw)	84	210	3.3	70	120	1.7	0.3
leaf (boiled)	91.7	109	2.1	313	18	0.5	0.4

Leafy greens

Common name: Coffee senna

Local:

Scientific name: *Senna occidentalis*

Plant family: FABACEAE

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



Distribution: A tropical plant. It grows in monsoon forest as well as arid areas. In Africa it grows up to 2400 m altitude. It can grow in acid, neutral or alkaline soils. It can grow in arid places. Temperatures which average 12.5-28°C are suitable. It grows in areas with rainfalls between 500 and 4000 mm per year. A rainfall of 500 to 1000 mm is enough.

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

Cultivation:

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf (dry)	10.0	-	31.7	-	-	3.1	-
leaf	84.9	205	5	-	17.9	12.7	-

Image sourced from: <https://tse1.mm.bing.net/th?id=OIP.wjO-VnTA1RQnqZQ4Illp9wHaFe&pid=Api>

Leafy greens

Common name: Burweed

Local:

Scientific name: *Triumfetta rhomboidea*

Plant family: MALVACEAE

Description: A herb or small shrub that keeps growing from year to year. Plants can be 1.5 m tall. The bark is tough and fibrous. The younger stems and leaves and flowers are densely covered with hairs. The leaves are alternate and the edges of the leaves have teeth. The lower leaves have 3 lobes. The flowers occur in small clusters opposite the axils of leaves. The stalks carrying the flowers are 20-40 cm long. There are 5 yellow petals. The fruit are brown and hairy and covered with hooked spines. They are round and about 5 mm across. They contain 2-4 seeds. The fruit cling to clothing.



Distribution: A tropical plant. It grows naturally in grassland and re-growth situations. It is more common in tropical places with seasonal rainfall. It grows in savannah woodland and in palm groves. It grows up to 1280 m above sea level. It can grow in arid places.

Use: It is eaten as a pot herb in times of scarcity. The roots are eaten cooked.

Cultivation:

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	78.4	284	4.2	-	-	29.2	-

Image accessed from:

http://www.phytoimages.siu.edu/users/paraman1/2_15_10/Upload15Feb10/077TriumfettaRhomboidea.jpg

Leafy greens

Common name: Shepherd's purse

Local:

Scientific name: *Capsella bursa-pastoris*

Plant family: BRASSICACEAE

Description: A cabbage family herb. It is an annual plant or it can take 2 years to complete its life cycle. The stem is erect and grows to 60 cm high. It has a rosette of leaves near the base. The leaves vary in shape and are toothed along the edge. The upper leaves are smaller, sword shaped and without stalks. The flowers are white. They occur in clusters at the ends of branches. The fruit is a flat, triangular, pod.



Distribution: It grows in temperate and subtropical places. It grows in higher rainfall areas and does best in moist soils. It is resistant to frost and drought and can survive winter snow. In Zimbabwe, it grows from 1490-1920 m above sea level.

Use: The young tender leaves are cooked and used as a vegetable. They can also be eaten raw in salads. They need to be gathered before the flowers appear. The dried seed pods give a pepper like flavouring. The fresh or dried roots can be used as a ginger substitute. **Caution:** Eating this food is not recommended during pregnancy as it can cause miscarriage.

Cultivation: Plants are grown from seed. The seeds can lie dormant in the soil for 30 years.

Production: The seeds contain 15-20% oil.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	88.2	138	4.2	150	91	4.8	-

Image sourced from: https://fr.wikipedia.org/wiki/Fichier:Capsella_bursa-pastoris_1.JPG

Leafy greens

Common name: Silver spinach

Local:

Scientific name: *Celosia trigyna*

Plant family: AMARANTHACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

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

Leafy greens

Common name: Cat's-whiskers

Local:

Scientific name: *Cleome gynandra*

Plant family: CLEOMACEAE

Description: An annual herb with a long tap root that grows 60-90 cm tall. It is erect and somewhat hairy. It usually has purple stems. The leaves occur one after another along a long stalk. There are 5-7 leaflets which are unequal and spread out at the end. They are oblong and about 2.5-6 cm long by 1.4-3.2 cm wide. The leaflets are pointed at the base with a rounder point at the tip. There are fine teeth along the edges of the leaves. The flowers are white or purple and occur in long flower clusters at the end of branches. These



are 30 cm long. The flower clusters are showy with a spidery like appearance. The fruit are a slender capsule with 2 valves and many small seeds. They are 5-10 cm long and very narrow. The seeds are kidney shaped and rough. They are brown and have fine lines along them. They are 1-1.5 mm across.

Distribution: A widespread tropical plant. It commonly occurs as a self sown weed on cultivated land. It grows in warm or tropical regions at a range of elevations but especially above 600 m altitude. It will grow from semi arid to wet humid climates. It will grow on many soil types, but needs fertile soil for good leaf production. A temperature of 18-25°C seems best. Plants need plenty of sunlight. They are not drought resistant but can produce a crop with short periods of rain. Plants cannot withstand flooding. It is often abundant near the sea. It can grow in arid places.

Use: The leaves are eaten. If they are cooked, the bitter taste is reduced. They are also used in flavouring sauces. The leaves are also blanched, dried and stored. The flowers can be eaten. Young pods are also eaten. The oil from the seeds is edible without needing to be refined. The leaves can be candied in vinegar or in salt water, then eaten with fish. The seeds are used as a spice in curries.

Caution: Fresh plants can contain hydrocyanic acid and should be cooked.

Cultivation: The plant is grown from seed that are broadcast. Fertile soil is needed to get plants with good leaf coverage. The seed germinate erratically, because the seed have a rest period after harvest. Seed germinate best 6 months after harvest. Once they are ready to grow, they germinate in 4-5 days. Leaves or whole plants can be harvested when 15 cm high. Picking out the tops encourages side growth and longer leaf production. Removing flowers extends the harvest period.

Production: Leaves can be harvested 4-5 weeks after planting. Seeds reach maturity about 5 months after sowing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	86.6	142	4.8	-	26	6.0	-

Leafy greens

Common name: Jute

Local:

Scientific name: *Corchorus olitorius*

Plant family: MALVACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

Common name: Vegetable kenaf

Local:

Scientific name: *Hibiscus cannabinus*

Plant family: MALVACEAE

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



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

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

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

Production:

Food Value: Per 100 g edible portion

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

Leafy greens

Common name: Slenderleaf rattlepod

Local:

Scientific name: *Crotalaria brevidens*

Plant family: FABACEAE

Description: A much branched herb. It lives for one or sometimes more years. It grows 2 m tall. The branches curve upwards and have soft hairs. The leaves are alternate. They have 3 leaflets. The leaf stalks are 2-6 cm long. The leaflets are narrow and 4-10 cm long by 1-2 cm wide. They are hairy underneath. The flowers are in a group at the top of the plant. These can be 50 cm long. There are many narrow flowers. They are yellow with red veins. The fruit is a narrow pod 4-5 cm long and 1 cm wide. It is slightly curved at the ends. There are many seeds that are 3 mm long and yellow to orange.



Distribution: A tropical plant. It grows between 500 m and 2700 m above sea level. It can grow in arid places.

Use: The tender leaves are cooked and eaten as a vegetable. They are cooked with potash and have peanuts added to improve the flavour. Leaves can be dried and stored for later use. **Caution:** It is bitter due to Pyrrolizidine alkaloids. If eaten with corchorus or with milk it is less bitter.

Cultivation: Plants are grown from seed. Seed germinate in 3-4 days. It responds well to natural compost and manures.

Production: Plants are ready for harvesting after 8 weeks. Harvesting can continue for 4 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	74.5	-	8.8	-	-	38	-

Image sourced from: <https://en.wikipedia.org/wiki/Crotalaria#/media/File:Rattlepod.JPG>

Leafy greens

Common name: Lettuce

Local:

Scientific name: *Lactuca sativa*

Plant family: ASTERACEAE

Description: A leafy vegetable which forms a heart or clump of tightly-wrapped leaves under cool temperature conditions. The leaves are often pale green. Plants are about 20 cm high. It is a leafy annual grown for its succulent, crisp, radial leaves. The lowland species has loose leaves, crumpled with frilly margins, while the leaves of the highland variety fold over the growing point to form a head, with light green, almost white, leaves of a greasy texture, and coarse veins and prominent mid-rib. There are many lettuce varieties.



Distribution: A temperate plant grown in most temperate countries, and also in many tropical countries, including Solomon Islands. Plants are grown throughout the country but particularly in higher places, and often for sale. Leafy forms are used in cooking in many parts of Asia. It suits hardiness zones 6-11.

Use: Leaves are eaten raw or used in soups.

Cultivation: Plants are grown from seeds and often transplanted. Seedlings are transplanted after 30-35 days and spaced 45 cm apart. Seeds need to be sown very shallowly. In hot places, lettuce develop a bitter taste if transplanted or checked in their growth. Cutting the tap root can stop plants seeding quickly.

Production: Leafy varieties are harvested after 50-60 days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	94.0	84	1.2	180	15	0.7	0.2

Leafy greens

Common name: Goat's horns

Local:

Scientific name: *Sida cordifolia*

Plant family: MALVACEAE

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



Distribution: A tropical plant that grows in open waste places in the tropics and sub-tropics. It 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 1100 m altitude. It can tolerate shade and can grow in arid places.

Use: The leaves are edible when cooked.

Cultivation:

Production:

Food Value: Per 100 g edible portion

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

Image accessed from

[http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia \(Bala\) in Hyderabad, AP W IMG 9420.jpg](http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_(Bala)_in_Hyderabad,_AP_W_IMG_9420.jpg)

Nuts, seeds, herbs and other foods

Common name: Peanut

Local:

Scientific name: *Arachis hypogaea*

Plant family: FABACEAE

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



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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (dry)	4.5	2364	24.3	0	-	2.0	3.0
seed (fresh)	45	1394	15	-	10	1.5	-
leaf	78.5	228	4.4	-	-	4.2	-

Nuts, seeds, herbs and other foods

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



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

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

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

Production: Trees produce after 5-8 years. Fruit mature in 60 days. In Tanzania, fruit are collected between April and June. A good tree can produce 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

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

Nuts, seeds, herbs and other foods

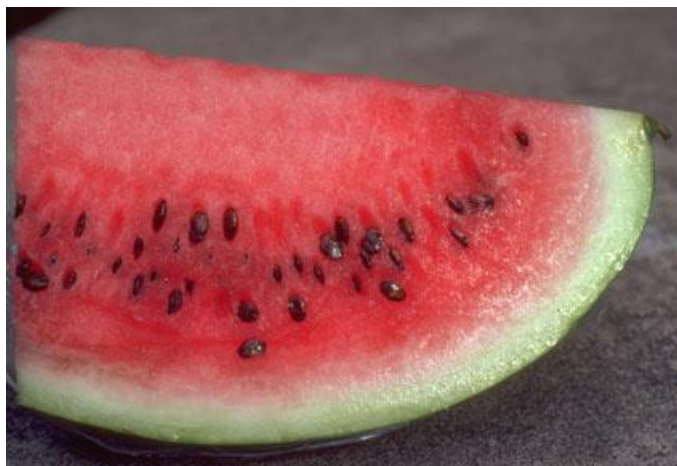
Common name: Watermelon

Local:

Scientific name: *Citrullus lanatus*

Plant family: CUCURBITACEAE

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



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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	90	148	0.6	-	-	0.2	-
seed	10	2107	40	--	-	5.6	-

Nuts, seeds, herbs and other foods

Common name: Comb fringe grass

Local:

Scientific name: *Dactyloctenium aegyptium*

Plant family: POACEAE

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



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

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

Cultivation: Plants can be grown from seeds.

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

Food Value: Per 100 g edible portion

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

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

Nuts, seeds, herbs and other foods

Common name: Governor's plum

Local:

Scientific name: *Flacourtia indica*

Plant family: FLACOURTITACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

Common name: Sunflower

Local:

Scientific name: *Helianthus annuus*

Plant family: ASTERACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

Common name: Smooth-shelled macadamia
Local:

Scientific name: *Macadamia integrifolia*
Plant family: PROTEACEAE

Description: A medium size evergreen tree. It grows up to 18 m tall and spreads to 15 m wide. It has a bushy habit. Young growth is pale green. Young leaves are long and toothed at the edge. Leaves are 10-20 cm long by 3-5 cm wide. They occur in whorls or rings of 3 or 4 leaves. They are stiff and dark green. The leaves are entire with a wavy or slightly prickly edge. Flowers occur in clustered stalks 10-30 cm long. They occur in the axils of leaves and hang downwards. The flowers are about 1.2 cm long. They are slender and white. The fruit are 3-4 cm across and green and leathery. The nuts are produced in a hanging cluster. They are 2-3 cm across and round. They are smooth and shiny.



Distribution: It is a subtropical plant that grows in the highlands in the tropics. It is native to Australia where it grows naturally in rain forests in the subtropics. It suits humid locations. Soils need to be well-drained. They need a sheltered site as they suffer from wind damage. They do best in humus rich soils. They can tolerate light frosts. It has been introduced to other countries from Australia. It does well at 1000-1200 m altitude in Papua New Guinea and will grow up to 1700 m. It suits hardiness zones 9-11.

Use: The nuts are eaten raw although sometimes they are roasted. They can be coated with chocolate or carob and used in pastries, candies, ice cream, cakes and pies. The oil can be used with salads and stir-fried dishes.

Cultivation: Trees are mostly grown from seed which should be sown fresh. Seeds germinate quickly and easily. They can be grown from cuttings, by budding or grafting. Pruning increases branching. A spacing of 5-10 m is suitable if planted together. Many varieties need pollinator trees and bees to assist pollination.

Production: Nuts are ripe from January to March in Australia. Nuts are harvested from the ground after they fall. The outside husk needs to be rubbed off before the nuts are dried in the sun.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
nut (dry)	1.4	3004	7.9	0	1.2	3.7	1.3

Nuts, seeds, herbs and other foods

Common name: Short-staple cotton

Local:

Scientific name: *Gossypium herbaceum*

Plant family: MALVACEAE

Description: A shrub. It grows 2 m high. The leaf stalk is 2.5-8 cm long. The leaf blade is divided into 5 lobes like the fingers on a hand. The leaves are 5-10 cm across. The lobes are broad and oval and half the length of the leaf. The flowers occur singly in the axils of the leaves. The flowers are yellow and red or purple at the centre. The fruit is a capsule with 3-4 valves. It is about 3 cm across. The seeds are about 1 cm across. They are white and woolly.

Distribution: A tropical plant. It needs a temperature above 13-18°C.

Use: The seeds yield a cotton oil used for salads. It is also used in cooking. The seed is roasted and used as a coffee substitute. The leaves are eaten.

Cultivation: Plants are grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (dry)	8.0	1827	20.2	-	-	-	-
seed (oil)	-	3700	-	-	-	-	-

Image sourced from: [https://www.rayon-de-serre.fr/372-full default/gossypium-herbaceum.jpg](https://www.rayon-de-serre.fr/372-full/default/gossypium-herbaceum.jpg)



Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	<i>Beta vulgaris subsp. cicla</i>	Silverbeet	leaf (boiled)	92.7	84	1.8	314	18	2.3	0.3	42
AMARANTHACEAE	<i>Celosia trigyna</i>	Silver spinach	leaf	89.0	139	2.7	1925	10	5.0	-	56
ANACARDIACEAE	<i>Mangifera indica</i>	Mango	fruit	83.0	253	0.5	1200	30	0.5	0.04	35
ANNONACEAE	<i>Annona squamosa</i>	Sweetsop	fruit	76.4	441	2.09	1	40	0.6	0.1	30
APIACEAE	<i>Daucus carota subsp. sativus</i>	Carrot	root (raw)	89.9	180	1.0	2813	6	0.6	0.4	51
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	10
ARECACEAE	<i>Hyphaene petersiana</i>	Doum palm	fruit	6.6	1265	4.9	-	19.7	2.0	0.6	34
ASTERACEAE	<i>Lactuca sativa</i>	Lettuce	leaf	94.0	84	1.2	180	15	0.7	0.2	61
ASTERACEAE	<i>Helianthus annuus</i>	Sunflower	seed	5.4	2385	22.8	5	1.4	6.8	5.1	69
BRASSICACEAE	<i>Brassica oleraceae var acephala</i>	Kale	leaf (boiled)	91.7	109	2.1	313	18	0.5	0.4	52
BRASSICACEAE	<i>Capsella bursa-pastoris</i>	Shepherd's purse	leaf	88.2	138	4.2	3000	91	4.8	-	55
CARICACEAE	<i>Carica papaya</i>	Papaya	fruit	88.0	163	0.5	290	54	0.4	0.18	39
CHRYSOBALANACEAE	<i>Parinari curatellifolia</i>	Mobola plum	fruit	64.6	533	1.6	-	70.9	0.9	0.4	37
CLEOMACEAE	<i>Cleome gynandra</i>	Spider flower	leaf	86.6	142	4.8	-	26	6.0	-	57
CUCURBITACEAE	<i>Cucurbita maxima</i>	Pumpkin	leaf	88.0	160	4.9	260	28	2.5	0.9	44
CUCURBITACEAE	<i>Lagenaria siceraria</i>	Bottle gourd	leaf	83.0	180	4.4	66	-	7.4	-	45
CUCURBITACEAE	<i>Cucumis melo</i>	Melon	fruit	93.0	109	0.5	300	30	0.4	0.2	32
CUCURBITACEAE	<i>Citrullus lanatus</i>	Watermelon	seed	10.0	2107	40	-	-	5.6	-	66
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	leaf (raw)	84.7	252	5.0	44	170	7.1	0.3	46
EBENACEAE	<i>Diospyros mespiliformis</i>	Monkey guava	fruit	64.5	523	1.1	-	-	2.0	-	33
EUPHORBIACEAE	<i>Manihot esculenta</i>	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	16
FABACEAE	<i>Sphenostylis stenocarpa</i>	African yam bean	seed	9.0	1470	19.2	-	-	0	-	13
FABACEAE	<i>Dolichos trilobus</i>	Japanese arrowroot	root	72.4	1794	7.1	-	-	0.2	4.4	15
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed	10.0	1449	19.5	55	-	15.0	-	22
FABACEAE	<i>Glycine max</i>	Soybean	seed	9.0	1701	33.7	55	-	6.1	-	23
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	seed (dry)	10.0	1428	22.8	-	-	9.0	-	24
FABACEAE	<i>Piliostigma thonnigii</i>	Camel's foot leaf tree	seed	6.74	1688	10.09	-	17.80	78.1	-	25
FABACEAE	<i>Tylosema fassoglensis</i>	Marama bean	seed	7.5	452	43.5	-	-	-	-	26
FABACEAE	<i>Vigna radiata</i>	Green gram bean	seed	11.0	1432	22.9	55	4	7.1	-	27
FABACEAE	<i>Vigna unguiculata</i>	Cowpea	seed	11.95	1406	23.52	-	1.5	8.27	3.37	28
FABACEAE	<i>Canavalia gladiata</i>	Sword bean	seed	15.0	1335	27.1	-	-	-	-	29
FABACEAE	<i>Senna obtusifolia</i>	Java bean	leaf	79.7	251	5.6	-	113	5.9	-	43
FABACEAE	<i>Senna occidentalis</i>	Coffee senna	leaf	84.9	205	5.0	-	17.9	12.7	-	53

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
FABACEAE	<i>Crotalaria brevidens</i>	Slenderleaf rattlepod	leaf	74.5	-	8.8	-	-	38	-	60
FABACEAE	<i>Arachis hypogaea</i>	Peanut	seed (dry)	4.5	2364	24.3	0	-	2.0	3.0	63
MALVACEAE	<i>Azanza garckeana</i>	Chewing gum tree	fruit	14.8	1042	5.0	-	-	5.0	0.4	31
MALVACEAE	<i>Triumfetta rhomboidea</i>	Burweed	leaf	78.4	284	4.2	-	-	29.2	-	54
MALVACEAE	<i>Corchorus olitorius</i>	Bush okra	leaf (raw)	80.4	244	4.5	6410	80	7.2	-	58
MALVACEAE	<i>Hibiscus cannabinus</i>	Vegetable kenaf	leaf	79.0	280	5.5	34	-	12.1	-	59
MALVACEAE	<i>Sida cordifolia</i>	Goat's horns	leaf	6.6	1296	24.2	-	-	79.8	-	62
MALVACEAE	<i>Gossypium herbaceum</i>	Cotton	seed (dry)	8.0	1827	20.2	-	-	-	-	71
MORINGACEAE	<i>Moringa oleifera</i>	Horseradish tree	leaf (boiled)	87	189	4.7	883	31.0	2.0	0.2	48
MYRTACEAE	<i>Syzygium cordatum</i>	Water berry	fruit	85.8	204	0.6	-	11.6	1.4	0.2	38
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	41
POACEAE	<i>Eleusine coracana</i>	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	12
POACEAE	<i>Triticum aestivum</i>	Wheat	seed	12.5	1387	11.7	-	-	3.3	-	14
POACEAE	<i>Zea mays</i>	Maize	seed (mature)	10.4	1528	10.0	100	4	4.9	-	18
POACEAE	<i>Oryza sativa</i>	Rice	seed (brown)	13.5	1480	7.6	-	-	2.8	-	19
POACEAE	<i>Sorghum bicolor</i>	Sorghum	seed	-	1459	11.1	-	-	-	-	20
POACEAE	<i>Panicum miliaceum</i>	Common millet	seed	9.6	1548	11.0	-	-	-	-	21
POACEAE	<i>Dactyloctenium aegyptium</i>	Comb fringe grass	seed	11.4	1438	15.7	-	-	-	-	67
PROTEACEAE	<i>Macadamia integrifolia</i>	Macadamia	nut	1.4	3004	7.9	0	1.2	3.7	1.3	70
SALICACEAE	<i>Flacourtia indica</i>	Governor's plum	fruit	69.5	452	0.5	15	14	1.2	-	68
SOLANACEAE	<i>Solanum melogena</i>	Eggplant	fruit	91.8	117	0.83	6	1.3	0.4	0.2	50
TALINACEAE	<i>Talinum portulacifolium</i>		leaf	90	-	1.9	-	175.6	1.4	0.5	49
ZYGOPHYLLACEAE	<i>Balanites aegyptiaca</i>	Desert date	nut (dry)	5.0	2286	23.0	-	-	7.0	-	64



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

www.foodplantsolutions.org

