Potentially Important Food Plants of Rwanda




FOOD PLANT SOLUTIONS
ROTARIAN ACTION GROUP

Solutions to Malnutrition and Food Security

The Mustard Seed Institute

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

www.foodplantsolutions.org

The Mustard Seed Institute

Progress Through Knowledge

The Vision of the Mustard Seed Institute is to be a community-based social enterprise providing practical and sustainable solutions for extreme poverty eradication and peace building through research and innovation, training and skills transfer, mediation and dialogues. In the rural community of Rwankuba, Eastern Province, Rwanda.

We are excited to be working in partnership with Food Plant Solutions to improve the health and well being of the local community through education and advocacy on agricultural innovations. We will be specifically focused on gaining knowledge about which crops to grow in order to lower malnutrition levels amongst the local children. It is currently estimated that 40% of children in rural areas of Rwanda are malnourished; this detrimentally impacts their physical and mental development in the long-term.

www.mustardseedinstitute.org

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Dedication

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

Food Plant Solutions Field Guide – Rwanda, Version 3, October 2021

Preface

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

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

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

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

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

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

Contents

Introduction

This book is designed as a simple introduction to the more common food plants of Rwanda. It is hoped people will take greater pride and interest in these plants and become confident and informed about how to grow and use them. Many of the local food plants that occur in every country are very good quality foods. Unfortunately, people often reject traditional food plants and grow more of the introduced vegetables, such as ballhead cabbage. These do not have the same food value as many traditional, tropical, dark green, leafy vegetables.

Growing food

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

A country with very special plants

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

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

Getting to know plants

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

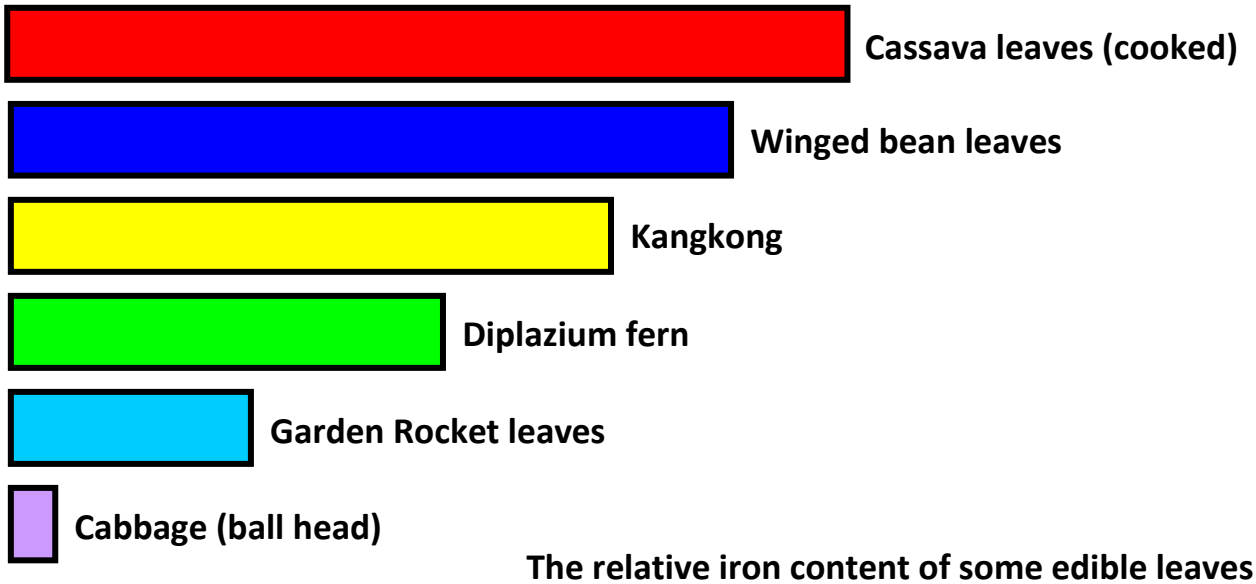
Naming of plants

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

Local food plants are often very good

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

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



The relative iron content of some edible leaves

A healthy balanced diet

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

Learning to cook well

Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Many plants in the tropics develop cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) only become available when food is cooked in oil.

Learning to grow "wild" food plants

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

Saving better types of plants

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

Growing from cuttings and suckers

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

Saving seed

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

Growing a garden of mixed plants

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

Different types of plants for food security

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

Looking after the soil

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

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

Building up the soil

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

Poor soils where crops won't grow

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

Soil nutrients

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

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

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

Making compost

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

Pests

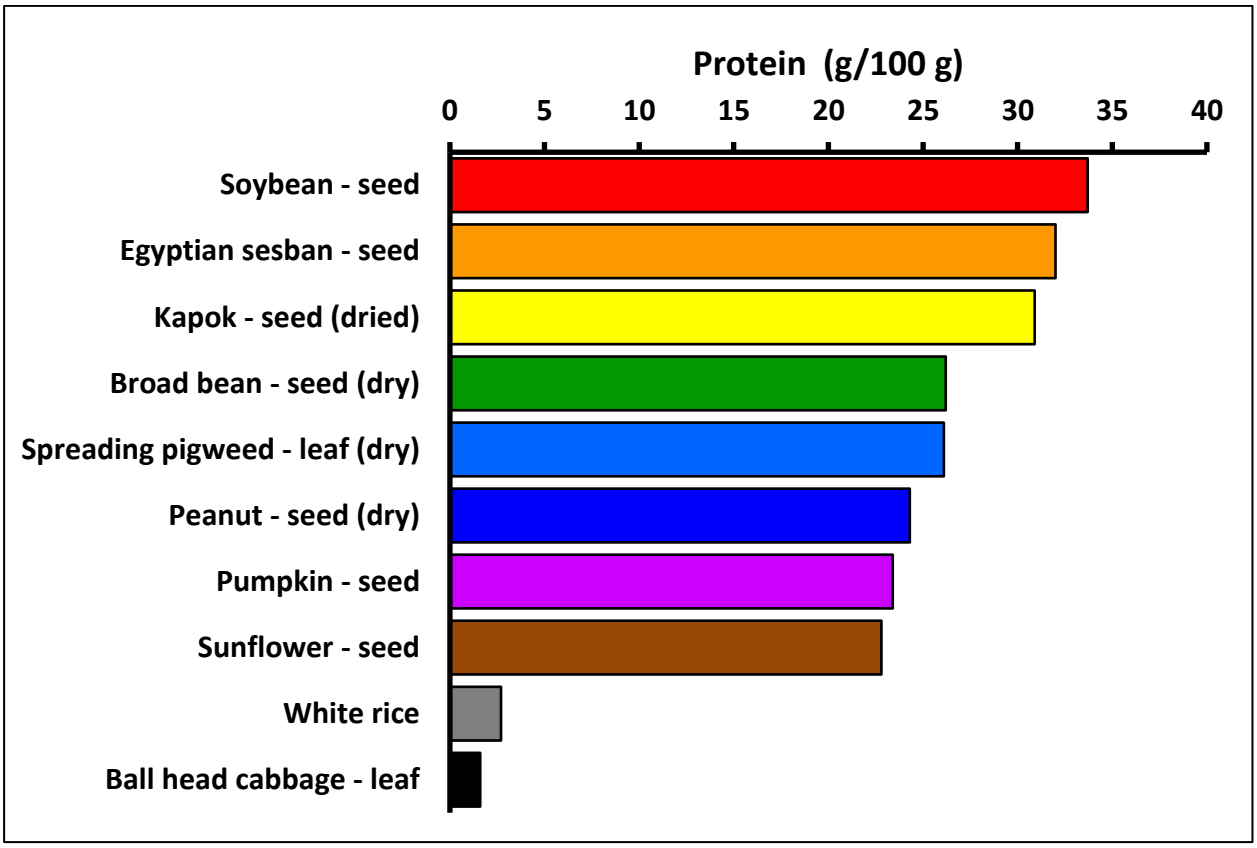
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance.

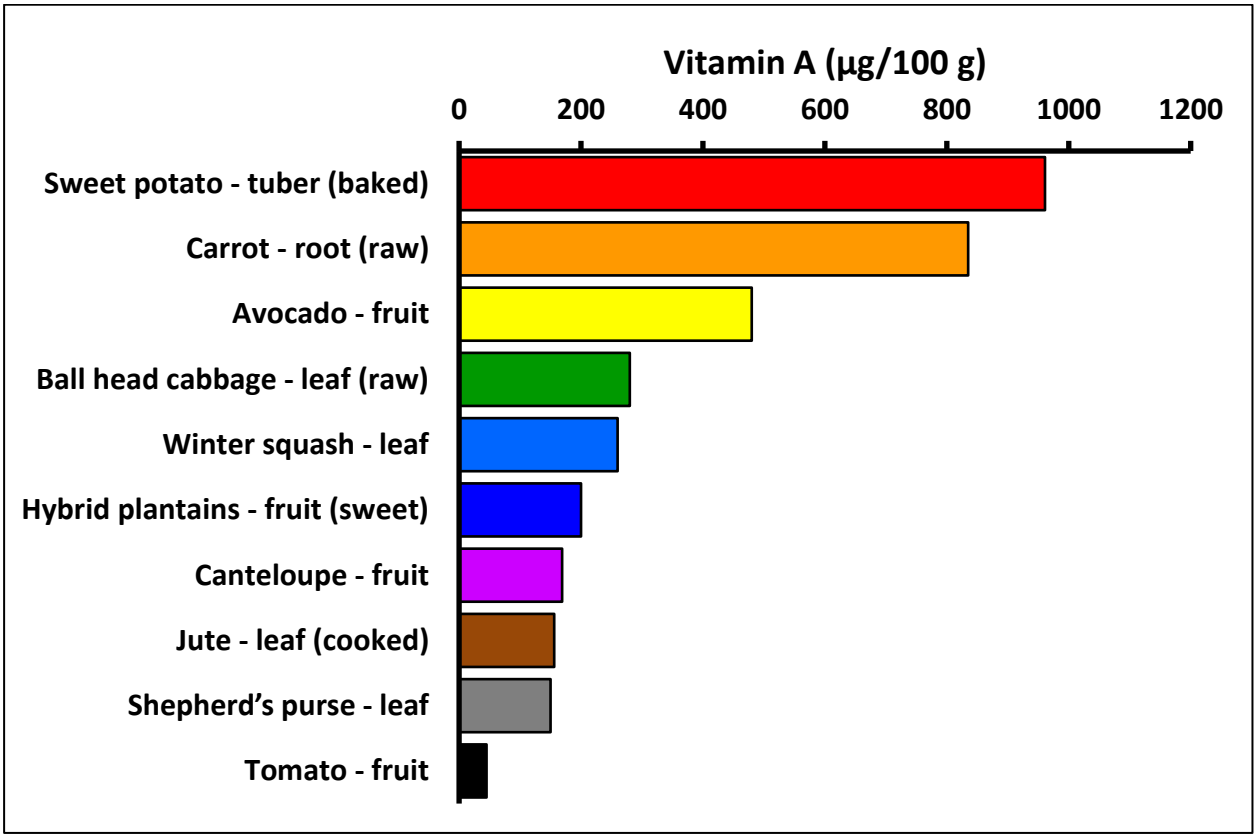
What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause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

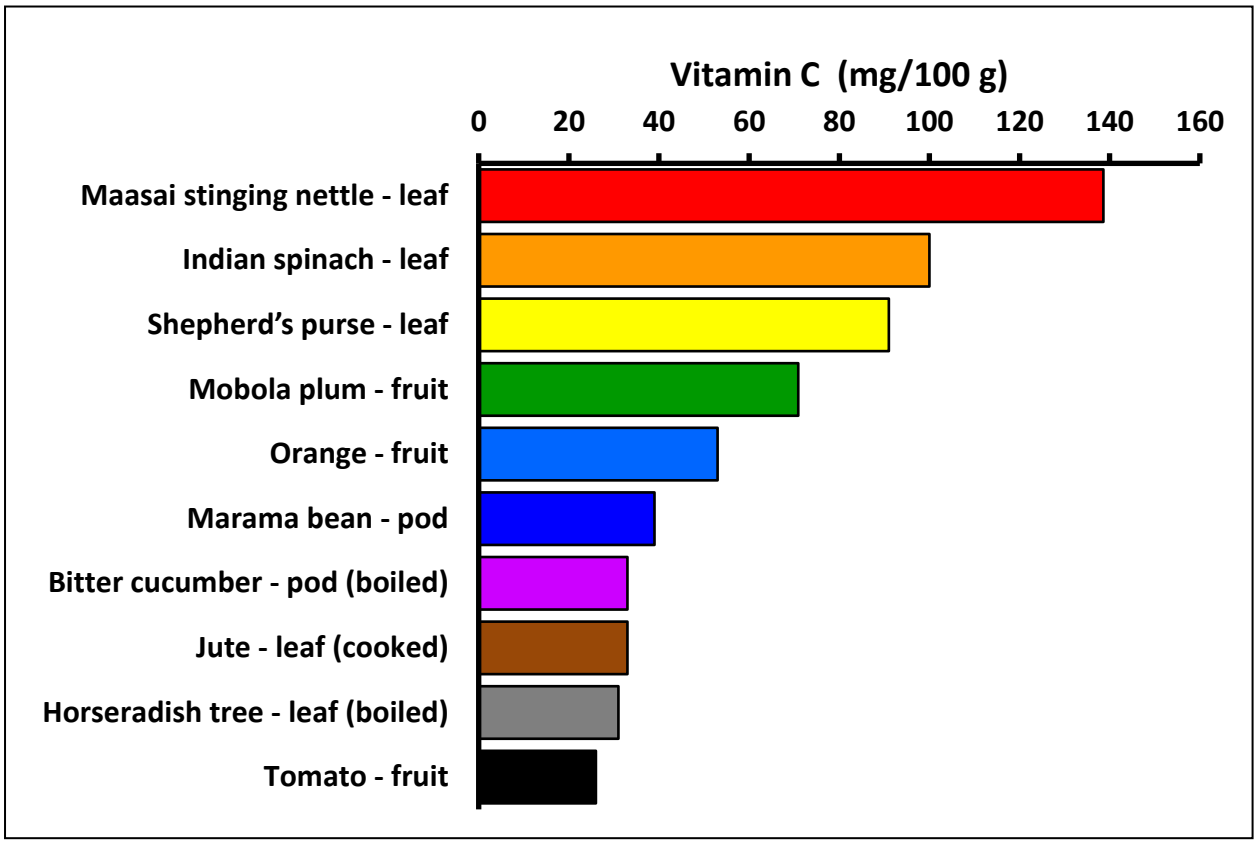
Diseases

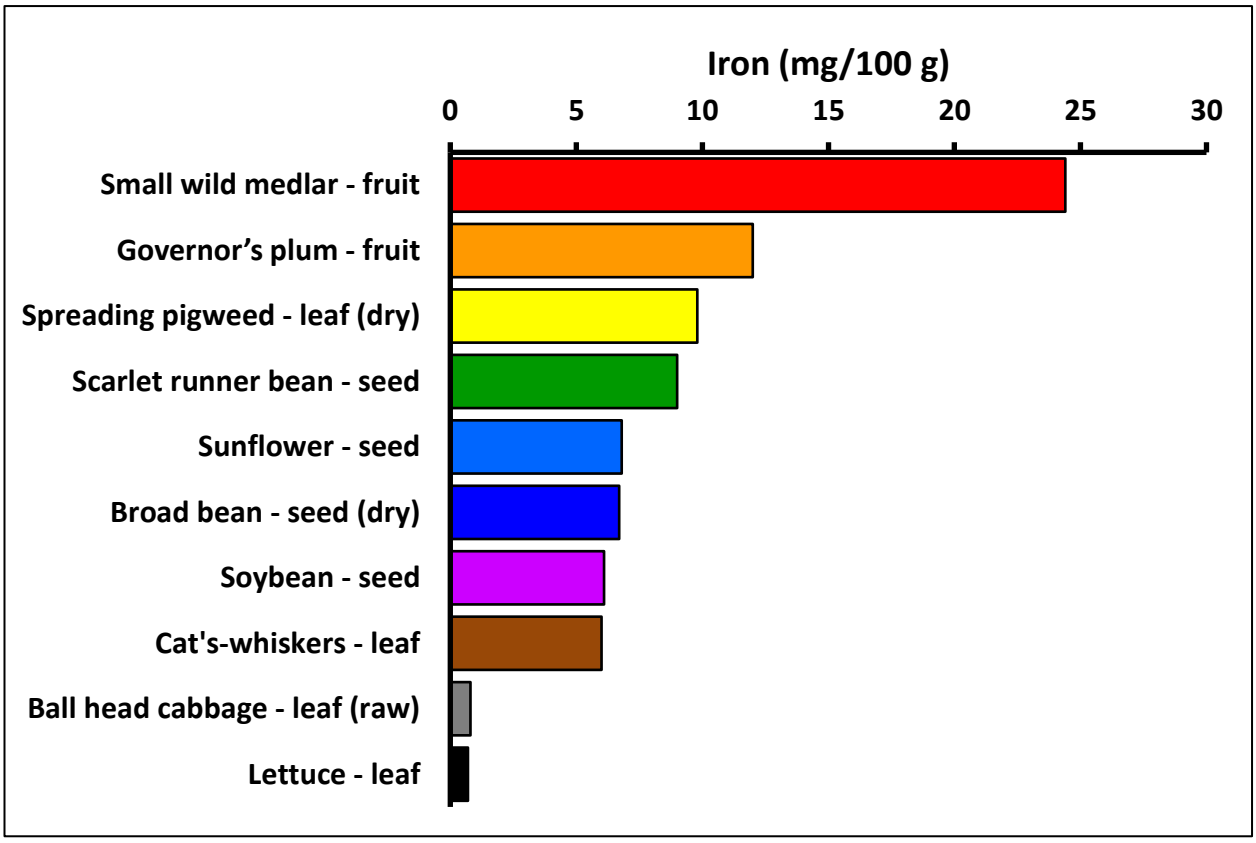
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct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

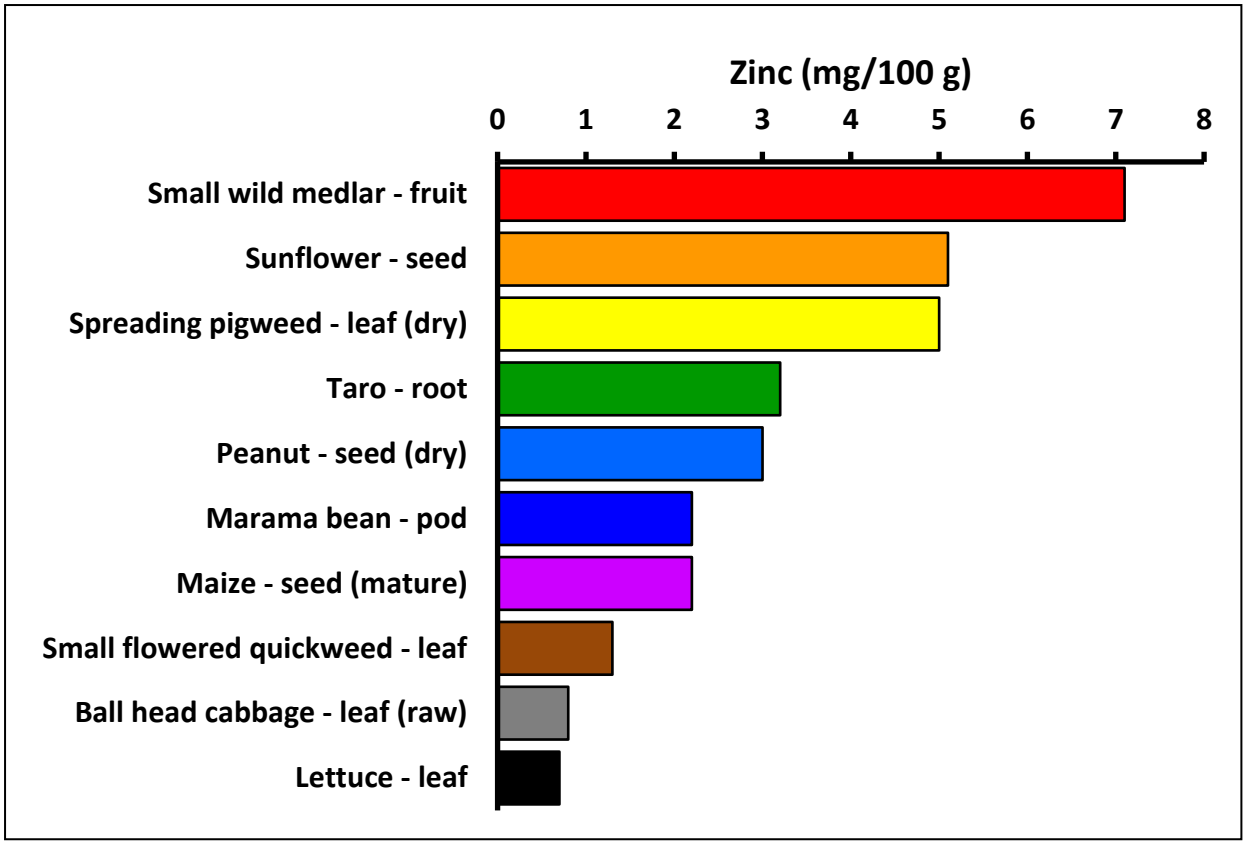
Food value charts for a selection of plants from Rwanda






Vitamin C (mg/100 g)
0
20
40
60
80
100
120
140
160
Maasai stinging nettle - leaf
Indian spinach - leaf
Shepherd's purse - leaf
Mobola plum - fruit
Orange - fruit
Marama bean - pod
Bitter cucumber - pod (boiled)
Jute - leaf (cooked)
Horseradish tree - leaf (boiled)
Tomato - fruit


Iron (mg/100 g)
0
5
10
15
20
25
30
Small wild medlar - fruit
Governor's plum - fruit
Spreading pigweed - leaf (dry)
Scarlet runner bean - seed
Sunflower - seed
Broad bean - seed (dry)
Soybean - seed
Cat's-whiskers - leaf
Ball head cabbage - leaf (raw)
Lettuce - leaf



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

Starchy staples

English: Sweet potato
Local:

Scientific name: *Ipomoea batatas*
Plant family: CONVOLVULACEAE

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

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

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

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

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

Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar, but once ground coverage has occurred, weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason, sweet potatoes are often grown on

mounded beds. In well drained or high organic matter soils, digging or mounding is not as essential. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage, plants need to be hilled or have the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: 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 their is normally a ring of small plants called suckers. Many different varieties occur. If left to maturity, a lily type flower is produced in the centre of the plant. It has a spathe 15 - 30 cm long which is rolled inwards. The flowers are yellow and fused along the stalk. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and *Colocasia esculenta* var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.

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

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

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

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

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

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

temperatures, and higher hours of sunlight, enhance production and determine seasonality of production.

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Finger millet
Local:

Scientific name: *Eleusine coracana*
Plant family: POACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: 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 - 1,000 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 1,800 m altitude in the equatorial tropics. It is grown in most areas of Asia and has been grown from sea level to 3,300 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	proVit C mg	Iron mg	Zinc mg
seed (mature)	10.4	1528	10.0	100	4	4.9	2.2

Starchy staples

English: Esente
Local:

Scientific name: *Ensete ventricosum*
Plant family: MUSACEAE

Description: A banana like plant that grows to 6 - 12 m tall. The lower part of the leafy false stem is swollen. Many different varieties exist. The leaves are bright green with an obvious red midrib. The leaves can be 5 m long and 0.9 m wide. The flower is a very large hanging spike 2 - 3 m long. The flowers are cream coloured. There is a single petal in a large red bract. The fruit resemble small bananas. They are 6 - 8 cm long and 3 cm thick. They have a yellow skin. The seeds are pea like and fill the fruit. The seeds are black and about 6 mm across.

Distribution: It grows in tropical Africa. It does best with a temperature of 18 - 28°C and a relative humidity of 60 - 80 %. In Ethiopia it grows between 1,500 and 3,000 m altitude but does best between 1,700 and 2,450 m altitude. In Malawi it is usually on the edges of forests or in sheltered gullies. It is damaged by frost or drought. It can grow in arid places. It suits hardiness zones 10 - 12.

Use: The fermented pulp (kocho) of the stem is eaten. It is used as a flour to make bread. The leaf bases and fresh corms are cut up and boiled as a vegetable. The milky white juice extract is allowed to ferment in pits lined with ensete leaves then cooked. The young flowers are eaten as a relish. The fruit are eaten only in times of food scarcity. It is the endosperm of the seeds that is eaten.

Cultivation: It can be grown by seed. It is normally grown by bud suckers or shoots. To get bud suckers, a 4 - 6 year old plant is cut off at 20 - 30 cm height. The central bud (which would normally grow one shoot) is removed and the hole filled with soil. The corm is then replanted into a manured pit about 5 days later. After 4 - 8 weeks this produces 40 - 200 buds. These can be separated and grown in a nursery for one year before being transplanted into the field. These plants are normally then transplanted to wider spacing after 2 years, and again after 4 years. Plants reach harvest maturity in 6 - 7 years. Suckers can be used for transplanting and reach maturity in 2 years. The final spacing for bud suckers is 3 m x 1.5 m. Large amounts of organic manure are often applied. Plants are harvested before the onset of flowering.

Production: An average family cultivates 200 - 400 plants per year and they eat about 10 - 20 plants per person per year. In Ethiopia, using 1,600 plants per hectare at a spacing of 2.5 m gave about 5,000 kg per hectare of refined product.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	12.4	1472	13.3	-	-	-	-
pith	56.3	715	1.2	-	-	5.3	-

Starchy staples

English: Cassava
Local:

Scientific name: *Manihot esculenta*
Plant family: EUPHORBIACEAE

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

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

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

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

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

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

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

moisture is adequate, cassava stalks can be planted at any orientation from horizontal to vertical, but in very sandy soils horizontal planting is best and in heavy clay soils vertical planting is best.

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Sorghum
Local:

Scientific name: *Sorghum bicolor*
Plant family: POACEAE

Description: Sorghum is a millet grass. A mature sorghum plant resembles maize in its stature. Plants vary in height from 45 cm to 4 m. It is an annual grass with erect solid stems. The stems can be 3 cm across at the base. Prop roots occur at the base of the plant. There are numerous sorghum varieties. Some have one main stem while others produce multiple tillers. More tillers are produced when plants are widely spaced. The nodes on the stem are slightly thickened. Short types have up to 7 leaves while tall late varieties may have up to 24 leaves. The leaf blade can be 30 - 135 cm long. Leaves are bluish green and waxy. They have a prominent midrib. The large flower panicle can be 20 - 40 cm long. The flower occurs at the top of the plant. It can stick upright or bend over. The flower can be open or compact. Over 1,000 cultivated varieties occur in China.

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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Pigeon pea
Local:

Scientific name: *Cajanus cajan*
Plant family: FABACEAE

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

Distribution: A tropical plant that requires a tropical or subtropical climate. Plants grow from sea level up to about 1,800 m in the tropics. They can tolerate drought and are suited to a drier climate. They can grow in places with less than 600 mm rainfall per year. They do less well in the wet tropics. They suffer in waterlogged soils and are damaged by frost. It can also tolerate heat. It will grow on poor soils cannot grow on salty soils. It can grow in arid places and suits hardiness zones 10 - 12.

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: 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 2,000 m altitude. Many varieties will not flower in the tropics (short days). It needs fertile soil. The best soil acidity is pH 5.5 - 7.0. It is damaged by frost.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit 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

English: Lablab bean
Local:

Scientific name: *Lablab purpureus*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Scarlet runner bean
Local:

Scientific name: *Phaseolus coccineus*
Plant family: FABACEAE

Description: A climbing bean. It is a robust plant and keeps growing from year to year by re-growing from the fattened root. The stems are often hairy. It grows 1.8 - 2.4 m high. It can spread 1.8 - 2.4 m wide. It twines around a trellis. The leaves are compound and have three leaflets. The flowers are bright red. They are in clusters 2.5 cm long. The pods are long (30 cm) and with a wavy edge. The seeds are large and can be several different colours. It sometimes has a root tuber.

Distribution: A tropical plant. It grows naturally in the mountain regions from Mexico to Panama. It is grown in the highlands in the tropics. On the tropical coast seedlings die and pods are not formed. It is damaged by frost. It suits hardiness zones 8 - 10.

Use: The very young pods can be eaten. They are boiled, steamed, baked etc. The seeds are edible. They are dried then soaked. The flowers have a bean like flavour and are used in salads. Young leaves can be used as a potherb. The tubers can be eaten after they are cooked and the cooking water thrown away.

Cultivation: It is grown from seeds. Seed are planted 2.5 cm deep. Plants are spaced 20 cm apart. It needs sticks to climb up. It can be allowed to re-grow from the tubers or the tubers re-planted.

Production: It grows quickly.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	12.0	1419	20.3	-	7	9.0	-

Legumes

English: Marama bean
Local:

Scientific name: *Tylosema fassoglensis*
Plant family: FABACEAE

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

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

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

Cultivation: Plants can be grown from seeds.

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

Food Value: Per 100 g edible portion

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

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

Legumes

English: Mung bean
Local:

Scientific name: *Vigna radiata*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Broad bean
Local:

Scientific name: *Vicia faba*
Plant family: FABACEAE

Description: An upright plant up to 1 m tall. Plants vary in height from 30 - 180 cm. It has a well-developed taproot. It has square stems which are hollow and have wings at the angles. There can be 1 - 7 branches from near the base of the plant. The leaves have leaflets along the leaf stalk and end in a short point. There are 2 - 6 leaflets. These are 5 - 10 cm long. Flowers occur in the axils of leaves and there are 1 - 6 flowers on a stalk. The flowers are white with black spots. Pods are large and fat and contain several large beans inside. The pods are 5 - 10 cm long in field varieties and can be 30 cm long in garden varieties. They are fleshy with a white velvety lining. They become tough and hard at maturity. The seeds can vary a lot in shape and size. They can be flat or rounded and white, green, brown, purple or black. They are 1 - 2.6 cm long. The hilum along the seeds is prominent.

Distribution: A temperate plant only suitable for the highlands over about 1,200 m. in the tropics. It mainly occurs from 1,900 - 2,700 m altitude in equatorial zones. It is frost tolerant and is resistant to drought. It can grow with temperatures down to 4°C. In the lowland hot tropics it often flowers but does not set seed. It requires fertile soils. It does best with adequate lime needing a soil pH of 6.4 - 7.2. It can tolerate some salinity.

Use: It is mostly the young beans that are eaten. The ripe beans and leaves are also edible. The dried beans can be boiled, ground into flour and added to soups or used for making tofu. Sprouted seeds are cooked and eaten. The tender pods are eaten as a vegetable. **Caution:** Some people, mainly of Mediterranean origin can get a disease called Favism from these beans. The beans should be well cooked. They can react with some people using some antidepressant drugs.

Cultivation: The crop is grown from seed which are sown at 15 - 40 cm spacing. If the seed pod formation is poor, it can be improved by pinching out the tops of the plants when in flower. Hand pollination also helps. Plants are self-pollinated but also cross pollinated by insects.

Production: Time to maturity is 12 - 16 weeks. Yields in the cool tropics vary from 1 - 2 tons per hectare.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1448	26.2	130	16	6.7	-
seed (fresh, raw)	76.0	315	7.1	35	140	1.9	0.6
seed (fresh, boiled)	83.7	259	4.8	27	20	1.5	0.5

Leafy greens

English: 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 1,490 - 1,920 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	proVit 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

English: Indian spinach
Local:

Scientific name: *Basella alba*
Plant family: BASELLACEAE

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

Distribution: A tropical plant. It occurs mostly in the tropical lowlands and is best below 500 m but will grow up to about 1,600 m. in the equatorial tropics. It will grow quite well in the temperature range 15 - 35°C. It does not like water-logging but can survive 4 - 12 weeks drought once well established. It requires adequate water during the growing season. The best pH is 5.5 - 7.0. It cannot tolerate salty conditions. Flowering does not occur when day lengths are over 13 hours.

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

English: 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 1,960 m above sea level. It needs an annual rainfall of up to 2,500 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	proVit 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

English: Small flowered quickweed
Local:

Scientific name: *Galinsoga parviflora*
Plant family: ASTERACEAE

Description: An annual herb. It grows to 75 cm high and has a spread of 50 cm. The stem is erect and much branched. The stem is rather weak. The leaves are oval and opposite. The leaves have leaf stalks and the leaves are toothed around the edge. The flowers are small and daisy-like. They occur in small clusters and have white rays and a yellow disk. The flowers are produced in the axils of the upper leaves.

Distribution: A tropical and subtropical plant. It will grow in most soils and under most conditions. It can tolerate drought and frost. It can grow in arid places but is best with medium to high rainfall. Seeds need a temperature of 10 - 35°C and light to germinate. It grows in many African and Asian countries. In Zimbabwe it grows from 1,370 - 1,660 m above sea level. In Papua New Guinea it grows from 900 - 2,500 m altitude.

Use: The leaves and the young stems can be eaten raw or cooked. They are used as a potherb or added to soups and stews. It is also dried and ground into a green powder and added to soups and stews especially with chicken. The fresh juice is drunk with other vegetable juices.

Cultivation: Plants are grown from seed. Often they are self sown. The seeds germinate quickly and young plants grow rapidly.

Production: The leaves should be picked before plants start to form seeds.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	88.4	653	3.3	-	12.0	5.3	1.3

Image sourced from:
http://www.ctahr.hawaii.edu/defrankj/weed_id_website/images/color%20slides/broadleaf%20weeds/pages/29%20galinsoga%20parviflora%20whole%20plant.htm

Leafy greens

English: Maasai stinging nettle
Local:

Scientific name: *Urtica massaica*
Plant family: URTICACEAE

Description: A stinging nettle like *Urtica simensis* but it is more robust and has double teeth around the edges of the leaves. It is a herb that keeps growing from year to year. It grows 2 m high. The stinging hairs are 2 mm long. The leaf stalks are 4.5 cm long. The leaf blade s are 7 - 13 cm long by 6 - 11 cm wide. The flowers are of one sex. The fruit is oval, flattened and dry. It is 1 mm long.

Distribution: A tropical plant. In Kenya it grows in moist bushland from 1,500 - 3,250 m altitude. It grows in loose soils with plenty of organic matter.

Use: The young leaves are wilted, boiled and eaten as a vegetable.

Cultivation: Plants can be grown from seed or sections of rhizomes. Old plants can be cut back to stimulate new leaves.

Production: Leaves are harvested with gloves to protect the hands. They are collected during the rainy season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	80.5	-	5.8	-	138.6	-	-

Leafy greens

English: 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	proVit C mg	Iron mg	Zinc mg
leaf	86.6	142	4.8	-	26	6.0	-

Leafy greens

English: Spreading pigweed
Local:

Scientific name: *Amaranthus graecizans*
Plant family: AMARANTHACEAE

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

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

Use: The leaves and seeds are eaten cooked. The seeds can be ground and made into flat bread. **Caution:** This plant can accumulate poisonous nitrates if grown with high nitrogen inorganic fertilisers. The plant will cause diarrhoea if eaten in large amounts.

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (dry)	6.3	903	26.1	-	-	9.8	5.0

Leafy greens

English: 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 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits hardiness zones 9 - 12.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	7	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Fruit

English: Wild custard apple
Local:

Scientific name: *Annona senegalensis*
Plant family: ANNONACEAE

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

Distribution: A tropical plant. It grows in the lowlands. It is found throughout Africa. It grows in tropical and warm regions. It grows in semi-arid to sub humid regions. It grows in the Sahel. The young trees need light shade. They need well drained soil. It is a tree of the savannah regions. It grows in the lowlands. It is best with a temperature range of 17 - 30°C and a rainfall of 700 - 2,500 mm per year. It can grow in arid places. It grows best with a pH between 5.5 - 7. In Malawi it grows below 1,200 m altitude. In Kenya it grows from sea level to 1,750 m above sea level.

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

Cultivation: It is grown from fresh seeds. It is probably best to grow seedlings in a nursery and then to transplant them. Seed grow easily but not all at the same time. There are 2,500 - 3,000 seeds per kg. Seed can only be easily stored for 6 months. Plants can be cut back and allowed to re-grow. Plants can be grown by root suckers.

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

Food Value: Per 100 g edible portion

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

Image accessed from: www.prota4u.info

Fruit

English: 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 per10 sq m is average.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	7.0	2319	15.8	-	-	-	-
leaf	85.0	172	4.2	72	-	-	-
fruit	93.0	109	0.5	169	30	0.4	0.2

Fruit

English: Governor's plum
Local:

Scientific name: *Flacourtia indica*
Plant family: FLACOURTITACEAE

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

Distribution: A tropical plant that grows in the lowlands. They thrive in dry, shrubby areas at low altitudes. Trees grow in coastal areas and up to 700 m or higher. In Africa it grows from sea level to 2,400 m above sea level. It grows in sub-tropical, broadleaved, evergreen forest. It can grow in arid places. It also grows on limestone.

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: White mulberry
Local:

Scientific name: *Morus alba*
Plant family: MORACEAE

Description: A small tree, usually up to 9 m high, but it can grow to 20 m tall. It often is low and spreading. It has dark green toothed leaves that vary considerably in shape, even on the one tree. They can be oval, heart shaped or 3 lobed and 5 - 15 cm long. The tip is pointed and the leaf is on a stalk 5 cm long. The upper surface is smooth but there can be some hairs on the veins underneath. Male and female flowers occur separately either on the same or separate plants. The flowers are greenish and in spikes which droop down. The fruit is a dark red or black berry but pale kinds also occur. The fruit is about 2 cm long.

Distribution: It is native to northern China. It is a warm temperate plant. The white mulberry is normally used for silk worms and the black mulberry suits more highland regions. The normal range is 700 - 2,200 m altitude in the tropics. It grows to 3,300 m altitude in India. It can tolerate heat and drought once established. It is winter hardy and can tolerate salt. It can grow in arid places and grows in Miombo woodland in Africa. It suits hardiness zones 4 - 10.

Use: The fruit is eaten raw or used in juice, stews and tarts. The fruit can be dried and stored, or processed for vinegar or wine. The leaves are edible and can be put in stews or used for tea. (Leaves are also used for silk worms.) The bark can be roasted and ground into a flour. The tree also yields an edible manna.

Cultivation: Plants can be grown from seed but they are slow to germinate and take a long time to bear. If seed are used, they should be soaked in cold water for 48 hours. It is better to grow trees from cuttings. Trees can also be grown by grafting. Because trees "bleed" it is best not to do too much pruning but they can be topped or trained.

Production: Cuttings produce fruit in 3 years while it takes 5 - 8 years for seedling trees. Fruit is produced seasonally. The fruit season is normally September to December in the southern hemisphere.

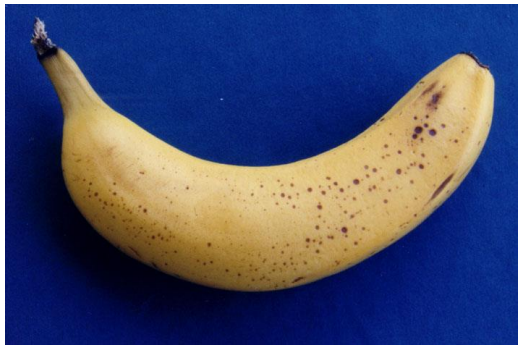
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	80.2	152	1.3		10	0.5	0.1

Fruit

English: Hybrid plantains
Local:

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



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

Distribution: A tropical and subtropical plant that grows from sea level up to about 2,000 m altitude in the tropics. They are rarely an important food above about 1,600 m. In Nepal they grow to about 1,800 m altitude. They do best in warm and humid tropical climates. Temperatures need to be above 15°C. The best temperature is 27°C. The maximum growing temperature is 38°C. Bananas grow best in full sun. For best growth, a rainfall of 200 - 220 mm per month is needed. A deep friable soil is best. They can tolerate a pH of 4.5 - 7.5. It suits hardiness zones 10 - 12.

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

Cultivation: They are planted from sword suckers. Diploids need re-planting annually but many triploids can be re-suckered from the base on the same site. Spacing depends on variety. A population of 1,000 – 3,000 plants per hectare is used, depending on variety. Suckers are usually planted 30 cm deep.

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

Food Value: Per 100 g edible portion

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

Fruit

English: Avocado
Local:

Scientific name: *Persea americana*
Plant family: LAURACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: Small wild medlar
Local:

Scientific name: *Vangueria infausta*
Plant family: RUBIACEAE

Description: A shrub or small deciduous tree. It grows 3 - 4.5 m tall. It can be 7 m tall. It has a smooth grey trunk. The bark becomes rough with age. The branches are short and stout. They are soft and covered with red hair when young. The leaves are light green and leathery. The leaves are 5 - 30 cm long and 3.8 - 18 cm wide. They are often egg-shaped. The tips can be round or blunt and they are densely hairy. The veins are like nets. The flowers are greenish-white or yellow. They are small. They grow in clusters. The fruit are round and 3.8 cm across. They have a shallow crown on top and are covered with a light brown leathery skin. They have 3 seeds inside. Each seed is in a separate compartment.

Distribution: A tropical plant. It grows in the lowlands and the highlands. It grows on stony and sandy ground. It grows in shady places. It can tolerate frost. It can tolerate drought. It grows up to 3,333 m above sea level. It can grow in arid places.

Use: The fruit are eaten raw. The fruit can be used to make a sauce or a pudding. When sugar is added, the fruit looks and tastes like apple sauce. The fruit can be dried and stored. It is later soaked and cooked. The seeds are cracked and the kernels extracted and eaten. They are roasted. They are also used as flavouring. The leaves are cooked as a green vegetable.

Cultivation: Plants can be grown from seeds. The fruit are allowed to dry and then soaked in water before planting. Using fertiliser, manure or early irrigation reduces the survival and early growth of young plants. They are adapted to low fertility and seasonal rainfall.

Production: It grows quickly. Fruit are edible January to April.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	64.4	498	1.4	-	11.5	24.4	7.1

Image accessed from: http://www.plantzafrica.com/planttuv/voteplant.php

Vegetables

English: Jute
Local:

Scientific name: *Corchorus olitorius*
Plant family: MALVACEAE

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

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

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

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

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

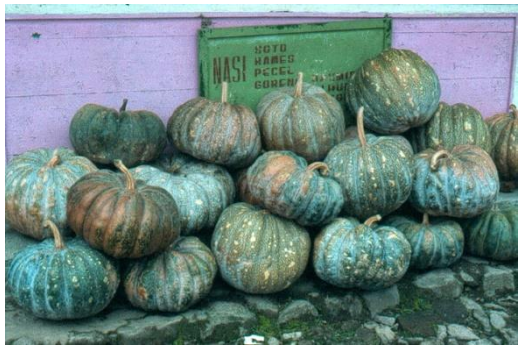
Food Value: Per 100 g edible portion

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

Vegetables

English: Pumpkin
Local:

Scientific name: *Cucurbita maxima*
Plant family: CUCURBITACEAE



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

Distribution: A subtropical plant that grows from sea level to 2,400 m altitude. They need a fertile soil. *C. moschata* is better suited to coastal areas. They are frost sensitive but better suited to cooler areas than *C. moschata.* It can grow in arid places. It suits hardiness zones 8 - 11.

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Marrow
Local:

Scientific name: *Cucurbita pepo*
Plant family: CUCURBITACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: 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 2,600 m altitude. Sometimes on the coast only leaves are produced. Carrots are frost resistant. In Nepal carrots are grown up to 1,700 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	proVit C mg	Iron mg	Zinc mg
root (raw)	89.9	180	1.0	835	6	0.6	0.4
root (boiled)	91.5	79	0.6	852	4	0.4	0.3
leaf	87.4	-	2.2	65	-	-	-

Vegetables

English: 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 2,700 m altitude in the tropics. It grows best in a warm humid climate. It is sensitive to frost and prefers full sunlight. It grows best with a night temperature of 17 - 23°C and day temperatures of 28 - 36°C.

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Bitter cucumber
Local:

Scientific name: *Momordica charantia*
Plant family: CUCURBITACEAE

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

Distribution: A tropical plant that grows from sea level up to about 500 m and will probably grow to 1,000 m altitude in tropical regions. They require a well-drained soil preferably rich in organic matter. Seeds do not germinate below 15°C. Plants grow best with temperatures of 18 - 35°C. A soil pH of 6.5 is best. It suits hardiness zones 9 - 12.

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: 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 2,200 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	proVit 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

Nuts, seeds, herbs and other foods

English: Sunflower
Local:

Scientific name: *Helianthus annuus*
Plant family: ASTERACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Egyptian sesban
Local:

Scientific name: *Sesbania sesban*
Plant family: FABACEAE

Description: A shrub that grows to 6 m tall. The bark is reddish-brown. The leaves are made up of 10 - 25 pairs of opposite oblong leaflets. They can be 15 mm long by 3 mm wide. The flowers are yellow and pea shaped. The standard petal is often speckled with finely veined dark maroon. They occur in many flowered sprays that are up to 15 cm long. The fruit are long slender pods, 30 cm long by 0.3 cm wide. They are often slightly curved.

Distribution: A tropical plant that grows in low lying areas, usually near water. It can survive water-logging and salty soils. It grows in areas 350 - 1,500 m above sea level. It grows in savannah woodland and can grow in arid places.

Use: The leaves and young flowers are eaten. They are often fried or pounded with rice and beans. The seeds are used for food in times of scarcity. (They have a protein inhibitor preventing the protein being well used.) The seeds are also fermented into a flavouring paste.

Cultivation: It can be grown as a hedge. It can be cut back and will re-grow.

Production: It is fast growing and only lives for short time.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.2	1446	32.0	-	-	-	-

Nuts, seeds, herbs and other foods

English: 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 - 1,500 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 2,100 m above sea level. It can grow in arid places. It grows in Miombo woodland in Africa.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit 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 accessed from: http://www.plantzafrica.com/plantnop/parinaricurat.htm

Nuts, seeds, herbs and other foods

English: Winter squash
Local:

Scientific name: *Cucurbita moschata*
Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is a creeping plant with long creeping stems and softly hairy but without prickly hairs. The stems are rounded or 5 angled and moderately hard. They can grow 15 - 20 m long. The leaves are large and shallowly lobed and divided like fingers on a hand. Occasionally the leaves have white blotches. They have rounded lobes. They are 20 cm by 30 cm. The leaf stalk is 12 - 30 cm long. The flowers have male and female flowers separately on the same plant. The fruit stalk is distinctly expanded where it joins the fruit. The fruit are not hard shelled and are dull in colour. The flesh is yellow and often has fibres through it. The seeds are plump and white to brown. They separate easily from the pulp of the fruit. The edge of the seed is scalloped and irregular in outline. There are a large number of cultivated varieties.

Distribution: A tropical plant that suits the wet tropics. It will thrive in humid as well as in very hot climates. A temperature of 18 - 30°C is best. It can tolerate some shade. It can grow in soils with a pH of 5.5 - 6.9. It suits hardiness zones 8 - 11.

Use: The fruit are eaten cooked. They are boiled, fried or baked. They can be mashed and used in pies, soups, bread and cakes. They can be dried, ground into flour and used for bread. The young leaves and flowers are edible. They can also be dried and stored. The seeds are eaten roasted. They can also be roasted in salt.

Cultivation: Plants are grown from seed. Seeds can be put in a nursery and transplanted.

Production: Fruit mature in 70 - 180 days after sowing depending on variety.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	5.5	2331	23.4	-	-	2.8	-
leaf	93.6	88	3.0	95	10	2.1	-
fruit	95.0	35	0.7	-	14	0.4	-

Nuts, seeds, herbs and other foods

English: Kapok

Scientific name: *Ceiba pentandra*
Plant family: BOMBACACEAE

Description: A very large tree with a straight trunk and height of 30 -4 0 m. Trees can be 60 m tall and the trunk 8 m around. It has large prickly buttresses near the base. The branches come out horizontally and there is a ring of them around the trunk. The leaves are compound. The leaflets spread out like fingers on a hand, with 5 - 8 leaflets. They are 5 - 18 cm long by 2 - 4.5 cm wide. The leaf stalk is 7 - 20 cm long. The leaves all fall off the tree (deciduous). Flowers are yellowish white, in clusters near the ends of branches. These hang downwards. A long seed capsule hangs from branches. It is 10 -3 0 cm long. It splits into 5 valves. The seeds are embedded in white or grey kapok.

Distribution: It is a tropical plant. Mostly in the lowlands and up to about 1000 m. It suits rainforest areas with a heavy rainfall. The soil needs to be well drained. The tree is easily damaged by strong winds. It needs a temperature of 25 - 30°C and not below 15°C. It does no tolerate shade and suits hardiness zones 11 - 12.

Use: The young pods can be eaten cooked. The young leaves can be eaten cooked. The seeds can be eaten either roasted fresh, or after sprouting. They are also added to soups. The young flowers can be eaten. They are blanched before eating. The resin from the trunk is put in water and drunk.

Cultivation: Seeds germinate quickly and seedlings can be transplanted. It can be easily grown from large cuttings.

Production: it is a fast growing tree. Pods are produced seasonally.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dried)	6.8	2065	30.9	-	-	-	-

Nuts, seeds, herbs and other foods

English: Peanut
Local:

Scientific name: *Arachis hypogea*
Plant family: FABACEAE

Description: Peanuts grow on spreading bushy plants up to about 40 cm high. The leaves are made up of 2 pairs of oppositely arranged leaflets. Flowers are produced in the axils of the leaves. Two main kinds of peanuts occur. The runner kind (Virginia peanut) has a vegetative or leafy branch between each fruiting branch and therefore produces a spreading bush. The bunch type (Spanish-Valencia peanuts) produces fruiting branches in a sequence one after the other along the branches. They grow as a more upright plant and grow more quickly. Pods are produced on long stalks which extend under the ground and they contain between 2 - 6 seeds. The stalk or peg from the flower grows down into the soil and then produces the pod and seed under the ground. The flowers need to be no more than 18 cm from the soil surface for the seed pod to develop underground.

Distribution: Peanuts grow in tropical and subtropical areas. They grow well from sea level up to about 1,650 metres in the equatorial tropics. They require temperatures of 24 - 33°C. Plants are killed by frost. They need a well-drained soil and cannot stand water-logging and often require raised garden beds. Peanuts need 300 - 500 mm of rain during the growing season. Dry weather is needed near harvest.

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

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

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

Food Value: Per 100 g edible portion

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

Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
Amaranthaceae	*Amaranthus graecizans*	Spreading pigweed	leaf (dry)	6.3	903	26.1	-	-	9.8	5.0	34
Amaranthaceae	*Celosia trigyna*	Silver spinach	leaf	89.0	139	2.7	94	10	5.0	-	30
Annonaceae	*Annona senegalensis*	Wild custard apple	fruit	77.2	329	1.7		18.1	0.7	0.3	36
Apiaceae	*Daucus carota* subsp. *sativus*	Carrot	root (raw)	89.9	180	1.0	835	6	0.6	0.4	46
Araceae	*Colocasia esculenta*	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	13
Asteraceae	*Galinsoga parviflora*	Small flowered quickweed	leaf	88.4	653	3.3	-	12.0	5.3	1.3	31
Asteraceae	*Helianthus annuus*	Sunflower	seed	5.4	2385	22.8	5	1.4	6.8	5.1	50
Basellaceae	*Basella alba*	Indian spinach	leaf	85.0	202	5.0	56	100	4.0	-	29
Bombacaceae	*Ceiba pentandra*	Kapok	seed (dried)	6.8	2065	30.9	-	-	-	-	54
Brassicaceae	*Capsella bursa-pastoris*	Shepherd's purse	leaf	88.2	138	4.2	150	91	4.8	-	28
Chrysobalanaceae	*Parinari curatellifolia*	Mobola plum	fruit	64.6	533	1.6	-	70.9	0.9	0.4	52
Cleomaceae	*Cleome gynandra*	Cat's-whiskers	leaf	86.6	142	4.8	-	26	6.0	-	33
Convolvulaceae	*Ipomoea batatas*	Sweet potato	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	11
Cucurbitaceae	*Cucumis melo*	Canteloupe	fruit	93.0	109	0.5	169	30	0.4	0.2	37
Cucurbitaceae	*Cucurbita maxima*	Winter squash	leaf	88.0	160	4.9	260	28	2.5	0.9	44
Cucurbitaceae	*Cucurbita moschata*	Pumpkin	seed	5.5	2331	23.4	-	-	2.8	-	53
Cucurbitaceae	*Cucurbita pepo*	Marrow	fruit	91.3	102	1.1	-	12	0.8	0.2	45
Cucurbitaceae	*Lagenaria siceraria*	Bottle gourd	fruit	93.0	88	0.5	25	10	2.4	-	47
Cucurbitaceae	*Momordica charantia*	Bitter cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	48
Euphorbiaceae	*Manihot esculenta*	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	18
Fabaceae	*Arachis hypogea*	Peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	55
Fabaceae	*Cajanus cajan*	Pigeon pea	seed (young, boiled)	71.8	464	6.0	2	28.1	1.6	0.8	21
Fabaceae	*Glycine max*	Soybean	seed	9.0	1701	33.7	55	-	6.1	-	22
Fabaceae	*Lablab purpureus*	Lablab bean	seed (young)	86.9	209	3.0	14	5.1	0.8	0.4	23
Fabaceae	*Phaseolus coccineus*	Scarlet runner bean	seed	12.0	1419	20.3	-	7	9.0	-	24
Fabaceae	*Sesbania sesban*	Egyptian sesban	seed	9.2	1446	32.0	-	-	-	-	51
Fabaceae	*Tylosema fassoglensis*	Marama bean	pod	72.5	446	6.4	-	39	0.5	2.2	25
Fabaceae	*Vigna radiata*	Mung bean	seed (sprouted)	90.4	126	3.0	2	13.2	0.9	0.4	26
Fabaceae	*Vicia faba*	Broad bean	seed (dry)	10.0	1448	26.2	130	16	6.7	-	27
Flacourtitaceae	*Flacourtia indica*	Governor's plum	fruit	69.5	452	0.5	15	14	12	-	38
Lauraceae	*Persea americana*	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	41
Malvaceae	*Corchorus olitorius*	Jute	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	43
Moraceae	*Morus alba*	White mulberry	fruit	80.2	152	1.3		10	0.5	0.1	39

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
Moringaceae	*Moringa oleifera*	Horseradish tree	leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2	35
Musaceae	*Ensete ventricosum*	Esente	pith	56.3	715	1.2	-	-	5.3	-	17
Musaceae	*Musa x paradisiaca*	Hybrid plantains	fruit (sweet)	70.7	337	1.1	200	10	0.4	0.2	40
Poaceae	*Eleusine coracana*	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	15
Poaceae	*Sorghum bicolo*	Sorghum	seed	-	1459	11.1	-	-	-	-	20
Poaceae	*Zea mays*	Maize	seed (mature)	10.4	1528	10.0	100	4	4.9	2.2	16
Rubiaceae	*Vangueria infausta*	Small wild medlar	fruit	64.4	498	1.4	-	11.5	24.4	7.1	42
Solanaceae	*Solanum melongena*	Eggplant	fruit	91.8	117	0.8	6	1.3	0.4	0.2	49
Urticaceae	*Urtica massaica*	Maasai stinging nettle	leaf	80.5	-	5.8	-	138.6	-	-	32

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