Potentially Important Food Plants of Kenya




Africa Youth for Peace and Development

FOOD PLANT SOLUTIONS
ROTARIAN ACTION GROUP

Solutions to Malnutrition and Food Security

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

www.foodplantsolutions.org

Africa Youth for
Peace and Development

AYPAD is a youth serving, empowerment, and advocacy movement with a mission and vision of ensuring peace and development among youth around Africa through enabling empowerment activities. We welcome this noble opportunity to partner with Food Plant Solution a credible institution working to aid grass roots organizations like ours.

This Field Guide will be a powerful tool to improve the nutritional values on the diets of many people through increasing the variety with less known foods. Matching our values, we believe this partnership will create an impact on our agricultural projects and the lives of many women and youth.

www.aypadinternational.org

AYPAD MANGEMENT TEAM

Potentially Important Food Plants of Kenya

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 – Kenya, Version 4, March, 2018

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 Robin Thomson 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 Kenya. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Kenya, 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 Kenya. 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.

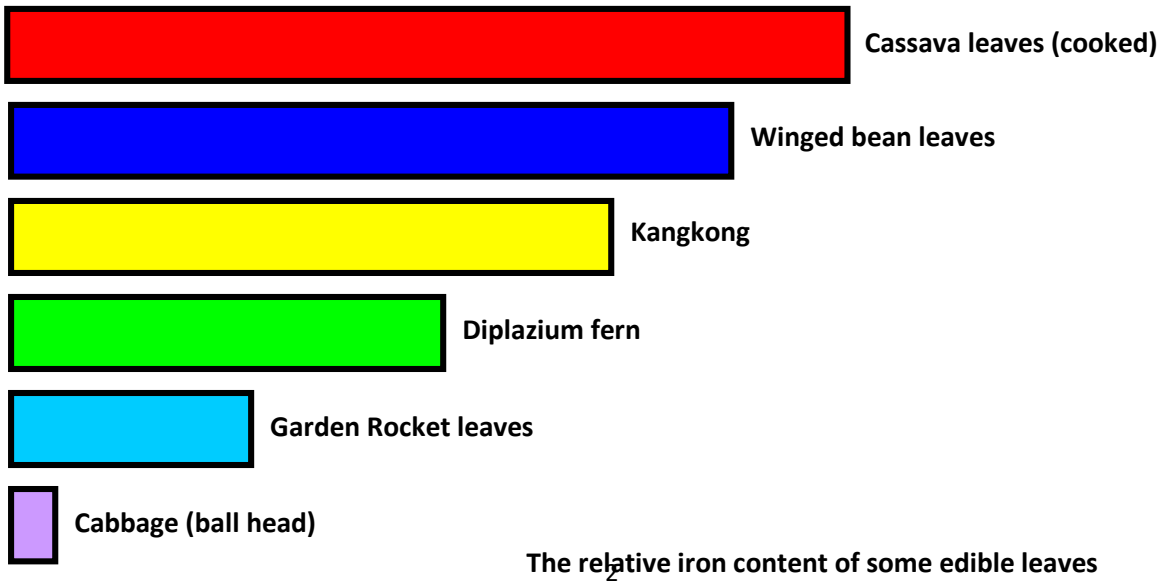
Naming of plants

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.

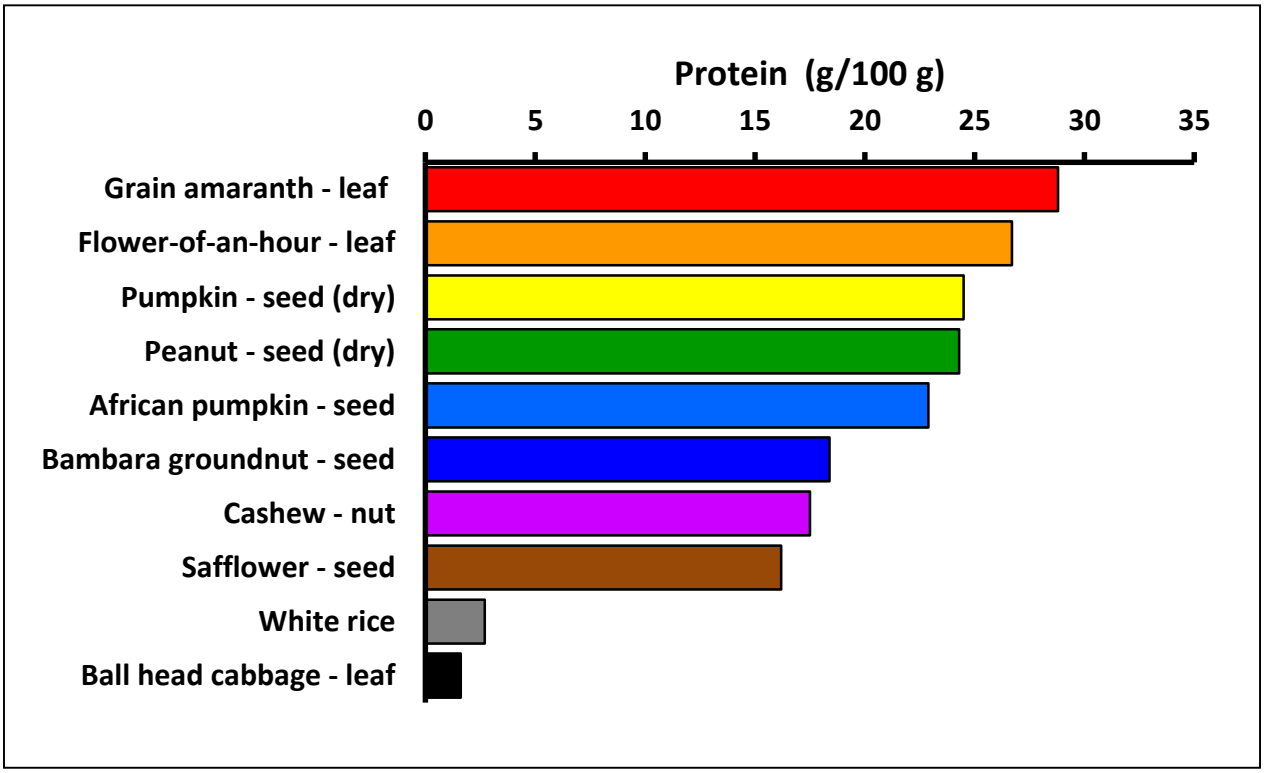
Pests

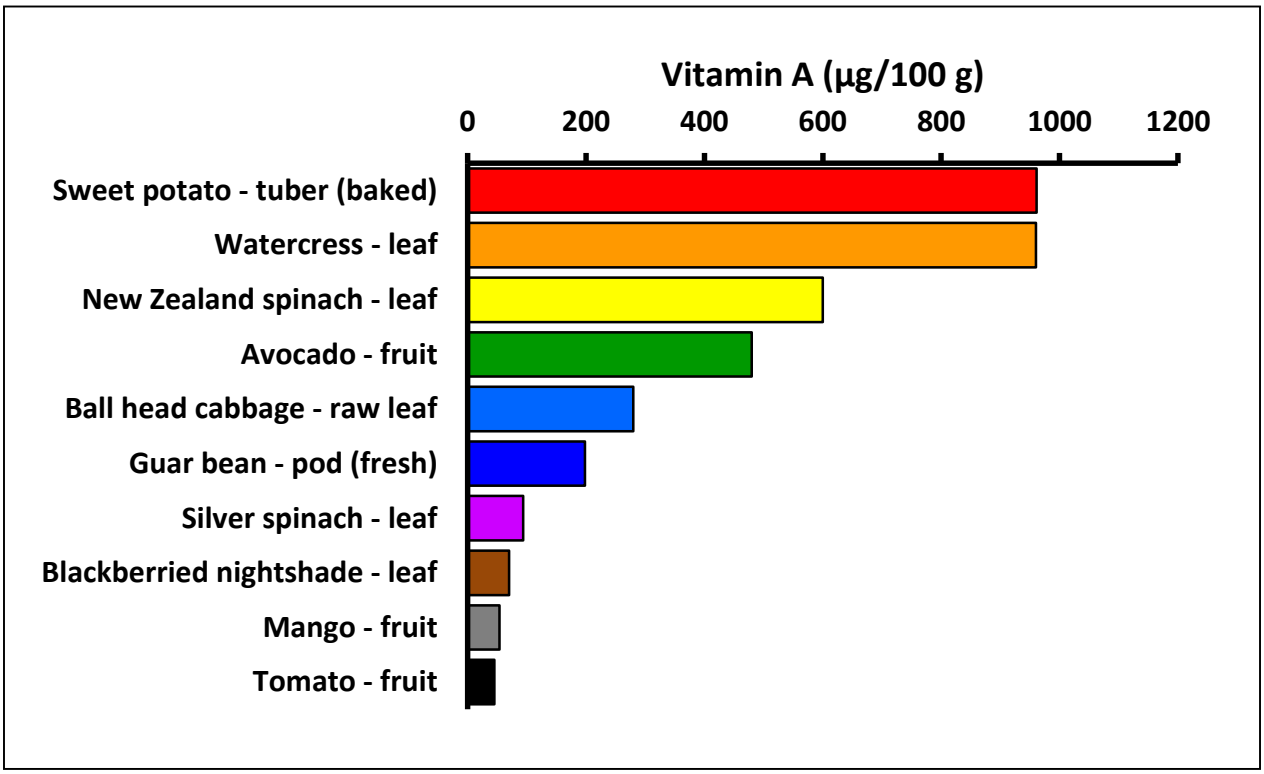
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects 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.

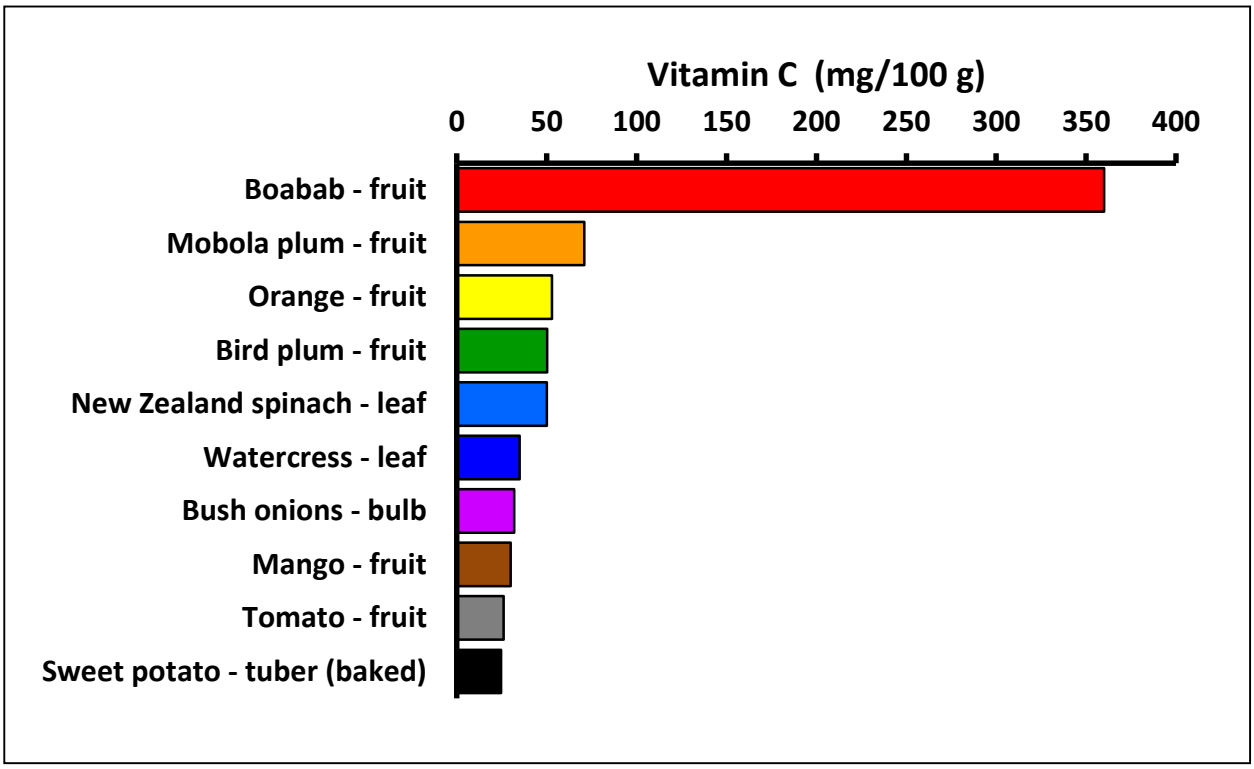
Diseases

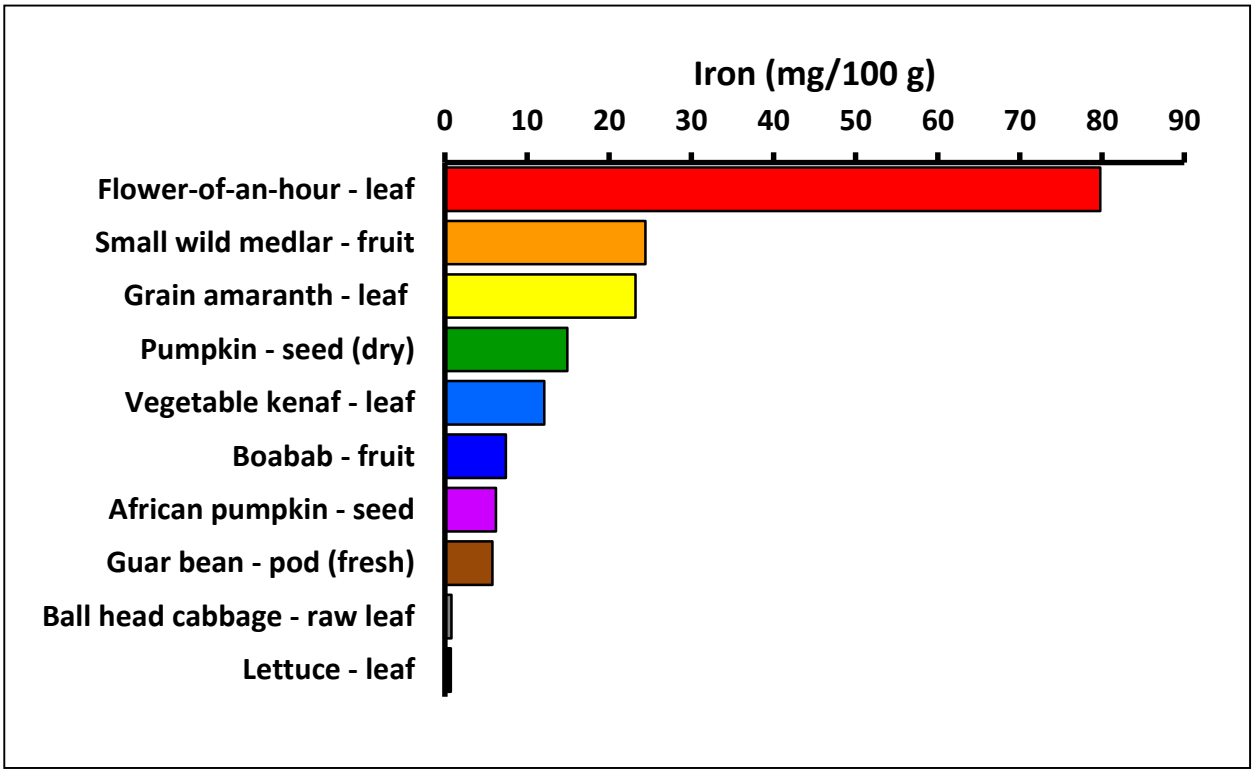
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct 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.

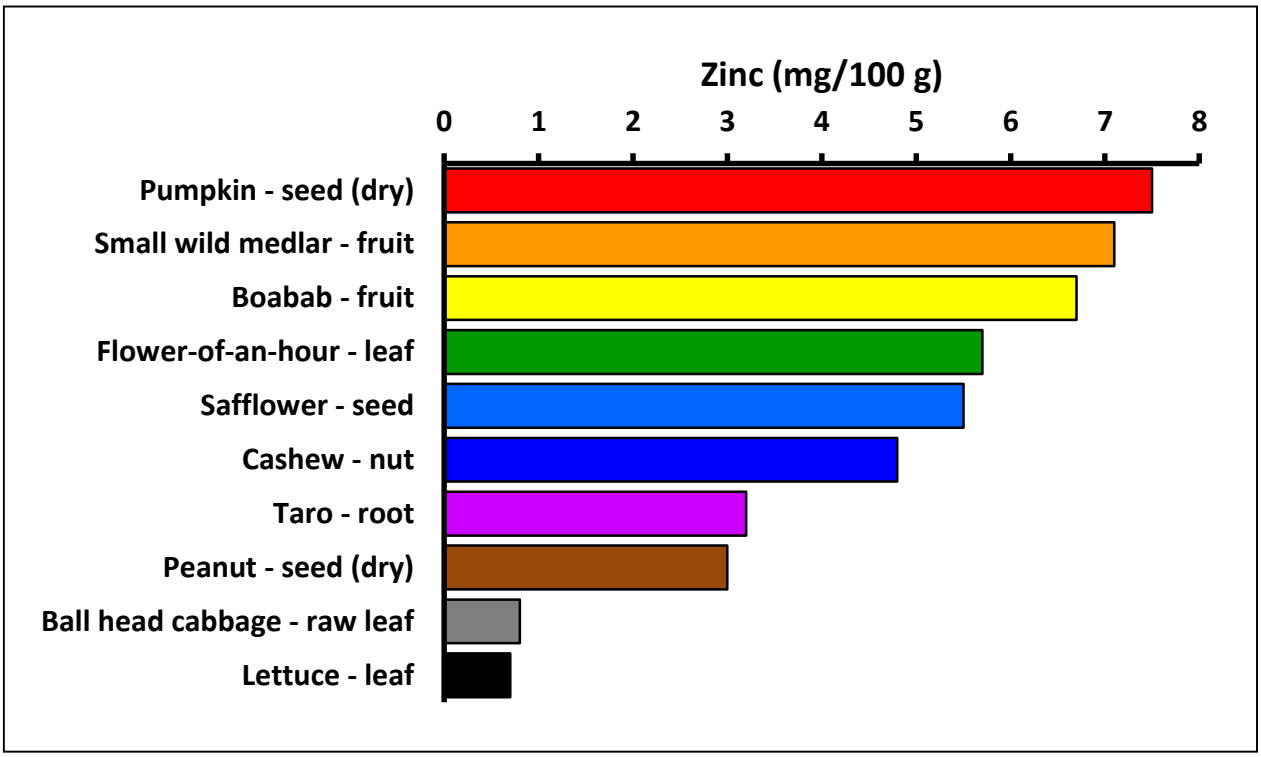
Food value charts for a selection of plants from Kenya






Vitamin C (mg/100 g)
0
50
100
150
200
250
300
350
400
Boabab - fruit
Mobola plum - fruit
Orange - fruit
Bird plum - fruit
New Zealand spinach - leaf
Watercress - leaf
Bush onions - bulb
Mango - fruit
Tomato - fruit
Sweet potato - tuber (baked)


Iron (mg/100 g)
0
10
20
30
40
50
60
70
80
90
Flower-of-an-hour - leaf
Small wild medlar - fruit
Grain amaranth - leaf
Pumpkin - seed (dry)
Vegetable kenaf - leaf
Boabab - fruit
African pumpkin - seed
Guar bean - pod (fresh)
Ball head cabbage - raw leaf
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). This does not mean that they are not useful, but merely reflects a desire to concentrate on plants that are less well known and/or underutilised.

Starchy staples

English: Grain amaranth
Local:

Scientific name: *Amaranthus caudatus*
Plant family: AMARANTHACEAE

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

Distribution: A tropical plant. It can grow in warm temperate places. It cannot tolerate frost. Plants do best under high light, warm conditions and dry conditions. They need a well drained soil. Some varieties can tolerate pH up to 8.5 and there is some salt tolerance. It can grow in arid places. In the Andes it grows between 500-3,000 m above sea level. It suits hardiness zones 8-11.

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

Cultivation: Plants can be grown from seed if the soil is warm. Seeds are small and grow easily. Cuttings of growing plants root easily. Amaranths are mostly grown from seeds. The seeds are collected from a mature dry seed head of an old plant. These dry flower stalks are stored and then the flowers rubbed between the hands over the garden site. Collecting the seeds is fairly easy by banging flower heads on a mat or piece of cloth then the rubbish can be blown out of this mixture by dropping it and blowing gently as it falls. The very small seeds of these plants are scattered over the ashes or fine soil in fertile ground. Some types are self sown.
Amaranthus seeds are very small. A thousand seeds weigh about 0.3 g. It is very difficult to sow such small seeds evenly over the ground. So there are a few different methods you can use to try and get the plants well spaced. One way is to mix the seeds with some sand and then when you sprinkle this along a row it will only contain a few seeds among the sand. The other way is to throw the seeds over a small plot of ground which will be a nursery. After 2 or 3 weeks the seedlings can be transplanted into the garden bed where they are to grow. If the seeds are just scattered over the garden, the small seedlings can be thinned out and either eaten of transplanted to a different spot. Seedlings are transplanted when about 5-7 cm tall. Plants can be harvested when small by thinning out and either transplanted or eaten cooked. Plants can be harvested whole or have top leaves harvested several times. Harvesting begins after 4-7 weeks and can continue over 2 months. A spacing of about 8 cm x 8 cm is used if the plants are to be harvested by pulling up the whole plant. If the harvesting is to be done by picking off the top leaves, a wider spacing is normally used. When the tops are picked out 3 or 4 times over the life of the one plant, a spacing about 30 cm x 30 cm is used.

As far as producing a large amount of food is concerned, the spacing is not very important. Having between 200 and 1,000 plants per square metre gives about the same total amount of food. The main thing that varies is the size of the leaves. Mostly people like larger leaves so a wider spacing of 8 cm to 10 cm for plants to be pulled out is suitable. For plants to be harvested by picking out the tops, they can be picked down to about 15 cm high. Picking lower makes the plant flower later, but it also recovers more slowly from picking.

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

Amaranths eventually stop producing leaves and grow flowers. Flowering occurs after about 3 months and seed can be recollected about a month later. Amaranths are called day-length neutral plants because they still produce flowers at about the same stage, irrespective of whether there are many or few hours of daylight. Because flowering stops harvesting of leaves, it is a problem, but there does not seem to be any easy way of slowing down flowering. Flowering can be delayed a little by picking out the tops down to a lower level. Also it is made a little later if plants are grown in the shade. But lower picking and growing in the shade mean the plants produce less food, so there is no point. Plants need to be harvested and used when they are ready. If plants are left growing the amount of harvestable leaf gets less and the quality gets poorer. Nitrogen deficiency shows as the oldest leaves near the bottom of the plant going yellow. This is because the plant needs more nitrogen to grow more new leaves at the top and there is not enough nitrogen in the soil for it to get it from there. So it reuses the nitrogen it used in the oldest leaves. These leaves therefore go yellow. Potassium deficiency shows as the edges of the oldest leaves going yellow. These shortages of nutrients could be corrected by adding some nitrogen or potash fertiliser but it is most likely too late for the current crop.

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	6.0	1034	28.8	33	-	23.2	5.5
seed	-	-	13	-	-	-	-

Starchy staples

English: Taro
Local:

Scientific name: *Colocasia esculenta*
Plant family: ARACEAE

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

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

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

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

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

For dryland taro, the soil is prepared by digging, unless a fresh bush fallow is used where the natural friability of the soil allows plants to be put into the undug soil in a small hole that is prepared. Plants are put into a hole 5 - 7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth 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	92.2	2.7	424	35.5	1.2	0.2

Starchy staples

English: Finger millet **Scientific name:** *Eleusine coracana*
Local: **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: 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. Under the ground fattened tubers are produced. There are a large number of varieties which vary in leaf shape and colour, tuber shape, colour, texture and in several other ways.

Distribution: A tropical and subtropical plant. They grow from sea level up to about 2,700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow with a pH between 5.2 - 6.8. Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivated varieties 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 leaves which are however larger. With increasing shade less tubers are produced and these grow more slowly. Sweet potato tends to be responsive to potassium fertiliser. cultivated varieties 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. 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.

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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: 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. They can grow in poor soil and can survive drought. 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 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: Bullrush millet
Local:

Scientific name: *Pennisetum glaucum*
Plant family: POACEAE

Description: An annual grass that grows to 3 m tall. The leaf blades are 20 - 100 cm long by 2 - 5 cm wide. The flower is dense and 40 - 5 0 cm long by 1.2 - 1.5 cm wide. They also vary in shape and size. Plants that tiller produce smaller heads. The species varies a lot. There are 13 cultivated, 15 weed and 6 wild races of this grass. It has a cylindrical ear like a bullrush. The grains are small and round and have a shiny grey colour like pearls. There are thousands of cultivated varieties.

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	13.5	1363	12.7	-	-	3.5	-

Legumes

English: Peanut
Local:

Scientific name: *Arachis hypogea*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Guar bean
Local:

Scientific name: *Cyamopsis tetragonolobus*
Plant family: FABACEAE

Description: An upright bushy plant often only 1 m tall. Some kinds grow to 3 m. The branches are stiff and usually with white hairs. The branches stick upwards and are angled and with grooves. The leaves are produced alternately and have 3 leaflets. The leaflets are oval and with slight saw teeth around the edge. The leaf stalks have grooves. The flowers are small in clusters in the axils of leaves. The flowers are white with pink wings. It produces clusters of thick fleshy pods. They are stiff and straight. There is a double ridge along the top of the pod and a single one below. There are also 2 ridges along the flat sides. The pods have a beak at the end. There are 8 - 10 small oval seeds inside.

Distribution: A tropical plant. It is a hardy, drought resistant plant that suits dry areas. It grows well on alluvial and sandy soils and in areas with high summer temperatures and low rainfall. It can tolerate an alkaline soil with pH 7.5 - 8.

Use: The green immature pods are eaten cooked. They are added to curries. They can be fried in oil, salted or dried for later use. The seeds are eaten. The seeds contain a gum used as a thickening agent. It is used in ice cream, baked goods, gluten free foods and salad dressing. The sprouted seeds are also eaten.

Cultivation: They are grown from seed, often in mixed cropping situations. It requires 15 - 24 kg of seed to sow a hectare. Seeds are sown 2 - 3 cm deep. They are often put 20 - 30 cm apart in rows 65 cm apart. Seeds germinate within one week.

Production: Plants mature in 3 - 3.5 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
seed	9.9	1452	30.5	-	-	-	-
pod (fresh)	82.0	-	3.7	198	49	5.8	-

Legumes

English: Horse Gram
Local:

Scientific name: *Macrotyloma uniflora*
Plant family: FABACEAE

Description: A climbing or twining herb. The young growth has white hairs. The stems are hairy. The leaves have 3 leaflets. The leaves are 3.5 cm long. The leaflets are 1-2.5 cm long by 0.7-3 cm wide. They are broadly oval. They are thin textured and with a rounded tip. The flowers are about 0.8 cm across. They are greenish-yellow. There are 1-5 flowers in a cluster in the axils of leaves. The fruit is a pod 3-5.5 cm long by 0.4-0.8 cm wide. They are slightly hairy and dark brown when ripe.

Distribution: t is a tropical plant. It grows in northern Australia. In tropical Queensland it grows between 500-760 m altitude. It needs freely drained soil. It needs a temperature of 20-30°C. It cannot tolerate frost. It is drought resistant and can grow in areas with a rainfall of 900 mm per year. It needs a pH 5-7.5. It can grow in poor soils.

Use: The seeds are parched then boiled, fried or used in curries and soups. The seeds also yield an edible oil. The flour can be processed into sweetmeats. The fleshy root can be roasted and eaten. The pods are cooked and eaten.

Cultivation: Plants can be grown by seed or cuttings. The seeds are sown 1-2.5 cm deep.

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)	9.7	1392	-	22.5	-	-	-

Image accessed from: Ian Staples, QLD DPI&F Tropical Forages

Legumes

English: African yam bean
Local:

Scientific name: *Sphenostylis stenocarpa*
Plant family: FABACEAE

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

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

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

Cultivation: It can be grown from seed or tubers.

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1470	19.2	-	-	-	-
tuber	64.0	542	3.8	-	-	-	-

Legumes

English: Mung bean
Local:

Scientific name: *Vigna radiata*
Plant family: FABACEAE

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

Scientific name: *Vigna subterranea*
Plant family: FABACEAE

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	-	1572	18.4	-	-	-	-

Leafy greens

English: Chaff-flower
Local:

Scientific name: *Achyranthes aspera*
Plant family: AMARANTHACEAE

Description: A coarse rambling annual herb. It has many branches but the branches are not close together. The plant grows 0.5 to 2 m high and spreads 0.5 m across. The stem is erect, hairy and woody. It often has many joints. The leaves are in opposite pairs. The leaves are 6 to 15 cm long, somewhat wedge shaped and slightly hairy and tapering to a point. The flower spikes are 10 to 50 cm long with small green flowers about 5 mm long. The chaffy flowers on long spikes tend to eventually point downwards. They have rigid curved spines near the flower. The seeds attach to clothes.

Distribution: A tropical plant. A native plant of tropical areas. It prefers moist well drained soils. It can grow in a partly shaded position but is most commonly in full sunshine. It is drought and frost tender. It does best in soils with high organic matter but can grow in sandy areas. It can grow in arid places. In Tanzania it grows up to 3,000 m above sea level and in areas with 700-1,300 mm rainfall.

Use: The young leaves and seeds are cooked and eaten. They are boiled without salt.

Cultivation: It is grown by 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
leaf	70.6	387	5.3	43	20	-	-
seed	83.9	176	4.2	-	-	-	-
flower	85.0		6.4	-	-	-	-

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: Watercress
Local:

Scientific name: *Nasturtium officinale*
Plant family: BRASSICACEAE

Description: A cabbage family herb. It is a small leafy plant that grows in water and lasts for several years. It grows 30 cm high and has runners 2.5 m long. It has hollow stems and roots freely from the nodes. It branches freely. The leaves consist of 3 - 7 pairs of small leaflets then a larger leaflet at the end. The flowers are small and white and grow grow in a cluster. Flowers are not always produced and need days with more than 12 hours of sunlight to form. A small narrow curved seed pod about 2 cm long can develop. It grows attached to the banks of streams.

Distribution: This is a temperate climate crop. It is common in tropical highland creeks especially those flowing off limestone hills with pH 6.5 - 7.5. It needs to be in running water. In the tropics it occurs from about 1,000 m to at least 2,900 m altitude. It suits plant hardiness zones 6 - 10.

Use: The leaves and stems are eaten raw or cooked and have a spicy flavour. Cooking should be used if the water in the stream is not pure and clean. The seed can be germinated to produce sprouts. The seeds can be ground to make a mustard flavouring.

Cultivation: It is grown from cuttings planted along the edges of clear running water. Cuttings of 10 - 15 cm long are suitable. The plant has roots along the stem at the node and cuttings quickly form roots in water. A spacing of 30 cm is suitable. This small plant keeps living for many years once established. It can also be grown from seeds. Plants can float on the water. It will not tolerate drying out. Watercress has a high phosphate requirement.

Production: Harvesting can occur 4 - 6 weeks after planting. Regular picking encourages branching and increases production. Tips 5 - 10 cm long are harvested. This can be repeated every 4 - 6 weeks.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	95.0	63	2.4	960	35	3.4	0.1

Leafy greens

English: Purslane
Local:

Scientific name: *Portulaca oleracea*
Plant family: PORTULACACEAE

Description: A spreading branched herb. It lies flat on the ground. It grows each year from seed. The plants spread 10 to 50 cm wide. The stems are purplish. The leaves are fleshy, flat and shaped like a wedge at the base. They are 1.5 to 2.5 cm long and 0.3-1 cm wide. The flowers are yellow and occur in a few rounded heads. They are 0.8-1.5 cm across. They bloom about the middle of the day. The capsules are 0.5 cm long and oval. The seeds are black and shiny

Distribution: It grows in tropical and temperate regions. They are common in waste places throughout the Philippines. It is a common self sown plant in lowland areas and up to 1700 m altitude. It prefers sandy well drained places. It can grow on salty soils. It can grow in arid places. It suits hardiness zones 7-12.

Use: The stems and leaves are cooked and eaten. Usually the skin is scraped off then the plant is boiled and mashed. It thickens stews and other dishes in which it is cooked. It is used as a pot herb. The fleshy stems are pickled. Sprouted seeds are eaten in salads. The seeds are ground for use in cakes and bread.
Caution: In areas where a lot of nitrogen fertiliser is used plants can cause nitrate poisoning. Plants can also have oxalates.

Cultivation: It roots easily from broken pieces. It can be grown from stem cuttings. It can be grown from seed.

Production: The first harvest of leaves can be a month after planting. In the tropics it can complete its lifecycle in 2-4 months. Often it is harvested in the dry season when other vegetables are in short supply.

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	9.1	1405	19.5			64.0	64.0
seed paste	63.5	438	7.1				
root	79.0	210	3.5				
plant	87.0	181	4.0		11	2.5	
leaf	82.2	108	3.1	54	20	0.8	1.5

Leafy greens

English: Blackberried nightshade
Local:

Scientific name*: Solanum nigrum*
Plant family: SOLANACEAE

Description: An erect, branched, smooth herb that grows about 60 - 100 cm tall. The stems are green and 3-angled. Leaves are pointed at both ends. The leaves are 1.3 - 9 cm long by 0.5 - 6 cm wide. They are oblong and taper to the tip. They can have wavy lobes. The inner ring of petals is white and about 8 mm across. The fruit are black, smooth and round and hang downwards.

Distribution: They occur in waste places at low and medium altitudes throughout the country. It grows from sea level up to high altitudes such as 2,700 m in the tropics. It often comes up self-sown after fires. It is grown in most tropical countries as a green, leafy vegetable.

Use: The ripe fruit are cooked and eaten. They are also used for soup. The leaves and young shoots are eaten cooked. It is a commonly used vegetable.

Cultivation: It is grown from seed. In highlands areas, it is almost always self-sown or encouraged by burning grassland, but then weeded and harvested as a normal part of the garden. In coastal areas, seeds are sown by broadcasting, or scattering. Good yields can be obtained under moderate fertility levels. A spacing of 40 cm x 40 cm is suitable. Topping, or removing the top of the plant, encourages branching. It can be grown from cuttings.

Production: Seeds germinate about a week after planting. Leaves can be harvested after about 8 - 10 weeks by cutting off the last 5 cm of each branch. High yields can be obtained and 5 - 8 harvests over 6 - 8 weeks are possible. It grows rapidly, has high seed production and high viability of seed. This gives it a competitiveness as a weedy species, but also means it is one of the first edible greens to be harvested from a new garden.

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	87.0	160	4.3	70	20	1.0	-

Leafy greens

English: New Zealand spinach
Local:

Scientific name: *Tetragonia tetragonoides*
Plant family: AIZOACEAE

Description: A perennial, branched herb. It starts growing erect, but then lies over and grows along the ground. It grows to 12 cm high. The stems can spread out to 1 m along the ground. The triangular leaves are small and thick on round fleshy stems. They are 4 - 6 cm long and have distinct veins underneath. The flowers are yellow and 8 mm across. They are hidden at the base of the leaves. The fruit is up to 1 cm long and with 4 or 5 horns on top.

Distribution: A temperate plant that will grow in hot, dry climates. It is better suited to high altitude areas above 1,000 m in tropical countries. It grows on rocky or sandy ground often close to the seashore. It can grow in salty soils. It requires good drainage and full sun. It can grow in arid places. It suits hardiness zones 7 - 9.

Use: The fleshy leaves and tops are eaten. They can be eaten raw, steamed, boiled, stir-fried, creamed, served with mushrooms, or made into quiche.
Caution: They can contain oxalates and nitrates which can be poisonous. These can be removed by boiling in water for 2 minutes and discarding the water.

Cultivation: It is grown from seeds or cuttings. It is easy to save seed. Seeds often grow better if soaked in water overnight. Seedlings are not easy to transplant so it is better to sow direct. Often 3 - 4 seeds are planted in a mound with the mounds 70 cm apart. Cuttings form roots quickly.

Production: Plants grow rapidly. The tips of plants can be cut regularly.

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	90.9	61	1.7	600	50	2.6	0.5

Fruit

English: Boabab
Local:

Scientific name: *Adansonia digitata*
Plant family: BOMBACACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

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. 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 is 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: Bird plum
Local:

Scientific name: *Berchemia discolor*
Plant family: RHAMNACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	78.8	305	1.1	-	50.3	2.2	2.2

Fruit

English: Dog plum
Local:

Scientific name: *Ekebergia capensis*
Plant family: MELIACEAE

Description: A tall tree. The leaves are densely clustered. The leaves have up to 6 pairs of leaflets. They are opposite with a leaflet at the end. The leaflets are broadly sword shaped. They narrow to the tip. They are 8 cm long by 2.5 cm wide. The flowering shoots are in the axils of leaves. They are 12 cm long and branched. The flowers are greenish-white. The fruit is slightly fleshy and pink. They are round and 1 cm across.

Distribution: It is a tropical plant. It grows in dry forest on well-drained soil. It grows in savannah woodland and along rivers. It grows between 600-3,000 m altitude. It can grow in arid places. In Zimbabwe it grows up to 1,670 m above sea level. It grows in areas with a mean annual rainfall of 750-2,000 mm.

Use: The fruit are eaten raw.

Cultivation: Plants are grown from fresh seeds. The seeds germinate in 4-9 weeks. Soaking the seeds then rubbing them improves germination. Seeds cannot be stored for long. It can be grown by cuttings.

Production: It is fast growing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	74.6	370	1.4	-	1.0	2.4	0.6

Fruit

English: Cape fig
Local:

Scientific name: *Ficus sur*
Plant family: MORACEAE

Description: This tree varies in form. It can be a small tree up to 6 m tall in dry places or a large spreading tree up to 12-24 m tall in forest. It normally loses its leaves for a short period. The bark is smooth and brownish grey. It has a thick trunk and shallow spreading roots. The leaves are alternate and leathery. They are oval with a pointed tip. The leaves are 10 cm long by 3 cm wide. They can be 23 cm long by 13 cm wide. They are red when young becoming green when mature. They are smooth and sometimes slightly hairy underneath. The leaf stalks are long and with a furrow on the upper surface. Twigs and leaves have milky juice. There are only a few small male flower near the opening of the fig and many female flowers. The fig is pollinated by a small wasp. The figs are roughly round and about 2-4 cm across. They have a prominent opening at the end. They are reddish-yellow when ripe. They hang from the trunk and old main branches. The pulp is sweet. Many figs form one long bunch.

Distribution: A tropical plant. It occurs from sea level to 1600 m altitude. It can be up to 2,100 m. It occurs in areas where the rainfall is 700-1200 mm. It grows in the Sahel. It grows in wet soils. It usually grows near streams. It cannot tolerate cold. It can be grown in sun but is best in shade. It can grow in arid places. It grows in Miombo woodland in Africa. It suits hardiness zones 10-12.

Use: The figs are edible but often infected with insects. They can be eaten raw. The seeds are removed. The fruit are eaten in porridge. They can be used for jam or preserves. The young leaves are cooked and eaten. The roots above the ground are eaten when young. The bark is chewed with cola nuts to reduce thirst.

Cultivation: Plants normally grow naturally from seed. The seeds are very fine. They can be grown from cuttings. Stem cuttings can be treated with rooting hormone. It can be cut back and will re-grow.

Production: Trees are quick growing. Fruit are usually collected at the end of the rainy season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	87.0	129	1.1	-	12.0	0.7	0.4

Fruit

English: Donkey berry
Local:

Scientific name: *Grewia flavescens*
Plant family: MALVACEAE

Description: A small tree which loses its leaves during the year. It can grow 3-5 m tall. It can be a partly climbing plant. The stems are square and fluted. The leaves are oval and the edges have teeth. Leaves are 2.5-10 cm long and oblong. The tips are pointed. The flowers are star like with 5 slender gold petals. They occur in small bunches in the axils of leaves. The fruit are round and 12 mm across. The have slight lobes. They have very small hairs. They become yellow to red. They are edible.

Distribution: A tropical plant. They grow is dry sands. It grows in the Sahel. They suit hot valley areas. They need a rainfall of more than 300 mm each year. It grows in open woodland often along dry stream beds. It grows between 100-1,525 m above sea level. It is tolerant of drought. It can grow in arid places. It is often on termite mounds.

Use: The fruit are eaten raw or dried. They can be stored once dried. The dry skin is rubbed off before eating the flesh. The fruit are also used for making an alcoholic drink.

Cultivation: Plants can be grown from seeds. The seeds do not germinate easily. They can take 3 months to germinate

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	18.2	589	7.0	-	-	9.2	0.8
flower	76.2	358	0.8	-	-	-	-

Image accessed from: http://www.plantzafrica.com/plantefg/grewiaflavescens.htm

Fruit

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 surfac e 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. It is 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

Fruit

English: Small wild medlar
Local:

Scientific name: *Vangueria infausta*
Plant family: RUBIACEAE

Description: A shrub or small deciduous tree. It grows to 3 or 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 between 10-3,333 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 earl 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: Wax Gourd
Local:

Scientific name: *Benincasa hispida*
Plant family: CUCURBITACEAE

Description: A climbing, pumpkin family plant. The vine can grow to 3 m long. The plant re-grows from seed each year. The vines are thick, furrowed and hairy. The leaves are heart shaped with 5 - 7 lobes. They are rough to touch. Flowers are yellow. The immature fruit can have skin of various colours depending on variety. The fruit is up to 30 cm long and 20 cm across and green with a waxy covering when mature. This waxy layer enables the fruit to be stored for a long time. Fruit shape and size can vary with variety. The flesh is firm and white. The fruit are heavy, weighing from 8 - 45 kg.

Distribution: A tropical plant. It is suited to warm, lowland, tropical conditions. It does better in dry areas or drier seasons. They are reasonably drought tolerant. The best temperature for growing is 23 - 28°C. They need a well-drained soil. They grow best with a soil pH of 6.5.

Use: The white flesh is added to stir fried dishes. The seeds can be fried and eaten. Young leaves and flower buds can be eaten. The young fruit are used as a vegetable. The mature fruit are peeled, cut in pieces and candied.

Cultivation: It is grown from seeds. There are about 1,800 seeds per kg. Seeds are sown 3 - 5 cm deep with a spacing of 60 - 80 cm between plants. Seed can be sown in nurseries and transplanted when 15 - 20 cm tall. They are usually planted in mounds and allowed to grow over a strong trellis. They can be allowed to stay on the ground. If plants are going to be allowed to trail over the ground, a spacing of about 3 m is necessary. Decayed manure or compost is used where available. Plants are responsive to sulphate of ammonia. Flowering normally starts 60 - 80 days after planting. Flowers are open in the early morning. Hand pollination may assist fruit development. This becomes more important in colder areas. Thinning of fruit gives larger fruit. The growing tips of plants can be pruned out to encourage branching or to restrict growth.

Production: Fruit are ready 3 - 5 months after planting. The fruit keeps well when fully mature. They can be stored for 6 months at 13 - 15°C in a dry atmosphere. The pulp of wax gourds can be shredded and dried for later use.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	92.0	118	0.7	-	15	0.6	0.6
fruit (cooked)	96.6	54	0.4	-	10.5	0.4	0.6

Vegetables

English: Pumpkin
Local:

Scientific name: *Cucurbita maxima*
Plant family: CUCURBITACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: 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: Bush onions
Local:

Scientific name: *Cyperus bulbosa*
Plant family: CYPERACEAE

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

Distribution: A tropical plant. It grows in tropical regions. In Australia it is inland near salt lakes. It grows in dry regions and seasonally wet grasslands. It grows in areas with an annual rainfall of about 300 mm. In East Africa it grows from 300-2,400 m altitude. It can grow in arid places.

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

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

Food Value: Per 100 g edible portion

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

Vegetables

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.

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	-	-	5.3	-

Vegetables

English: Vegetable kenaf
Local:

Scientific name: *Hibiscus cannabinus*
Plant family: MALVACEAE

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

Distribution: A tropical plant. It can grow in well-drained sandy soils and in dry but seasonally waterlogged places. It grows from 1,500 -2,100 m above sea level. It grows in areas with an annual rainfall of 500 - 635 mm. It can grow in arid places and suits hardiness zones 10 - 12. It grows in many African and Asian countries.

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Flower-of-an-hour
Local:

Scientific name: *Hibiscus trionum*
Plant family: MALVACEAE

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

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

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

Cultivation: Plants can be grown from seed or cuttings.

Food Value: Per 100 g edible portion

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

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

Nuts, seeds herbs and other fruits

English: African pumpkin
Local:

Scientific name: *Telfairia pedata*
Plant family: CUCURBITACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	2.8	2821	22.9	-	-	6.2	1.6

Image accessed from: http://gardenbreizh.org/photos/galeries.html © Paul Latham

Nuts, seeds, herbs and other foods

English: Niger seed
Local:

Scientific name: *Guizotia abyssinica*
Plant family: ASTERACEAE

Description: An erect branched herb. It grows 30-180 cm tall. The stems are soft and hairy. The leaves are usually carried opposite one another. The leaves do not have stalks and they clasp the stem. The leaves have teeth along the edge and the surface is a little rough. The flower head is made up of many small flowers each capable of producing a seed. The fruit (called seeds) are black angled structures. They are up to 12 mm long. The seed inside is 3.5-5 mm long. There are about 250-300 seeds per gram.

Distribution: It is grown in both temperate and tropical zones. It can compete well with weeds. It has some salt tolerance. The temperatures are between 16°C and 20°C where Niger does best. It cannot tolerate temperatures above 28°C average and must have temperatures above 6°C. In Africa it grows between 300 and 2300 m altitude but does best at 1800-2000 m altitude in Ethiopia. The rainfall is 100-1300 mm per year where it grows most. At lower altitudes a lower rainfall is satisfactory if it is spread through the growing season. It grows on a wide range of soils. It can grow on poorly drained soils. It needs short day lengths for flowering. It grows in open places. It can grow in arid places.

Use: The seeds can be fried and used as snacks. They are also used in sauces. The seed cake is mixed with honey to make a sweet bread. The seed oil is edible. It is used in cooking.

Cultivation: It is grown from seed. It is often sown mixed with finger millet. Seeds can be broadcast or planted in rows. 10-15 kg of seed per hectare are used for broadcast crops. When planted in rows 5-8 kg per hecatre of seed are used. Fertilisers do not improve seed yield much. As petals drop, seeds are harvested to avoid seed loss. Stems are cut near the ground, then dried for a few days before threshing.

Production: Flowering occurs 3 months after sowing. Seeds are ready for harvest 4-6 weeks later. It can take 5 months at altitudes over 2000 m. Yields can be 300-700 kg per hectare. Yields of 1400 kg are possible.

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	6.2	2019	17.3	-	-	-	-

Nuts, seeds, herbs and other foods

English: Cashew
Local:

Scientific name: *Anacardium occidentale*
Plant family: ANACARDIACEAE

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

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

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

Cultivation: It is usually grown from seeds. Seeds germinate poorly and slowly. Only nuts which sink in water (or a solution of 150 g of sugar in a litre of water) should be planted. Seeds are sun dried for 2 - 3 days to improve germination. Seeds can be sown in a nursery then transplanted, or more commonly, are sown directly. Trees are spaced 7 -1 0 m apart. The crop is cross pollinated mostly by insects. For good production, complete fertiliser or appropriate organic material should be applied. Pruning to shape the tree is often undertaken in the first 2 - 3 years. Cashews are often planted scattered in gardens or amongst other trees. Clearing under the tree prevents fire and makes finding nuts easier. Allowing nuts to fall before harvesting ensures only ripe nuts are collected. Resin in the cashew nut shell can damage hands and discolour the nuts. Roasting the nuts before removing the kernel avoids this.

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut	4.0	2478	17.5	-	-	2.8	4.8
leaf	69.9	418	5.2	-	-	-	-
fruit	84.7	213	0.8	0.12	265	1.0	0.2

Nuts, seeds, herbs and other foods

English: False benniseed
Local:

Scientific name: *Ceratotheca sesamoides*
Plant family: PEDALIACEAE

Description: An erect, slender stemmed herb that grows 2 - 3 m tall. The leaves have stalks. The leaves at the top of the plant are arrowhead shaped and with teeth in their lower section. The lower leaves are wider and have teeth all around. The flowers are tube shaped. At the base of the flower stalk there is a pair of small purple glands on the stem. The fruit have 2 "horns" at the end.

Distribution: A lowland tropical plant that grows in tropical Africa. It grows on sandy soil and suits wet areas. In Malawi, it grows below 900 m altitude. In West Africa, it grows in open savannah woodland.

Use: The leaves are eaten as a vegetable. They can be added to soups. Leaves can be preserved by drying. The seeds are eaten like sesame seeds. They are also put into soups. The seeds yield an edible oil.

Cultivation: Plants are grown from seeds. Seeds are broadcast at the beginning of rains.

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)	7.0	2299	14.2	-	-	-	-
leaf	81.0	226	4.2	-	-	3.2	-

Nuts, seeds, herbs and other foods

English: Safflower
Local:

Scientific name: *Carthamus tinctorius*
Plant family: ASTERACEAE

Description: An erect, annual herb that grows to 60 - 150 cm tall. It has many branches. It has spines but the numbers vary. The stems are white, stiff and round with fine grooves along their length. The types with more spiny leaves are better for oil production. The leaves are arranged in spirals around the stem. They do not have leaf stalks. The leaves are dark green and glossy. They are 10 - 15 cm long and 2 - 4 cm wide. The flower head is made up of many small flowers that are 13 mm long and like tubes. They are yellow to orange in colour. The fruit is 4 angled and has a hard hull and a single white or grey seed. The seed is oblong.

Distribution: It grows in both tropical and temperate zones. It does better in drier regions. It cannot tolerate waterlogging. It does not suit the low, wet tropics. It needs a good dry season for drying. It is resistant to drought. It can stand some wind and salinity. High temperatures can result in poor seed set. It does best where temperatures are 17 - 20°C on average. At the equator it can grow at 1,600 – 2,000 m altitude but most commonly in other regions it grows below 900 m altitude. A soil pH of 5 - 8 is suitable. It can grow in arid places.

Use: The young shoots and leaves are eaten cooked or raw. They can be seasoned with soy sauce. The seeds are hulled and roasted. They are eaten as snacks. They are also used in chutneys. The seed oil is used in cooking and as a salad oil. (This can be done by boiling the seeds and floating off the oil). The dried, edible petals are used to colour foods. They can give red or yellow dyes. The slightly bitter petals can be cooked with rice.

Cultivation: Plants are grown from seed. A fine seed bed is required and seed are broadcast or drilled. It is best sown about 2 - 3 cm deep. Seeds germinate in 4 - 7 days and a soil temperature of 15°C is best. Plants should be topped as soon as the first buds appear to increase the number of flower heads. A spacing of 15 - 30 cm between plants is suitable. Wider spacing gives more heads per plant and closer spacing gives higher yields per area. A seeding rate of 20 - 30 kg per hectare is required. Crops respond to fertiliser if there is sufficient moisture. In very dry weather, harvesting in the more moist morning or evening avoids seed shattering. Plants are uprooted and heaped for a few days before threshing.

Production: Plants take 120 days to maturity. Seeds are ripe about 35 - 40 days after maximum flowering. Plants are harvested when leaves turn brown.

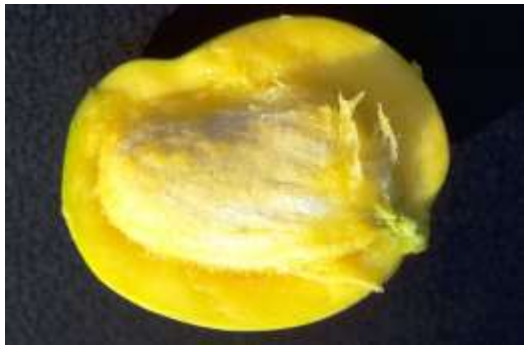
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	5.6	2163	16.2	5	0	4.9	5.5

Nuts, seeds, herbs and other foods

English: Mango
Local:

Scientific name: *Mangifera indica*
Plant family: ANACARDIACEAE



Description: An erect, branched evergreen tree. It can grow to 10 - 40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10 - 30 cm long and 2 - 10 cm wide. They are arranged in spirals. The leaf stalk is 1 - 10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10 - 50 cm long and branching. Up to 6,000 flowers can occur on a stalk. Most of these are male and up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5 - 30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour.

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Horseradish tree
Local:

Scientific name: *Moringa oleifera*
Plant family: MORINGACEAE

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

Distribution: A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits 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	4	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Nuts, seeds, herbs and other foods

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

Nuts, seeds, herbs and other foods

English: African breadfruit
Local:

Scientific name: *Treculia africana*
Plant family: MORACAE

Description: An evergreen tree. It grows to 15-30 m tall. It can grow up to 50 m tall. It has a dense spreading crown. The trunk is fluted. The bark is dark grey and smooth. It is thick and produces a white latex when cut. This later turns rusty red. The leaves are simple and alternate. They are very large. Leaves can be 30 cm by 14 cm or larger. They are dark green and smooth above but paler and slightly hairy underneath. The leaves are tough. They have 10-18 pairs of clear veins. The leaf stalk is 1.5 cm long and the leaf tip is pointed. Young leaves are red or yellow. The flower heads are rounded ad a yellow-brown. They are 2.5 to 10 cm across. Male and female flowers are usually separate. Flowers can grow in the axils of leaves or on older wood down to the trunk. The fruit is a compound fruit. It is rounded and very large. It can be 30-45 cm across. It grows on the trunk and main branches. Inside there are many orange seeds about 1 cm across. They are in a spongy pulp. The outer fruit surface is covered with pointy growths.

Distribution: A tropical plant. It suits hot, tropical lowland climates. It grows in forests near rivers. It can grow in swampy areas. It grows from sea level up to 1500 m in Uganda or 1,200 m in Tanzania.

Use: The seeds can be dried, fried and eaten. They are also boiled, roasted or ground into flour. The flour is used in soups and nut milk. An edible oil can be extracted from the seeds.

Cultivation: Plants are grown from seed. Seed can be planted in pots then transplanted or they can be sown direct. There are about 5,000 seeds per kg. Seeds will only store for a few weeks but seed treatment is not needed before sowing.

Production: The tree is fairly fast growing. A fruit can weigh 12 kg.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	9.2	1555	12.6	-	-	320	-

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 caudatus*	Grain amaranth	leaf	6.0	1034	28.8	33	-	23.2	5.5	11
Araceae	*Colocasia esculenta*	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	13
Poaceae	*Eleusine coracana*	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	15
Convolvulaceae	*Ipomoea batatas*	Sweet potato	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	16
Euphorbiaceae	*Manihot esculenta*	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	18
Poaceae	*Pennisetum glaucum*	Bullrush millet	seed	13.5	1363	12.7	-	-	3.5	-	20
Fabaceae	*Arachis hypogea*	Peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	21
Fabaceae	*Cyamopsis tetragonolobus*	Guar bean	pod (fresh)	82.0	-	3.7	198	49	5.8	-	22
Fabaceae	*Macrotyloma uniflora*	Horse Gram	seed (dry)	9.7	1392	-	22.5	-	-	-	23
Fabaceae	*Sphenostylis stenocarpa*	African yam bean	seed	9.0	1470	19.2	-	-	-	-	24
Fabaceae	*Vigna radiata*	Mung bean	seed (sprouted)	90.4	126	3.0	2	13.2	0.9	0.4	25
Fabaceae	*Vigna subterranea*	Bambara groundnut	seed	-	1572	18.4	-	-	-	-	26
Amaranthaceae	*Achyranthes aspera*	Chaff-flower	leaf	70.6	387	5.3	43	20	-	-	27
Amaranthaceae	*Celosia trigyna*	Silver spinach	leaf	89.0	139	2.7	94	10	5.0	-	28
Brassicaceae	*Nasturtium officinale*	Watercress	leaf	95.0	63	2.4	960	35	3.4	0.1	29
Portulacaceae	*Portulaca oleracea*	Purslane	leaf	82.2	108	3.1	54	20	0.8	1.5	30
Solanaceae	*Solanum nigrum*	Blackberried nightshade	leaf	87.0	160	4.3	70	20	1.0	-	31
Aizoaceae	*Tetragonia tetragonoides*	New Zealand spinach	leaf	90.9	61	1.7	600	50	2.6	0.5	32
Bombacaceae	*Adansonia digitata*	Boabab	fruit	16.0	1212	2.2	-	360	7.4	6.7	33
Annonaceae	*Annona senegalensis*	Wild custard apple	fruit	77.2	329	1.7		18.1	0.7	0.3	34
Rhamnaceae	*Berchemia discolor*	Bird plum	fruit	78.8	305	1.1	-	50.3	2.2	2.2	35
Meliaceae	*Ekebergia capensis*	Dog plum	fruit	74.6	370	1.4	-	1.0	2.4	0.6	36
Moraceae	*Ficus sur*	Cape fig	fruit	87.0	129	1.1	-	12.0	0.7	0.4	37
Malvaceae	*Grewia flavescens*	Donkey berry	fruit	18.2	589	7.0	-	-	9.2	0.8	38
Chrysobalanaceae	*Parinari curatellifolia*	Mobola plum	fruit	64.6	533	1.6	-	70.9	0.9	0.4	39
Rubiaceae	*Vangueria infausta*	Small wild medlar	fruit	64.4	498	1.4	-	11.5	24.4	7.1	40
Cucurbitaceae	*Benincasa hispida*	Wax Gourd	fruit (cooked)	96.6	54	0.4	-	10.5	0.4	0.6	41
Cucurbitaceae	*Cucurbita maxima*	Pumpkin	seed (dry)	6.9	2264	24.5	38	1.9	14.9	7.5	42
Cucurbitaceae	*Cucurbita pepo*	Marrow	fruit	91.3	102	1.1	-	12	0.8	0.2	43
Cyperaceae	*Cyperus bulbosa*	Bush onions	bulb	42.8	883	3.4	-	32	3.4	0.6	44
Asteraceae	*Galinsoga parviflora*	Small flowered quickweed	leaf	88.4	653	3.3	-	-	5.3	-	45
Malvaceae	*Hibiscus cannabinus*	Vegetable kenaf	leaf	79.0	280	5.5	34	-	12.1	-	46
Malvaceae	*Hibiscus trionum*	Flower-of-an-hour	leaf	6.3	1263	26.7	-	-	79.8	5.7	47
Cucurbitaceae	*Telfairia pedata*	African pumpkin	seed	2.8	2821	22.9	-	-	6.2	1.6	48
Asteraceae	*Guizotia abyssinica*	Niger seed	seed	6.2	2019	17.3	-	-	-	-	49
Anacardiaceae	*Anacardium occidentale*	Cashew	nut	4.0	2478	17.5	-	-	2.8	4.8	50
Pedaliaceae	*Ceratotheca sesamoides*	False benniseed	leaf	81.0	226	4.2	-	-	3.2	-	51
Asteraceae	*Carthamus tinctorius*	Safflower	seed	5.6	2163	16.2	5	0	4.9	5.5	52
Anacardiaceae	*Mangifera indica*	Mango	fruit	83.0	253	0.5	54	30	0.5	0.04	53
Moringaceae	*Moringa oleifera*	Horseradish tree	leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2	55
Lauraceae	*Persea americana*	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	56
Moracae	*Treculia africana*	African breadfruit	seed (dry)	9.2	1555	12.6	-	-	320	-	57

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