

# Potentially Important Food Plants of Madagascar



**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](http://www.foodplantsolutions.org)



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## **Dedication**

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

## **Preface**

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

The selection of plants included in this guide has been developed by Russ Stephenson 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 Madagascar. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Madagascar, 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](http://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.....	1
STARCHY STAPLES .....	13
LEGUMES .....	22
LEAFY GREENS .....	29
FRUIT .....	37
VEGETABLES .....	45
NUTS, SEEDS, HERBS AND OTHER FOODS.....	52
NUTRITIONAL VALUES OF FOOD PLANTS BY PLANT FAMILY.....	60

## ***Introduction***

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

### **Local food plants are often very good**

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

### **Growing food**

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

### **A country with very special plants**

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

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

## **Getting to know plants**

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

## **Naming of plants**

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

## **An Important Note**

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

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

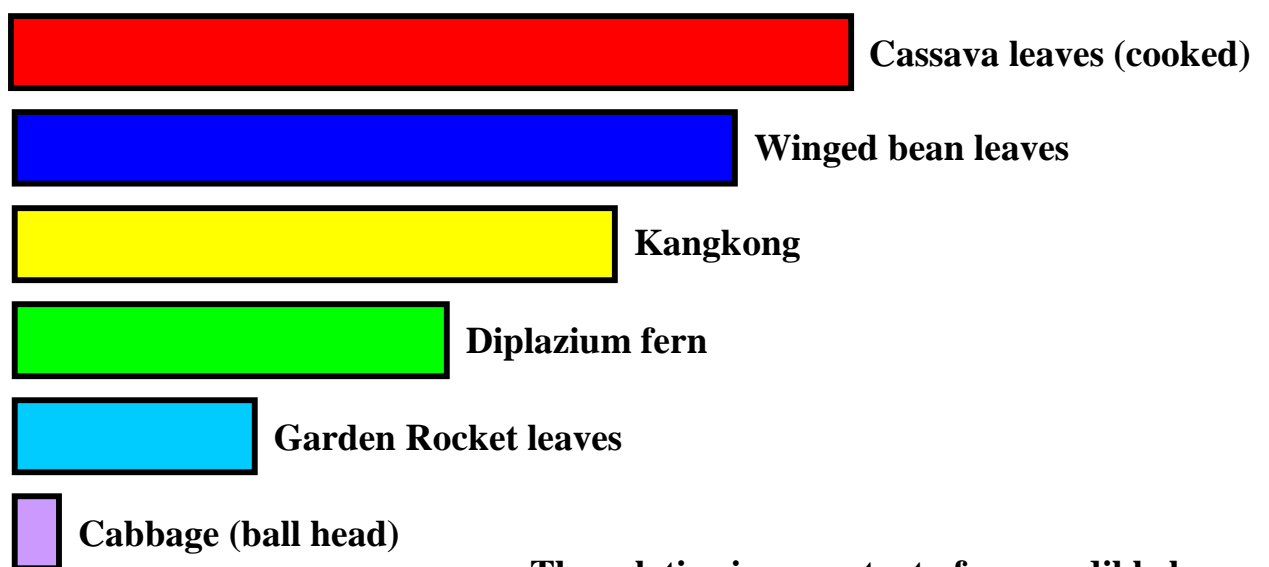
There are others, but these serve as examples.

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

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

### Nutrient Value

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



**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. Some plants contain cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) becomes more readily available when food is cooked in oil.

### **Learning to grow “wild” food plants**

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

### **Saving better types of plants**

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

### **Growing from cuttings and suckers**

Many food plants are grown from cuttings and suckers. This is very important, as it allows all the different kinds of yams, taros, bananas, sweet potato and sugarcane to be continually grown and ensures the varieties are preserved. Each plant has its own special propagation method. It is important to use healthy planting material, as diseases can be spread in planting material. In many cases, small tubers of yams, taro etc. are stored for planting for the next crop. This is not always good practice, as the small tubers could be the result of diseases (such as viruses) in the plant. A good rule is to take cuttings or save tubers from the best plants for re-planting.

## **Saving seed**

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

## **Growing a garden of mixed plants**

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

## **Different types of plants for food security**

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

## **Crop rotation**

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

## **Looking after the soil**

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

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

## **Control of soil erosion**

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

## **Building up the soil**

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

## **Poor soils where crops won't grow**

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

## **Soil nutrients**

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

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

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

### **Making compost**

Compost is old plant material that has been allowed to rot down into a fine, sweet smelling mulch that is full of nutrients that can be put back on the soil to grow new plants. Compost returns nutrients to the soil, improves the soil's ability to retain moisture and also helps improve soils that are acid or saline.

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

The composting process is carried out by small bacteria that live in the soil and feed on decaying plants. They break down old plant material into compost. These bacteria are living, so they need air, water and food. A good compost heap must have air, so don't cover it with plastic or put it in a container. This makes a foul smelling compost, as different bacteria that don't need air turn it into an acid mixture that preserves it. Good compost must have moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off.

As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil. A handful of compost placed at the base of each plant can be beneficial.

### **Pests**

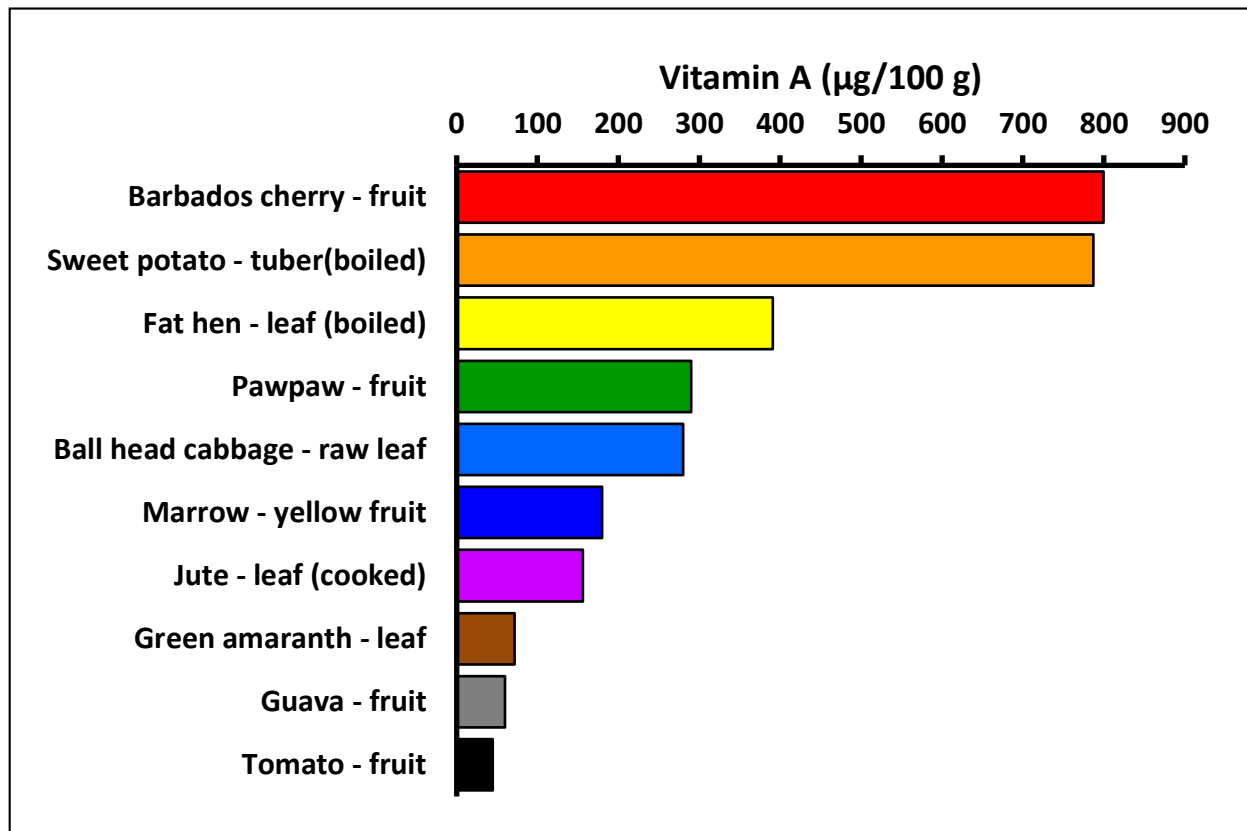
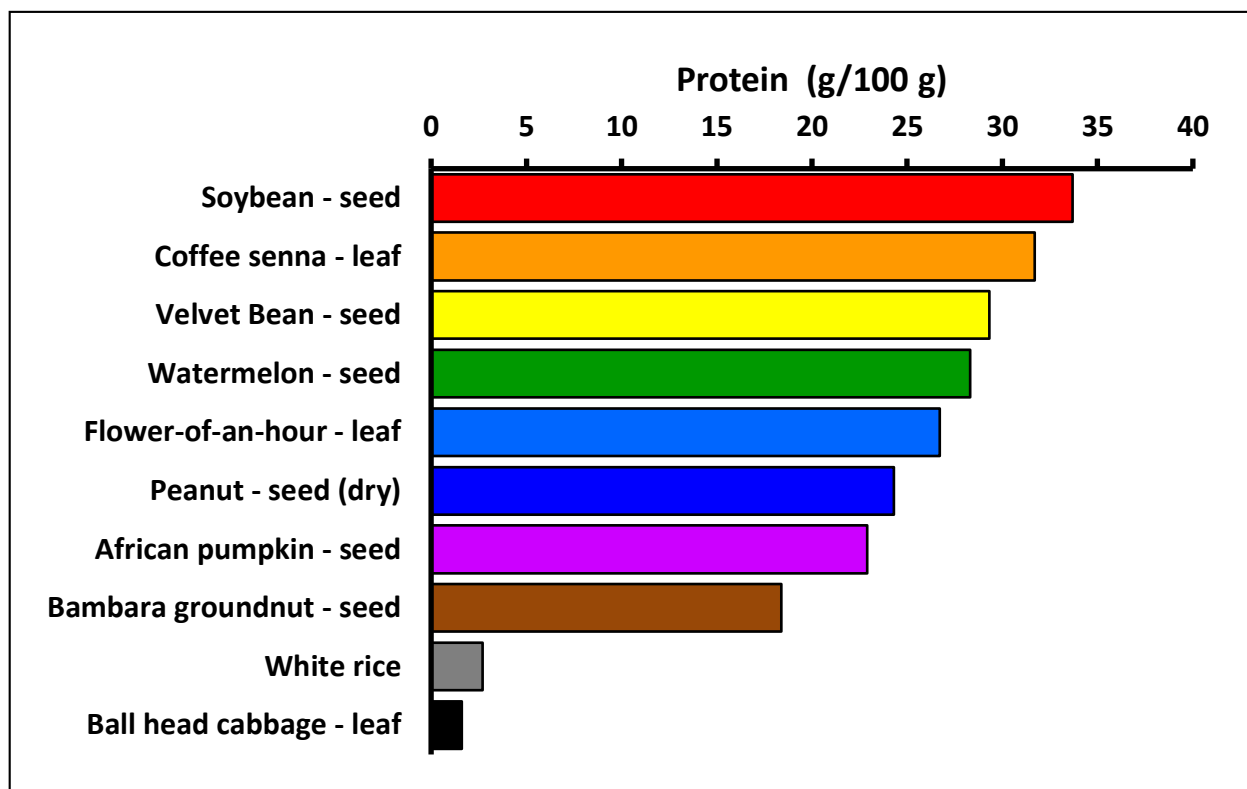
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move "like an army" into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs

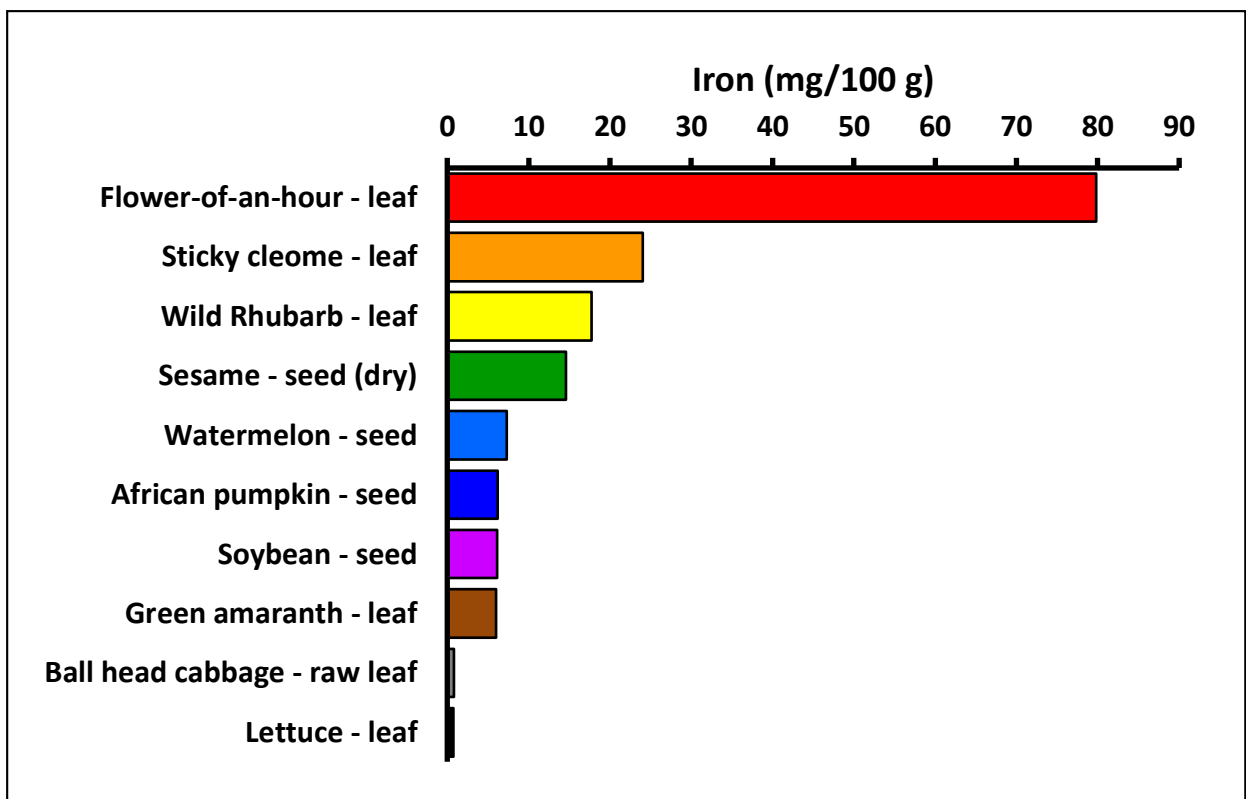
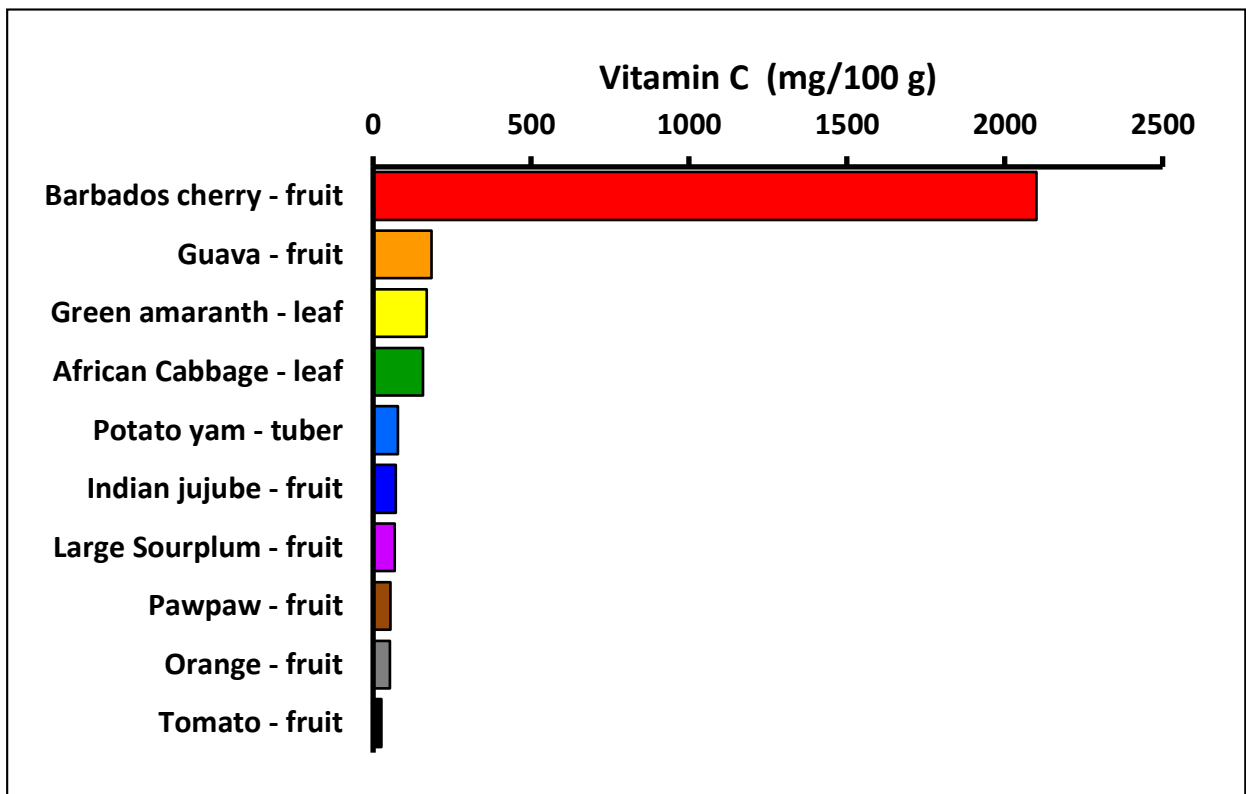
with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth that damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage. Spiders, ladybirds, hover flies and many other insects also feed off the insect pests that attack our crops and should be encouraged.

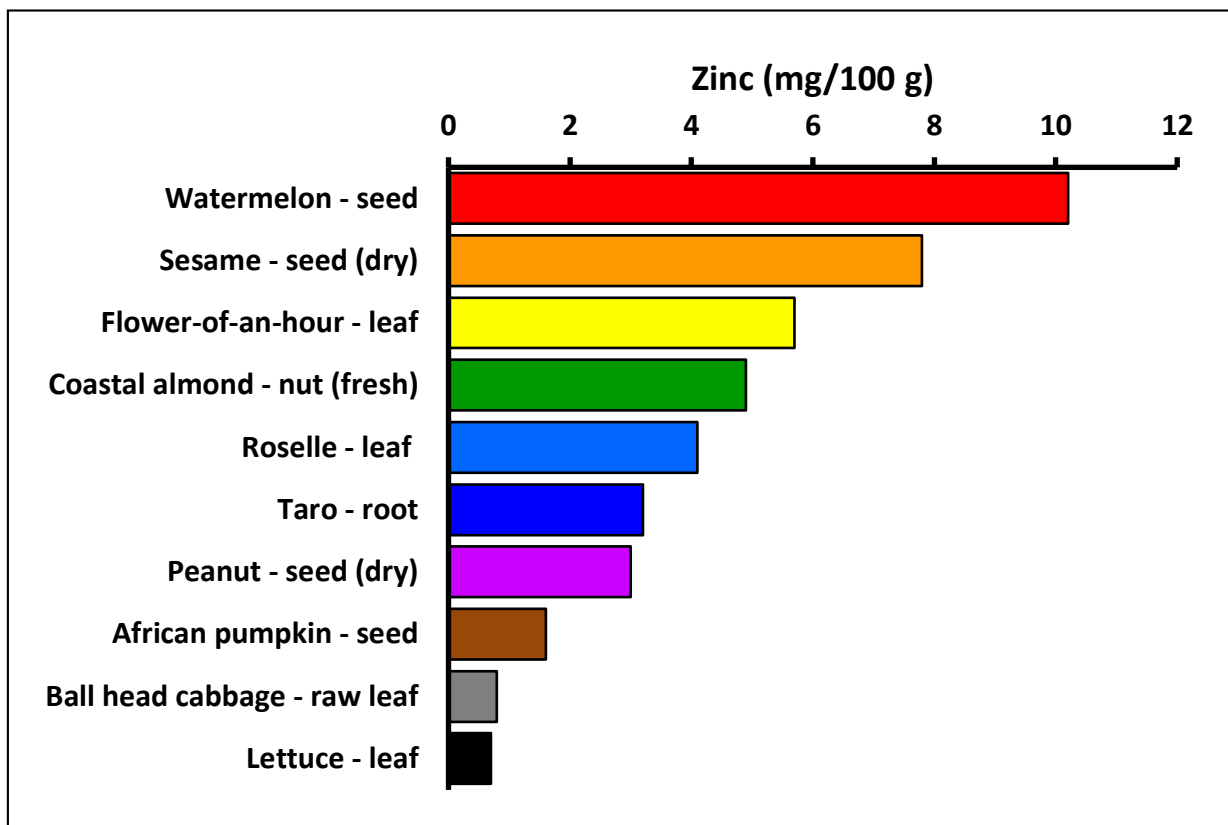
## **Diseases**

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

## Food value charts for a selection of plants from Madagascar







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

## ***Starchy staples***

**English:** Taro

**Local:**

**Scientific name:** *Colocasia esculenta*

**Plant family:** ARACEAE

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



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

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

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

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

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

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

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

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

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

Taro is sensitive to weed competition throughout most of its growth, but it is more critical during early growth up to 3 - 4 months. About 7 - 9 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 is more common. Wider spacings of 90 cm x 90 cm reduces overall yield.

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	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:** Chinese taro

**Local:**

**Scientific name:** *Xanthosoma sagittifolium*

**Plant family:** ARACEAE

**Description:** A herb that grows up to 2 m tall. It has a short stem with large leaves at the top. A corm is produced at the base of the plant. It produces about 10 flask-shaped cormels, about 15 - 25 cm long, on the underground corm. They get wider towards the tip. There is a vein around the edge of the oval leaf blade which is 50 - 75 cm long. The leaf has triangular lobes at the bottom. The flower is produced below the leaves. The large bract around the flower is pale green and about 20 cm long. The bases of this bract overlap. The closely arranged spike of flowers is about 15 cm long.



The smaller female part is at the bottom of the spike and the larger male part towards the top.

**Distribution:** It grows in many tropical countries and suits tropical rainforest regions. It can tolerate high rainfall and light shade. It does well in regions with an annual average temperature of 26°C and a well distributed rainfall of 1,400 - 2,100 mm during the growing season. It grows from sea level up to about 2,000 m. Soils need to be well-drained, but moist with a pH of 5.5 - 6.8.

**Use:** Cormels, or small corms, are eaten roasted or boiled. Main corms are often fed to pigs. Young leaves can be eaten after cooking.

**Cultivation:** *Xanthosoma taro* is normally planted by using the top piece of the main central corm or stem. Pieces weighing 1.5 kg are often used. It can also be grown by using the small side corms which may weigh 0.3 kg, or pieces of the corm can be used as long as they have some buds on them. These are often presprouted before planting. To multiply large amounts of planting material and still achieve acceptable yields, the latter method of using sections of the main corm works well. In crop growth, an axillary bud is produced in the axil of each leaf but only some of these develop into cormels. Often 10 or more cormels develop per plant into cormels 15 - 25 cm long.

**Production:** The crop grows for about 9 months, although may be left for 12 months before harvest. Crops can be planted at any time of the year, but are often planted to make best use of natural rainfall. The middle of the dry season should be avoided. Naturally loose or well cultivated soils are needed. The water table must be at least 45 cm below the soil surface. *Xanthosoma taro* grows better in good soils with plenty of nitrogen. It can be grown in poorer soils and still give satisfactory yield. It can grow in shade and is inter-cropped under cacao and coconuts. Yield is reduced, but it is still worth doing if no other land is available. Weed control is important. The corms can be harvested without digging out the whole plant by carefully digging soil away from the plant and breaking off small corms. The main stem is then covered to produce a new crop. The corms store reasonably well under dry, cool, well-ventilated conditions. The corms will also remain in good condition if they are left growing in the ground and just harvested when needed.

**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	67.1	559	1.6	5	13.6	0.4	0.5
leaf	90.6	143	2.5	160	37	2.0	-
shoot	89.0	139	3.1	-	82	0.3	-

## Starchy staples

**English:** Fat hen

**Local:**

**Scientific name:** *Chenopodium album*

**Plant family:** CHENOPODIACEAE

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



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

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

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

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

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

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

## Starchy staples

**English:** Finger millet

**Local:**

**Scientific name:** *Eleusine coracana*

**Plant family:** POACEAE

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



**Distribution:** It is a very drought resistant tropical plant.

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

## Starchy staples

**English:** Potato yam

**Local:**

**Scientific name:** *Dioscorea bulbifera*

**Plant family:** DIOSCOREACEAE

**Description:** A yam with a long smooth stemmed vine, round in cross section and without spines. The vine winds to the left, can climb into trees and grow to long lengths. The large leaves (14 - 30 cm across and slightly longer than wide) have pointed tips and round bases. About 7 veins arise from the tip of the leaf stalk. It produces often flattened bulbils (potatoes) in the leaf angles along the vine. They can be grey brown or purple. The smaller tuber underground is normally covered with roots. The flowers are large. The male flowers are in spikes up to 20 cm long. The female spikes are usually in pairs. The winged fruit are about 2.5 cm long by 1.5 cm across. The seeds have wings. The bulbils normally have few fibres through the tissue compared to some yam tubers. Many varieties have yellow flesh.



**Distribution:** An annual tropical plant. It will grow from the coast up to about 1,700 m altitude in equatorial zones. It is common near the edge of grassland and forest at mid altitudes. Both wild and cultivated forms occur. It is common near secondary forest at low and medium altitudes.

**Use:** The cooked tubers are eaten. More commonly the cooked aerial bulbils are eaten. Some kinds are bitter and inedible or at least require special processing and cooking. Some varieties are poisonous.

**Cultivation:** Either the vine bulbils or the underground tubers are planted. It is convenient to train the long vines up trees. The bulbils need a set storage time before sprouting. The leaves die off for 1 - 4 months each year before re-sprouting from the tuber. Bulbils only grow shoots from one end unless the bulbil is cut into pieces. If the larger bulbils are cut, the cut surfaces should be dried and healed in a shady place for 2 - 3 days before planting. Bulbils are planted 8 - 12 cm below ground at a spacing of about 100 cm by 100 cm. Normally nitrogen and potassium fertilisers give greater responses than phosphorus. Friable well drained soils are most suitable. Often little cultivation or mounding is done. A high level of organic matter improves yield. Strong staking is required with branched 2 m stakes, or with trees or living stakes. Vine and tuber growth can be extensive and heavy.

**Production:** Bulbils or aerial yams are produced as leaves begin to unfold, continue until plant maturity, and often fall. Harvesting can start 3 months after planting but immature tubers have less starch. Underground tubers are normally not harvested until leaf die back. Wounds and damage to the tubers normally heal naturally given dry aerated conditions. Some varieties have seasonally dormant aerial tubers which only grow after an extended storage period. Others germinate quickly.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
tuber	70.8	357	2.7	-	78	3.1	0.4
bulbil	79.4	326	1.4	-	-	2.0	-

## Starchy staples

**English:** Sweet potato

**Local:**

**Scientific name:** *Ipomoea batatas*

**Plant family:** CONVULVACEAE

**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	-

## Legumes

**English:** Pigeon pea

**Local:**

**Scientific name:** *Cajanus cajan*

**Plant family:** FABACEAE

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



Pods are slightly hairy. Pods are often 4 - 8 cm long and have a beak at the end. Pods are constricted between the seeds. Many varieties of pigeon pea occur. Some are dwarf and day length neutral.

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

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

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

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

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

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

## Legumes

**English:** Sword bean

**Local:**

**Scientific name:** *Canavalia gladiata*

**Plant family:** FABACEAE

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



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

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

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

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

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

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

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

## Legumes

**English:** Velvet Bean

**Local:**

**Scientific name:** *Mucuna pruriens*

**Plant family:** FABACEAE

**Description:** An evergreen herb of shrub. It is a climbing vine. It climbs to 6 m high. It can re-grow each year or live for a few years. The stems are slender with long, slender branches. They are very hairy when young. The leaves are alternate with sword shaped leaves. The leaf stalks are hairy. There are 3 leaflets. The leaflets are 5-19 cm long and 4-16 cm wide. The leaflets are rounded at the base and the side leaflets are unequal in shape. The flowers are large and white with bluish butterfly shaped petals. They occur in clusters of 2 or 3. The flowers are 2-4 cm long. The fruit are thick, leathery pods covered with hairs. They are 10 cm long and contain 4-6 seeds. The pods are dark brown.



**Distribution:** It is a tropical plant. It does best in a rich, moist, well-drained soil. It needs a protected, sunny position. It is damaged by drought and frost. It grows from sea level to 900 m above sea level. They need a temperature above 8°C. It can grow in arid places.

**Use:** The pods are burnt over a fire to remove the prickles then the beans are soaked until they sprout and then washed and boiled or pounded. The young leaves are cooked as a vegetable. The ripe seeds are roasted and eaten.

**Caution:** The seeds need special preparation.

**Cultivation:** Plants are grown from seed. The seed need treatment to assist them 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
seed	7.29	-	29.32	-	4.78	-	-

Image sourced fro: [www.floristtaxonomy.com/mucuna-pruriens-flowers-4](http://www.floristtaxonomy.com/mucuna-pruriens-flowers-4)

## Legumes

**English:** Yam bean

**Local:**

**Scientific name:** *Pachyrrhizus erosus*

**Plant family:** FABACEAE

**Description:** A climbing bean that can grow up to 6 m tall. The hairy stems are woody at the base. It has a white-fleshed tuber with a rough, sandy-coloured skin. The leaves are alternate and made up of 3 leaflets. These leaflets have large teeth. The flowers are violet or white. The pod is 8 - 15 cm long, curved and hairy, and contains 8 -11 flattened seeds. The seeds are almost black.



**Distribution:** It grows in warm places, like coastal areas in Papua New Guinea and up to about 70 m altitude in the tropics. A well-drained soil is needed. A light rich sandy soil is suitable. It cannot tolerate frost. Plants need 11 - 13 hours of daylight for tubers to form. It suits hardiness zones 10 - 11.

**Use:** The young tuber is eaten either raw or cooked. It can also be pickled. The young pods can be eaten, provided they are well cooked.

**Caution:** Old pods and mature seeds can be poisonous.

**Cultivation:** It is grown from seeds and also grows wild. Seed should be pre-soaked for 12 hours in warm water to encourage rapid germination. Seeds germinate (shoot) within 2 weeks. Plants can be grown by dividing the root clump and then growing plants from the thickened roots. Cuttings will grow. A spacing of 50 cm between plants is suitable. Topping the plant by picking out the growing point and removing the flowers is said to help tubers form.

**Production:** Tubers are ready about 6 months after sowing. Individual tubers can be up to 20 kg in weight.

**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	89.0	160	1.0	2.0	20	0.6	0.2
seed	8.1		38.5	345		1.3	
pod	86.0	189	2.6	345		1.3	

## Legumes

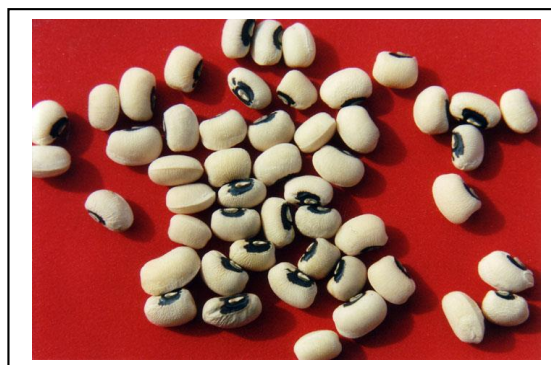
**English:** Cowpea

**Scientific name:** *Vigna unguiculata subsp. unguiculata*

**Local:**

**Plant family:** FABACEAE

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



**Distribution:** It grows in tropical and subtropical climates. It grows from sea level to 1,800 metres altitude in the tropics. Plants can stand high temperatures. Some kinds can tolerate drought. They are sensitive to cold and killed by frost. Plants germinate with a temperature between 11.5 - 15.5°C. The best growth occurs between 20 - 35°C. They can grow on a range of soils providing they are well drained. They are a short day plant. They do well in the semiarid tropics. It will not tolerate acid or alkaline soils. It grows in areas with an annual rainfall between 280 - 410 mm. It can grow in arid places.

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

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

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

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

## Legumes

**English:** Sesbania

**Scientific name:** *Sesbania grandiflora*

**Local:**

**Plant family:** FABACEAE

**Description:** A shrub or small tree up to 5 - 10 m tall. The trunk has rough bark and the branches often droop. The trunk is thick. The branches are hairy when young. The leaves are made up of 41 - 61 leaflets. These are narrow and oblong. They are 2.5 - 4 cm long by 0.5 - 1.4 cm wide. They have a sharp point at the tip. The flowers are large and white to red. The flower petals can be 5 -10 cm long. They are produced as 2 - 4 flowers on flowering branches 2 - 5 cm long. It has long narrow pods with up to 30 - 50 small brownish seeds. The seeds with their stalk can be 2.5 - 4.5 cm long in pods 20 - 25 cm long by 7 - 9 mm wide.



**Distribution:** A tropical plant. It grows in tropical and subtropical climates. It grows in places with an average rainfall of 900 - 1,200 mm and a temperature range of 17 - 25°C minimum and 25 - 37°C maximum. It is cultivated in coastal towns. It does well in both dry and moist areas. It probably grows up to about 1,500 m altitude in tropical places. It does best in rich moist soils. It needs a sunny location. It is damaged by frost. It can grow in arid places. It suits hardiness zones 10 - 12.

**Use:** The leaves and flowers are used as a vegetable. The young pods are also eaten. The young leaves are stripped from the stalks and lightly boiled or steamed or served as a vegetable in curries. The edible flowers of the white variety contain a considerable amount of sugar and iron and are said to taste like mushrooms. Flowers of the red-flowered variety are bitter and hence, are only used as an ornamental. The flowers are boiled, fried or used in curries, soups and stews.

**Caution:** The seeds are toxic and need to be fermented before use.

**Cultivation:** Trees are grown from seed. The seed often need seed treatment to break the hard seed coat. Seeds germinate best with temperatures above 19°C. It can be grown from cuttings.

**Production:** It is a quick growing, short-lived, tree. Trees flower in their second year. A tree can provide 6 - 9 kg of leaves per year. The leaves can be harvested 120 - 150 days after sowing. Repeat harvests can be made each 30 days.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	82.3	323	8.7	66	60	4.0	-
flower	89.0	92	1.8	0	59	0.6	-
seed	10.4	-	68.2	-	-	-	-

## Legumes

**English:** Soybean

**Local:**

**Scientific name:** *Glycine max*

**Plant family:** FABACEAE

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



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

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1701	33.7	55	-	6.1	-

## Leafy greens

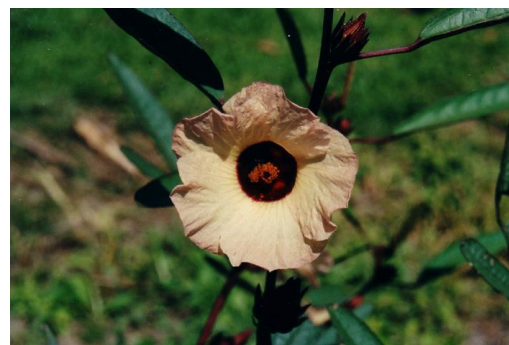
**English:** Roselle

**Local:**

**Scientific name:** *Hibiscus sabdariffa*

**Plant family:** MALVACEAE

**Description:** A branched shrub up to 2 m tall. It has reddish stems, leaves and fruit. Different types vary in their height, shape and leafiness. The leaves are 7 - 10 cm across and lobed. The upper leaves often have more lobes than the lower leaves. The flowers are large and yellow and in the axils of the leaves. They are carried singly. The bracts at the base of the flower are enlarged and form a fleshy red fruit. This capsule is 3 cm long and contains 22 - 34 seeds. The seeds are dark brown and 4 - 6 mm long. 1,000 seeds weigh about 25 g.



**Distribution:** A tropical plant that grows from sea level up to about 1,000 m altitude. It will tolerate a range of soils and requires short days for flowering. It will grow in semi arid locations. It grows best where average temperatures are in the range 25 - 30°C. It needs a temperature above 10°C. Plants will tolerate high temperatures. They grow up to 800 m altitude in Africa. A rainfall of 450 - 550 mm distributed over a 90 - 120 day growing period is required. It cannot tolerate waterlogged soils. It can grow in arid places. It suits hardiness zones 10 - 12.

**Use:** The swollen bases of the flowers are used for jams or drinks. The young leaves can be cooked and eaten. They can also be dried and used. The flowers can be used to flavour drinks. The seeds can be eaten. They can be dried and ground. They can be pressed for oil.

**Cultivation:** Seeds are sown and the seedlings can be transplanted. They are transplanted when 15 - 20 cm high. Seed should be planted 1 - 2.5 cm deep. A spacing of 50 cm x 50 cm is suitable although a wider spacing is used for fruit and a closer one for leaves. Plants can be propagated by cuttings.

**Production:** Fruit are ready 12 - 15 weeks after sowing. The bracts are picked 15 - 20 days after flowering. They can produce about 1 kg per plant. The yield of leaves can be 10 tons per hectare.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.2	1718	19.6	-	-	4.2	-
leaf	86.4	185	10.9	58	35	1.5	4.1
leaf (dry)	9.0	1185	6.9	-	4.2	6.4	2.8
calyces	86.0	185	1.6	29	14	3.8	-

## Leafy greens

**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 2-2,635 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

## Leafy greens

**English:**

**Local:**

**Scientific name:** *Leptadenia lancifolia*

**Plant family:** APOCYNACEAE

**Description:** A creeping shrub. It has many stems. The leaves are alternate and taper towards the tip. The stems are light green. Young shoots curve upwards and has long spaces between the leaves. The leaves are up to 10 cm long. They are oval and light green. The flowers are greenish-yellow. The fruit are cone shaped and have 2 valves. These split open releasing cottony winged seeds. The plant has a sticky sap when crushed.



**Distribution:** A tropical plant. It grows in Kano state, northern Nigeria. It grows in dry savannah. In Ethiopia it grows between 500-1,500 m altitude. It grows on sandy loams. It grows in areas with an annual rainfall between 1,100-1,500 mm. It can grow in arid places. It can tolerate drought. It is little damaged by insects.

**Use:** The young leaves are eaten. They are washed then cooked. They are usually cooked along with other leaves. They are slightly bitter and are eaten with beans, pigeon pea, or cowpeas.

**Cultivation:** It can be grown on the fences near houses to provide leafy greens. Plants are grown from 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	81.0	226	4.9	4915	78	5.4	-

Image sourced from: [www.actaplantarum.org](http://www.actaplantarum.org)

## 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 1,700 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	336	-	-	-	-
plant	87.0	43	4.0	-	11	2.5	-
root	79	210	3.52	-	-	-	-
leaf	82.2	108	3.1	54	20	0.8	1.5

## Leafy greens

**English:** Coffee senna

**Local:**

**Scientific name:** *Senna occidentalis*

**Plant family:** FABACEAE

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



**Distribution:** A tropical plant. It grows in monsoon forest as well as arid areas. It north Queensland it grows from sea level to 820 m altitude. In Africa it grows up to 2,400 m altitude. It can grow in acid, neutral or alkaline soils. It can grow in arid places. Temperatures which average 12.5 - 28°C are suitable. It grows in areas with rainfalls between 500 and 4000 mm per year. A rainfall of 500 to 1000 mm is enough. In Papua New Guinea it has been recorded up to 700 m altitude.

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

**Caution:** The seeds are poisonous unless roasted

**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	9.98	-	31.7	-	-	3.1	-

Image sourced from: [www.commonswikimedia.org](http://www.commonswikimedia.org)

## Leafy greens

**English:** Green amaranth

**Local:**

**Scientific name:** *Amaranthus viridus*

**Plant family:** AMARANTHACEAE

**Description:** An erect smooth branched herb without thorns that grows 30 - 60 cm tall. It grows from seeds each year. The stems are slender. The leaves are broad near the base and narrow near the top. Usually the leaves have notches. Leaves are 1 - 3 cm long with exceptionally long petioles. The flowers occur in the angles of the leaves and the seeds are small and brown or black. The spikes are not bristly.

**Distribution:** It is a tropical plant but also grows in temperate places. It is common in open waste places and can grow in arid places.

**Use:** The young leaves and seeds are cooked and eaten. The harvested leaves can only be stored for 2 - 3 days.

**Cultivation:** It can be grown from seed or cuttings. Seeds grow easily.



**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	87.3	-	4.5	72	169	6.0	-

## Leafy greens

**English:** Lotus-seed herb

**Scientific name:** *Alternanthera sessilis*

**Local:**

**Plant family:** AMARANTHACEAE

**Description:** A low lying and spreading plant which has many branches. It continues to grow from year to year. It has a strong taproot. The stem and branches are up to 60-100 cm long and near the ends there are 2 lines of hairs along the stem. The leaves are smooth and attached to the stem without a stalk. They are opposite. The leaves are 1-10 cm long and 0.2-2 cm wide. The flowers heads are white and 5-7 mm long. They grow along the plant and do not have flower stalks. It flowers all year round. The fruit are oval and compressed on the side. The seed is about 1.5 cm across. When plants are growing in water the stems become hollow and the plants float.



**Distribution:** A tropical plant. It grows in the lowlands and the highlands. It occurs in most tropical places. It is common in waste land at low and medium altitudes in the Philippines. It grows in open moist places from sea level to 2,000 m in Papua New Guinea. In Fiji it grows from sea level to 500 m. In Nepal it grows to 2,400 m altitude. It can grow in arid places. It is best in alkaline soil. It can grow in seasonally water logged soils and near rivers and ditches.

**Use:** The leaves and tender tips are cooked and eaten. They are used in soups. It is also used to prepare a cool drink. The harvested leaves can only be stored for 2-3 days.

**Cultivation:** It can be grown by dividing the underground stem. It can also be grown from sections which root at then nodes. It can be grown by seed.

**Production:** The first harvest of leaves can be taken 50-60 days 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
leaf	89.3	109	4.5	57	77	-	-
shoot	-	-	5.0	577	-	16.7	-

Image sourced from: commons.wikimedia.org

## Leafy greens

**English:** Sticky cleome

**Local:**

**Scientific name:** *Cleome viscosa*

**Plant family:** CLEOMACEAE

**Description:** An erect annual herb about 0.3 to 1 m tall. It is sticky and has a rank smell. The leaves are made up of 3 - 5 leaflets each 1 - 3 cm long. The flowers are in leafy groups at the end of branches. The flower stalks are less than 1 cm long. The petals are yellow and 7 - 8 mm long. The fruit is a narrow capsule and gradually tapers near the tip. The stems and seed pods are hairy. The seeds are round, black and 1 mm across.



**Distribution:** It is a tropical plant found in waste places at low and medium altitudes. It is damaged by drought and frost. It can grow in arid places. It restricts the germination and growth of Pearl millet.

**Use:** The leaves are edible when cooked. The young fruit are eaten candied. Roasted seeds are used in curries and pickles. Seed oil is used for cooking. The leaves are soaked, fermented and used as a spice.

**Cultivation:** Plants are 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
leaf	80.4	-	5.6	-	-	24	-

Image sourced from: [www.commonswikimedia.org](http://www.commonswikimedia.org)

## ***Fruit***

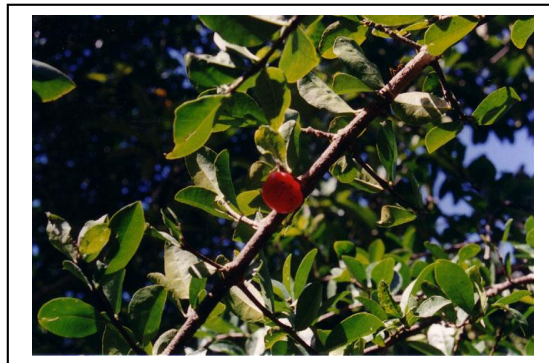
**English:** Barbados cherry

**Local:**

**Scientific name:** *Malpighia glabra*

**Plant family:** MALPIGHIACEAE

**Description:** A small evergreen tree or shrub that grows 5 - 7 m tall. It often has several trunks. The branches are spreading and often drooping. The leaves are opposite and oval to sword shaped. They are 2 - 8 cm long by 1 - 4 cm wide. They are dark green and glossy and can be wavy along the edge. The leaf stalk is short. The flowers have both sexes. The flowering stalks are short with 3 - 5 pinkish-red flowers that are 1 - 2 cm across. The fruit is bright red. And 1 - 2 cm across with has several small triangular seeds. The fruit resemble a common cherry, but is has 3 grooves and 3 seeds. The fruit are carried on the outside of the tree.



**Distribution:** A tropical and sub-tropical plant that suits the hot, tropical lowlands. It grows on sandy soils and in seasonally drier regions. Rainfall during flowering and fruiting improves fruit quantity and size. They do best in a frost free site and need a well drained soil. They can tolerate frost and drought. They do best in warm to hot climates with temperatures of 30 - 32°C. It can grow in arid places and suits hardiness zones 9 - 12.

**Use:** The fruit are eaten fresh or used in juice. They can be used for wine. They can be used in jellies, jams and preserves. The sauce or puree can be used as a topping for cakes, puddings, ice cream or sliced bananas.

**Caution:** It can produce an allergic reaction similar to that of latex.

**Cultivation:** They can be grown from hardwood cuttings or budded onto seedlings. They can also be grown by ground layering or from seed, although seed germinate poorly. A spacing of 3 - 4 m is suitable. Cross pollination is needed for good fruit production.

**Production:** Trees bear in 3 - 4 years and can continue for 15 years. Flowering normally follows periods of rainfall. There can be several flowering and fruiting periods per year. Flowers are pollinated by insects and fruit can ripen in 3 - 4 weeks. Fruit lose their flavour and nutritional value rapidly after harvest. They should be picked and eaten within a few hours. Individual trees can yield 15 - 30 kg of fruit per year.

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

<b>Edible part</b>	<b>Moisture %</b>	<b>Energy kJ</b>	<b>Protein g</b>	<b>proVit A µg</b>	<b>proVit C mg</b>	<b>Iron mg</b>	<b>Zinc mg</b>
fruit	83.2	163	1.8	800	2100	0.8	-

## Fruit

**English:** Wild custard apple

**Local:**

**Scientific name:** *Annona senegalensis*

**Plant family:** ANNONACEAE

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



**Distribution:** A tropical plant. It grows in the lowlands. It is found throughout Africa. It grows in tropical and warm regions. It grows in semi arid to sub humid regions. It grows in the Sahel. The young trees need light shade. They need well drained soil. It is a tree of the savannah regions. It grows in the lowlands. It is best with a temperature range of 17-30°C and a rainfall of 700-2,500 mm per year. It can grow in arid places. It 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](http://www.prota4u.info)

## Fruit

**English:** Pawpaw

**Local:**

**Scientific name:** *Carica papaya*

**Plant family:** CARICACEAE

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



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

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

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

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

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

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

## Fruit

**English:** Guava

**Local:**

**Scientific name:** *Psidium guajava*

**Plant family:** MYRTACEAE

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



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

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

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

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

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

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

## Fruit

**English:** Indian jujube

**Local:**

**Scientific name:** *Ziziphus mauritiana*

**Plant family:** RHAMNACEAE

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



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

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

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

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

**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	77.0	360	0.8	21	71	0.4	0.4

## 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	0.3

## Fruit

**English:** Large Sourplum

**Local:**

**Scientific name:** *Ximenia caffra*

**Plant family:** OLACACEAE

**Description:** A shrub or small tree. It grows to 8 m tall. It has many spines. Young stems can be very hairy. The bark is grey or brown. It is smooth at first but then becomes rough and cracked along its length. The young twigs are covered with fine red hairs. The leaves are simple and alternate. They vary in shape. They are 2.5-6 cm long and 2 cm wide. They are densely hairy at first. They become shiny green and smooth with age. The leaves narrow to the base and are on short leaf stalks. The lower leaf surface is more pale than the upper surface. The leaves tend to fold inwards. The flowers develop as long green buds in the axils of the leaves. These open to 4 petalled green, hairy flowers.



The flowers are either on their own or in a bunch from the same point. They are small and white. They have a sweet scent and are 1.3 cm long. The fruit are oval and 2.5-3 cm long. They are greenish when young and become bright red when ripe. They are edible. They contain one woody seed. (The large leaves, fewer spines, more solitary flowers and red fruit help distinguish this plant from the variety *americana*.)

**Distribution:** A tropical plant. It grows on rocky woodlands from 5 m to 2,000 m above sea level. It suits dry areas. It can tolerate drought. It can grow in arid places.

**Use:** The fruit are eaten ripe either fresh or dried. The flavour is best when the fruit are over-ripe. They can be used for jelly and marmalade. They are used for drinks and in porridge. The seeds are eaten.

**Cultivation:** Plants can be grown from seed or suckers. To collect seed fruit are collected when soft then left to dry in the sun before removing the seed. Seed are best sown fresh. Seed germinate quickly and easily. Seed lose their viability after 3 months.

**Production:** Plants are slow growing. They can be topped or pruned. Plants will regrow when cut back.

**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	77.4	374	1.9	-	68.2	0.5	0.3

Image sourced from: [www.commonswikimedia.org](http://www.commonswikimedia.org)

## Fruit

**English:** Banana

**Scientific name:** *Musa sp* (A &/or B genome) cv.

**Local:**

**Plant family:** MUSACEAE

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



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

**Use:** Fruit are eaten raw or cooked depending on variety. Male buds and flowers are eaten on some varieties. They are cooked as a vegetable. The central pith of the false stem and the underground rhizome are also sometimes eaten.

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (cooking)	65.3	510	2.0	113	18.4	0.6	0.1
fruit (sweet)	70.7	365	1.7	-	2	0.9	0.4
flower buds	91.3	109	1.6	-	-	1.0	-

## Vegetables

**English:** African Cabbage

**Local:**

**Scientific name:** *Brassica carinata*

**Plant family:** BRASSICACEAE

**Description:** A cabbage family herb. The leafy form grows for 3-4 years. It is 2 m tall. The stem is 2 cm across. The stem is usually without hairs but is waxy. It is grey green but with purple blotches. It has many branches which hang down. They are above 30 cm on the stalk. The leaves are light green and stalked. They vary a lot in shape. The leaves become smaller and with less lobes nearer the flower. The flower is yellow and occurs in branched flower stalks. The fruit are pods which are up to 65 mm long and 8 mm wide. They hang downwards. The seeds are 1-2.5 mm across and vary in shape and colour. They are reddish brown.



**Distribution:** A tropical plant. It occurs in the highlands of Ethiopia and Kenya. It has been introduced to other countries. It will grow on most agricultural soils. It needs a cool climate (15-20°C) and requires a sunny position. It is mostly grown between 1500-2500 m altitude in tropical regions. It can grow with a rainfall of 200-500 mm but is usually sown at the beginning of the rains.

**Use:** The seeds are cooked whole. They are used to make a mustard. The young leaves are cooked. They are also used in salads. The flower buds and young shoots are eaten raw. The seed produces a good quality cooking oil. (It has a mustard taste unless refined)

**Cultivation:** It is grown from seed. Seed germinate and come up in about 3 days. Leafy kinds do best on fertile well drained soils. For leafy kinds seed is sown into a fine well prepared seed bed and transplanted after 6 weeks. Plants can be established from cuttings. For leafy kinds a spacing of 50 x 50 cm is suitable. Oil seed kinds are sown more closely with about 500,000 plant per hectare.

**Production:** Leaf yields can be 4800 kg per hectare. Much higher yields are possible with intensive production. Leaf harvest can occur after 47 days under best conditions.

**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	86.1	3.5	-	157	1.3	0.9

## Vegetables

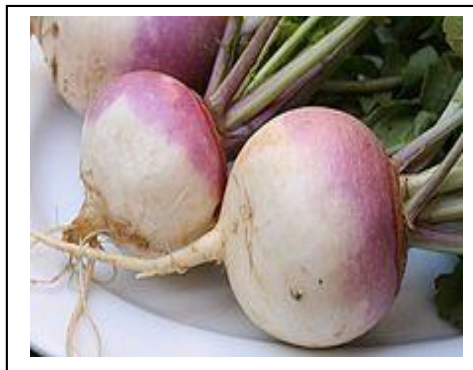
**English:** Turnip

**Local:**

**Scientific name:** *Brassica rapa*

**Plant family:** BRASSICACEAE

**Description:** A cabbage family herb. It is an erect annual plant. It has a round white fleshed taproot, which may be tinged purple. The leaves are divided and have hairs. Where the leaves join the root it is not raised into a "neck". There are Asian or more tropical varieties. These will produce seed in warmer places. The wild form is a thin plant with leaves that clasp the stem. The pods are 4-6.5 cm long and have seedless beaks 2-3.2 cm long.



**Distribution** It will grow in both the lowlands and highlands in the tropics but does best in the highlands between 1,700-2,600 m altitude. In Java it can be grown above 1,000 m above sea level. It is frost resistant. A temperature of 9-16°C is best. Also short day length and cool weather are important. It grows in Nepal to 2500m altitude. It suits hardiness zones 9-11.

**Use:** The swollen root is cooked and eaten. The leaves can be eaten. The seeds can be ground to a powder and used as a seasoning.

**Cultivation:** It is grown from imported seed. In the lowlands they are best grown in the shade. Plants are spaced 10-15cm apart. This can be achieved by thinning out plants.

**Production:** The roots are ready after 8-10 weeks. They need to be harvested when young to avoid becoming hard and fibrous.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	90	117	3	46	139	1.9	-
root	90	113	0.9	-	21	0.3	-

Image sourced from <http://en.wikipedia.org/wiki/Turnip>

## Vegetables

**English:** Capsicum

**Local:**

**Scientific name:** *Capsicum annuum* var. *annuum*

**Plant family:** SOLANACEAE

**Description:** An annual plant that grows up to 1.5 m tall. The leaves can be long and sword shaped or oval to rounded. The leaves can be 12 cm long. The flowers are produced singly, and are yellow or white. They are bell shaped. The flowers are 1.5 cm across and in the axils of leaves. Fruit are hollow and about 10 cm long and 6 cm wide and red when fully ripe. They contain many seeds. Kinds with different shaped fruit also occur.



**Distribution:** A tropical or subtropical plant. Plants grow from sea level up to about 2,400 m altitude. They are killed by frost. Soils need to be well drained and fertile. The fruit and plants can rot in the middle of the wettest seasons. They need a temperature above 4°C. A night temperature of 16 - 18°C and a day temperature of 26 - 28°C is best. A soil pH of 5.4 - 6.9 is suitable. They suit plant hardiness zones 8 - 12.

**Use:** The fruit are edible raw or cooked. They are stuffed, roasted, fried, preserved and used as flavouring. The leaves are edible when cooked.

**Cultivation:** Plants are grown from seed. Both self and cross pollination occur. It is possible to save seed. Seed will keep for 2 - 3 years. Seeds germinate in 6 - 10 days. Plants can be transplanted and need to be about 50 cm apart. About 50% of flowers set fruit.

**Production:** The first fruit can be harvested after 3 - 4 months.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (yellow raw)	92	113	1.0	24	183.5	0.5	0.2
fruit (green raw)	93.5	65	0.9	59	100	0.4	0.2
fruit (green boiled)	93.7	59	0.9	59	60	0.4	0.2

## Vegetables

**English:** Jute

**Local:**

**Scientific name:** *Corchorus olitorius*

**Plant family:** MALVACEAE

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



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

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

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

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

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

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

## Vegetables

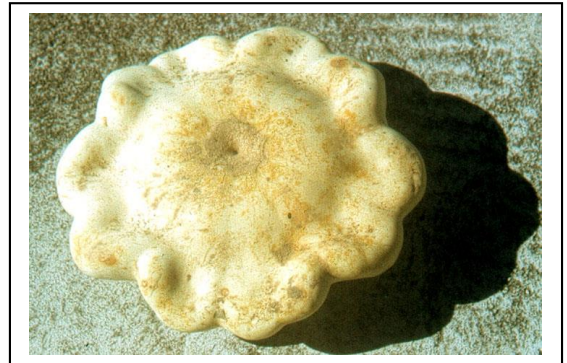
**English:** Marrow

**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:** Wild Rhubarb

**Local:**

**Scientific name:** *Digera muricata*

**Plant family:** AMARANTHACEAE

**Description:** An annual herb. It grows 20-50 cm high. The leaf blade is narrowly oval. It lies over. It is branched from the base. The leaves are alternate. It is 2-6 cm long by 6-30 mm wide. The flowers are white or pink. They are small and long slender flower stalks. The fruit have one seed.

**Distribution:** A tropical plant. In Pakistan it grows up to 1,500 m altitude. In Kenya it grows between sea level and 1,500 m altitude. It can grow in dry savannah and semi-desert and moist locations.

**Use:** Leaves are boiled and eaten as a vegetable. They are seasoned with salt and chilli or used in curries. The nectar is sucked out of the flowers.



**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	83.8	-	4.3	-	-	17.7	0.6

Image sourced from: [www.flickr.com](http://www.flickr.com)

## Vegetables

**English:** Bitter cucumber

**Local:**

**Scientific name:** *Momordica charantia*

**Plant family:** CUCURBITACEAE

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



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

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

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

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

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

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

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

## Nuts, seeds, herbs and other foods

**English:** Sesame

**Local:**

**Scientific name:** *Sesamum indicum*

**Plant family:** PEDALIACEAE

**Description:** A small, upright annual plant. It is erect and very branched and grows 1 - 2 m tall. The stem is stout, 4 sided and furrowed along its length. It is densely covered with fine, downy, glandular hairs that vary in shape. The lower leaves have long stalks and are spear shaped, often with lobes or a toothed edge. The leaf stalks are 3 - 11 cm long. The leaf blade is 4 - 20 cm long by 2 - 10 cm wide. Upper leaves are narrow and oblong. They are 0.5 - 2.5 cm wide. The flowers are pink and white. They occur in the axils of upper leaves, either on their own, or in groups of 2 or 3. They can be white, pink, purplish and with yellow spots and stripes. The fruit can be smooth or rough and there are 2 chambers in the capsule. The fruit are brown or purple. They are oblong and deeply grooved. The seeds are small and oval. They are 3 mm by 1.5 mm and vary in colour from white, yellow, grey, red, brown or black. The fully ripe pods burst open.



**Distribution:** A tropical plant that suits the hot, dry, semi-arid tropics and sub-tropics. It can tolerate short periods of drought once established. It needs a temperature of 20 - 24°C in early growth then 27°C for ripening. It grows from sea level to about 1,200 m in areas with an annual rainfall of 400 - 1000 mm. Soils need to be well drained. It is very intolerant of water-logging. It cannot stand high humidity and needs frost free conditions. It needs a dry period for seed drying. It does not like acid soils. It grows in open sunny places. It can grow in arid places.

**Use:** The seeds are eaten. They are used in soups or fried or boiled. They are used in tahini and hummus. Seeds are eaten in the form of sweetmeats. Roasted seeds are used in pickles. They are also put on bread. Oil from the seeds is used in cooking and on salads. The refuse from the seed after the oil has been extracted is boiled in water and made into soup.

**Cultivation:** Plants are grown from seed. Seed will not germinate below 21°C. Seeds are broadcast on well prepared land and then harrowed in using feet or a light harrow. Plants can be thinned or weeded during early growth to produce a better crop. Seeding rates of 9 - 11 kg/ha are used. Plants are spaced 2 - 15 cm apart and in rows placed at 20 - 45 cm apart. Some varieties shatter easily.

**Production:** Yields of 340 - 500 kg/ha are average. Plants reach maturity in 80 - 180 days. Crops are harvested as the leaves begin to drop. Plants are cut and stooked or dried in racks. The hull is removed by soaking in water overnight, then partly dried and rubbed against a rough surface.

**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)	4.7	2397	17.7	1	0	14.6	7.8
leaf (raw)	85.5	188	3.4	-	-	-	-

## Nuts, seeds, herbs and other foods

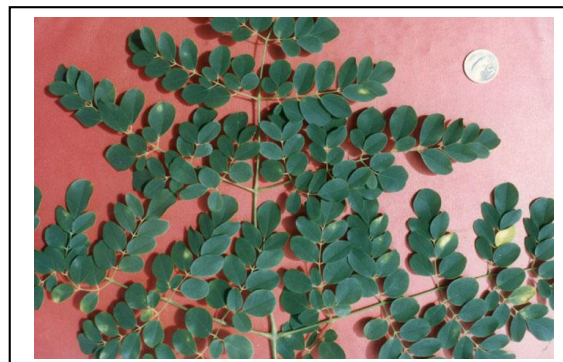
**English:** Horseradish tree

**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:** African pumpkin

**Local:**

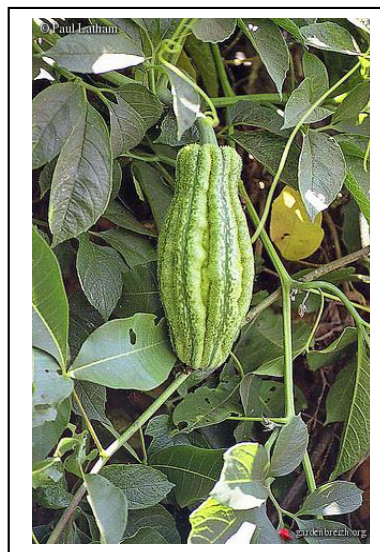
**Scientific name:** *Telfairia pedata*

**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/galleries.html> © Paul Latham

## Nuts, seeds, herbs and other foods

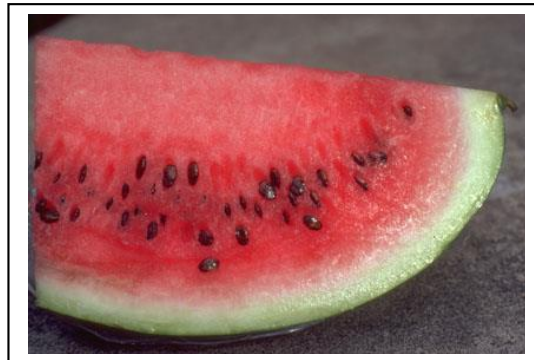
**English:** Watermelon

**Local:**

**Scientific name:** *Citrullus lanatus*

**Plant family:** CUCURBITACEAE

**Description:** An annual climber, with deeply divided leaves and tendrils along the vine. It trails over the ground and has hairy, angular stems. The leaves are on long leaf stalks. The leaves are deeply divided along their length. These leaf lobes are rounded and can themselves be divided. The leaves are 5 - 20 cm long by 2 - 12 cm across. The tendrils are divided. The plant has separate male and female flowers on the same plant. The flowers are pale yellow and smaller than pumpkin flowers. The flowers occur in the axils of leaves. The male flowers appear first. Fruit are large and round or oval. They can be 60 cm long. Fruit have a hard smooth skin. Several fruit colours and shapes occur. They often have a dark green mottle, or blotches. The fruit has reddish, juicy flesh and black or red seeds. The seeds are oval-shaped and smooth.



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

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

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

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

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	94.0	92	0.4	20	5	0.3	0.1
seed	5.1	2330	28.3	0	0	7.3	10.2

## Nuts, seeds, herbs and other foods

**English:** Okra

**Local:**

**Scientific name:** *Abelmoschus esculentus*

**Plant family:** MALVACEAE

**Description:** A tropical annual herb that grows erect, often with hairy stems. It mostly grows about 1 m tall but can be 3.5 m tall. It becomes woody at the base. The leaves have long stalks up to 30 cm long. Leaves vary in shape but are roughly heart shaped with lobes and teeth along the edge. Upper leaves are more deeply divided than lower ones. The flowers are yellow with red hearts. The fruits are green, long and ribbed. The seeds are 4 - 5 mm across. They are round and dark green.



**Distribution:** A tropical plant that suits the hot humid tropical lowlands but is unsuited to the highlands. It is very sensitive to frost. It can grow in salty soils. It grows best where temperatures are 20 - 36°C. It can grow well in dry climates with irrigation. It suits hot humid environments. It does best on well drained well manured soils but will grow on many soils. A soil pH of 5.5 - 7.0 is best.

**Use:** Pods are eaten cooked. They are slimy, but less so if fried. Dried powdered seeds can be used in soups as a thickener. They can also be pickled. Young leaves can be eaten cooked. They can be dried and stored. Flowers can also be eaten. Okra is frozen and canned. The seeds are roasted and used as a coffee substitute.

**Cultivation:** They are grown from seeds, which are easy to collect. They need high temperatures for germination (over 20°C) and a sunny position. Often seeds are soaked for 24 hours before sowing to give quick germination. Seeds are sown 1.5 - 2.5 cm deep with 2 - 3 seeds per hole. Later these are thinned out to one plant. Seeds can be sown in nurseries and plants transplanted. Pinching out the tops of plants when 30 cm high encourages branching. A spacing of about 90 x 45 cm is suitable. About 8 - 10 kg of seed are required for one hectare. Most kinds respond to fertiliser. Seeds do not breed true and can cross with other kinds of okra growing nearby. This is not normally a problem but simply means plants and fruit are not all the same.

**Production:** Plants maintain production if the fruits are harvested regularly. Plants are ready to harvest 8 - 10 weeks after sowing. Seed yields of 500 - 800 kg per hectare are recorded. Pod yields of 4 - 6 tonnes per hectare occur. It takes 2 - 4 months from sowing to harvest of young pods. Pods develop 5 - 10 days after flowering. Pod harvests can continue for 1 - 2 months. Leaving pods on the plants stops new pods developing.

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

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.2	1721	23.7	-	-	-	-
leaf	81.0	235	4.4	116	59	0.7	-
pod (fresh)	88.0	151	2.1	185	47	1.2	-
fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6

## Nuts, seeds, herbs and other foods

**English:** Bird's eye chillies

**Scientific name:** *Capsicum frutescens*

**Local:**

**Plant family:** SOLANACEAE

**Description:** It is a shrubby, perennial plant growing about 1 m tall. The leaves are smaller than round capsicums or bell peppers. Two or more flowers occur together in the axils of leaves. They have small pointed fruit about 1 - 2 cm long and they are red when ripe. They have a very hot taste when eaten or touched on the lips.



**Distribution:** It is grown in most tropical countries. It grows from sea level up to about 1,800 m altitude in the equatorial tropics. It can't tolerate water-logging or frost. It tolerates high temperatures and a wide range of rainfall. Very high rainfall leads to poor fruit set and rotting of fruit. Soil needs to be well-drained and, preferably, fertile with adequate organic material. Light, loamy soils rich in lime are best. It suits hardiness zones 10 - 12.

**Use:** The leaves are eaten for their mild, spicy taste. The leaves are eaten cooked. The fruit can be used in very small quantities to spice food. The small, red fruit are very hot to eat due to a chemical called capsaicin. They are used to add spice and flavour to other foods. It would not be appropriate to eat sufficient of Bird's eye chilli fruit to significantly affect nutrition.

**Cultivation:** The seeds are dried in the sun. They are small. For large-scale plantings, 1.8 - 2.3 kg/ha of seed is needed. Seed is best sown in nurseries and the seedlings transplanted when they have 4 - 5 leaves (after 3 - 4 weeks). They can be transplanted at about 0.8 m spacing. Pruning out the tops can increase branching. This is often done 10 days before transplanting. Excessive nitrogen can reduce fruit setting.

**Production:** The first picking of fruit can occur 3 months after planting and continue about every two weeks. Plants continue to be harvested for about 4 - 5 years before replanting. For dried chillies, the fruit are dried in the sun for 3 - 15 days. The fresh weight is reduced by about two thirds during drying. Yields of dry chillies can be from 300 - 2,500 kg/ha depending on growing conditions, irrigation, etc.

**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	74.0	395	4.1	7140	121	2.9	-

## Nuts, seeds, herbs and other foods

**English:** Coastal almond

**Local:**

**Scientific name:** *Terminalia catappa*

**Plant family:** COMBRETACEAE

**Description:** A large tree, up to 25 - 40 m tall. It loses its leaves during the year. The trunk can be straight or twisted. There can be buttresses up to 3 m tall. The branches lie horizontally and come out in layers. The leaves are long, smooth and shiny, with an abrupt point at the tip and a rounded base. Leaves tend to be near the ends of branches. Leaves can be 17 - 29 cm long and 10 - 15 cm wide. Young leaves have soft hairs. The leaves turn red and fall off twice a year. Flowers are greenish-white and in a spike at the end of the branches. The lower flowers on a spike are female, and the others are male. The fruit is about 6 cm long by 3 - 4 cm wide, thick and flattened, with a flange around the edge. The fruit are green and turn red when ripe. The pulp is edible.



**Distribution:** It grows on beaches in almost all tropical countries in the world, including Solomon Islands. It is a tropical plant, and sometimes cultivated as a shade tree. The tree is common in lowland areas particularly on sandy or rocky beaches. Seeds are spread by bats and sea water, as well as being planted by people. It is common along streets in coastal towns. It will grow from sea level up to about 800 m altitude. Plants are frost-susceptible. It can tolerate drought. It suits hardiness zones 11 - 12.

**Use:** The kernel of the fruit is eaten raw. An edible oil can also be extracted.

**Cultivation:** Plants can be grown from seed. Seeds can be stored dry for a year or more. Seeds germinate freely and most seeds grow. Insects can badly damage the leaves of young seedlings.

**Production:** It is fast growing. Nut production is seasonal.

**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 (fresh)	31	1810	15.9	-	4	4.6	4.9
nut (dry)	4.2	2987	20.0	-	2	6.3	8.8

## Nuts, seeds, herbs and other foods

**English:** Peanut

**Local:**

**Scientific name:** *Arachis hypogea*

**Plant family:** FABACEAE

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



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

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

**Use:** The seeds can be eaten raw 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	-

## Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	<i>Amaranthus viridis</i>	Green amaranth	leaf	87.3	-	4.5	72	169	6.0	-	34
AMARANTHACEAE	<i>Alternanthera sessilis</i>	Lotus-seed herb	leaf	89.3	109	4.5	57	77	-	-	35
AMARANTHACEAE	<i>Digera muricata</i>	Wild Rhubarb	leaf	83.8	-	4.3	-	-	17.7	0.6	50
ANNONACEAE	<i>Annona senegalensis</i>	Wild custard apple	fruit	77.2	329	1.7	-	18.1	0.7	0.3	38
APOCYNACEAE	<i>Leptadenia lancifolia</i>		leaf	81.0	226	4.9	4915	78	5.4	-	31
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	13
ARACEAE	<i>Xanthosoma sagittifolium</i>	Chinese taro	root	67.1	559	1.6	5	13.6	0.4	0.5	15
BRASSICACEAE	<i>Brassica carinata</i>	African Cabbage	leaf	88	86.1	3.5	-	157	1.3	0.9	45
BRASSICACEAE	<i>Brassica rapa</i>	Turnip	root	90	113	0.9	-	21	0.3	-	46
CARICACEAE	<i>Carica papaya</i>	Pawpaw	fruit	88.0	163	0.5	290	54	0.4	0.18	39
CHENOPODIACEAE	<i>Chenopodium album</i>	Fat hen	leaf (boiled)	88.9	134	3.2	391	37.0	0.7	0.3	16
CLEOMACEAE	<i>Cleome viscosa</i>	Sticky cleome	leaf	80.4	-	5.6	-	-	24	-	36
COMBRETACEAE	<i>Terminalia catappa</i>	Coastal almond	nut (fresh)	31	1810	15.9	-	4	4.6	4.9	58
CONVOLVULACEAE	<i>Ipomoea batatas</i>	Sweet potato	tuber(boiled)	72.0	363	1.1	787	15	0.6	0.3	20
CUCURBITACEAE	<i>Cucurbita pepo</i>	Marrow	yellow fruit	92.0	97	1.0	180	8	1.4	-	49
CUCURBITACEAE	<i>Momordica charantia</i>	Bitter cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	51
CUCURBITACEAE	<i>Telfairia pedata</i>	African pumpkin	seed	2.8	2821	22.9	-	-	6.2	1.6	54
CUCURBITACEAE	<i>Citrullus lanatus</i>	Watermelon	seed	5.1	2330	28.3	0	0	7.3	10.2	55
DIOSCOREACEAE	<i>Dioscorea bulbifera</i>	Potato yam	tuber	70.8	357	2.7	-	78	3.1	0.4	19
FABACEA	<i>Glycine max</i>	Soybean	seed	9.0	1701	33.7	55	-	6.1	-	28
FABACEAE	<i>Vigna subterranean</i>	Bambara groundnut	seed	-	1572	18.4	-	-	-	-	18
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed (young, boiled)	71.8	464	6.0	2	28.1	1.6	0.8	22
FABACEAE	<i>Canavalia gladiata</i>	Sword bean	seed	15.0	1335	27.1	-	-	-	-	23
FABACEAE	<i>Mucuna pruriens</i>	Velvet Bean	seed	7.29	-	29.32	-	4.78	-	-	24
FABACEAE	<i>Pachyrhizus erosus</i>	Yam bean	tuber	89.0	160	1.0	2.0	20	0.6	0.2	25
FABACEAE	<i>Vigna unguiculata subsp. Unguiculata</i>	Cowpea	young pod + seed (boiled)	89.5	142	2.6	45	17.0	0.7	0.2	26
FABACEAE	<i>Sesbania grandiflora</i>	Sesbania	leaf	82.3	323	8.7	66	60	4.0	-	27
FABACEAE	<i>Senna occidentalis</i>	Coffee senna	leaf	9.98	-	31.7	-	-	3.1	-	33
FABACEAE	<i>Arachis hypogea</i>	Peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	59
MALPIGHIACEAE	<i>Malpighia glabra</i>	Barbados cherry	fruit	83.2	163	1.8	800	2100	0.8	-	37
MALVACEAE	<i>Hibiscus sabdariffa</i>	Roselle	leaf	86.4	185	10.9	58	35	1.5	4.1	31
MALVACEAE	<i>Hibiscus trionum</i>	Flower-of-an-hour	leaf	6.3	1263	26.7	-	-	79.8	5.7	30
MALVACEAE	<i>Corchorus olitorius</i>	Jute	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	48
MALVACEAE	<i>Abelmoschus esculentus</i>	Okra	fruit(cooked)	90.0	134	1.9	58	16.3	0.5	0.6	56
MORINGACEAE	<i>Moringa oleifera</i>	Horseradish tree	leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2	53
MUSACEAE	<i>Musa sp (A &amp;/or B genome) cv.</i>	Banana	fruit (sweet)	70.7	365	1.7	-	2	0.9	0.4	44
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	40
OLACACEAE	<i>Ximenia caffra</i>	Large Sourplum	fruit	77.4	374	1.9	-	68.2	0.5	0.3	43
PEDALIACEAE	<i>Sesamum indicum</i>	Sesame	seed (dry)	4.7	2397	17.7	1	0	14.6	7.8	52

POACEAE	<i>Eleusine coracana</i>	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	17
PORTULACACEAE	<i>Portulaca oleracea</i>	Purslane	leaf	82.2	108	3.1	54	20	0.8	1.5	32
RHAMNACEAE	<i>Ziziphus mauritiana</i>	Indian jujube	fruit	77.0	360	0.8	21	71	0.4	0.4	41
RHAMNACEAE	<i>Berchemia discolor</i>	Bird plum	fruit	78.8	305	1.1	-	50.3	2.2	0.3	42
SOLANACEAE	<i>Capsicum annuum</i> <i>var. annuum</i>	Capsicum	fruit (yellow raw)	92	113	1.0	24	183.5	0.5	0.2	47
SOLANACEAE	<i>Capsicum frutescens</i>	Bird's eye chillies	fruit	74.0	395	4.1	7140	121	2.9	-	57



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