Food Plants of Dire Dawa, Ethiopia

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Solutions to Malnutrition and Food Security

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

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Food Plants of Dire Dawa, Ethiopia

Dedication

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

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

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Food Plant Solutions Field Guide – Dire Dawa, Ethiopia, Version 1 (English), Apr 2025

Preface

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

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

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

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

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

Potentially Important Food Plants of Dire Dawa, Ethiopia has been produced to provide information on approximately 50 edible plants that are known to grow in the Dire Dawa region. These plants come from all the major food groups and have been chosen because of their high nutritional value. Many of the plants in this book may be neglected and under-utilised plants. This means they may not be well known. However, because they are high in many beneficial nutrients, and they are already adapted to the environment, and therefore likely to require minimal inputs, they could be important food plants that are likely to be superior to imported foods and plants. Commercially grown plants may also be included in the book, but only if they are significant foods for household consumption. It is hoped people will become confident and informed about how to grow and use these plants as many local food plants provide very good quality food.

Markets and home or urban gardens

Some of the food plants included in this book require a large area of land to grow sufficient food for a family. Examples include grains (e.g. teff, wheat, rice) that are good sources of energy, and dry legumes (e.g. chickpea, soybean, lentil) that are good sources of protein. These foods are more likely to be purchased at local markets than grown in home or urban gardens. Plants more suited to home gardens that are featured in this book include potato, green pea, cabbage, mandarin, cucumber and garlic. Details for all plants include the plant description, cultivation and production practices and information about nutrition and uses.

Growing food

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

A country with very special plants

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

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

Getting to know plants

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

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

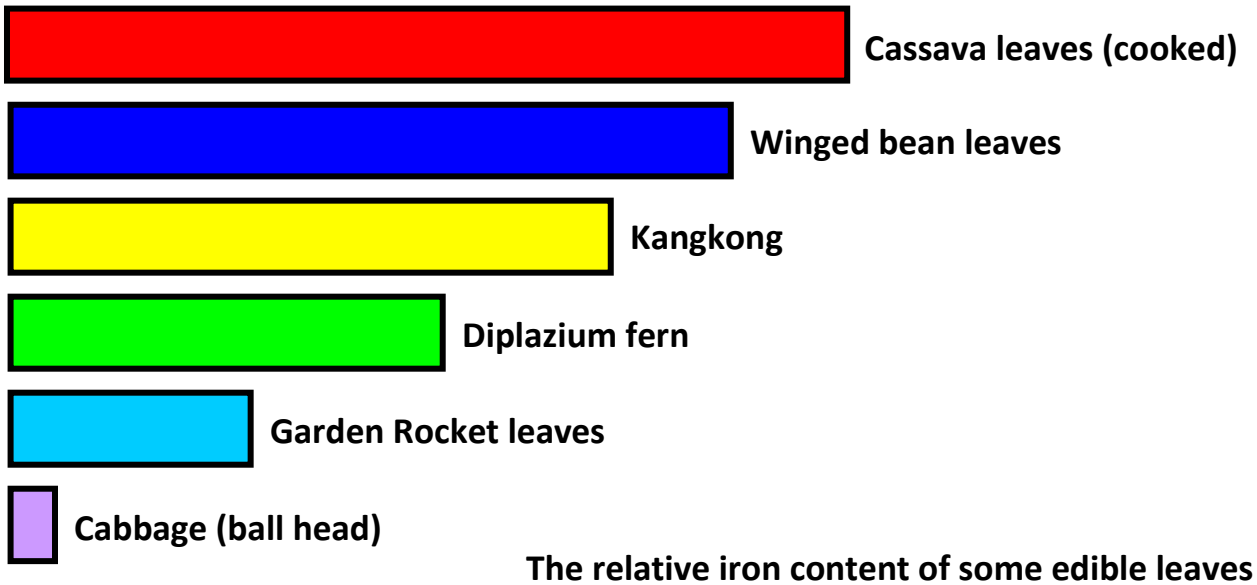
Naming of plants

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

Local food plants are often very good

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

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



The relative iron content of some edible leaves

A healthy balanced diet

Good nutrition, or eating a healthy balanced diet, is really very simple. If people eat a wide range of food plants, their bodies will normally get a balanced amount of all the different nutrients they

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

Learning to cook well

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

Learning to grow "wild" food plants

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

Saving better types of plants

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

Growing from cuttings and suckers

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

Saving seed

Some food plants are grown from seed. Sometimes this is very easy as the seeds are large, store well, grow easily and grow the same as the original plant. It is more difficult with other plants. Many large fleshy seeds, such as breadfruit, need to be planted while still fresh as they do not store easily. Other seeds do not "breed true" or do not grow into new plants that are the same as the original plants. For example, the fruit may not be as large or sweet or have the same colour or taste. With many of these plants, it may be necessary to find ways of growing them from cuttings or other methods such as grafting. Some plants "inbreed" and get smaller or poorer. This happens when a plant self-pollinates or receives pollen from a close relative. Corn grown in small plots normally does this and the plants grown from seed grown in this situation get smaller and smaller each year. The

seed needs to be saved from several different plants with different history and then mixed together before sowing. All the seeds on one cob are related and will inbreed. Some seeds develop a hard seed coat and need to be scratched, soaked in water, or even put into hot water, before they will start to grow. Saving local seeds is often a good idea as they are already adapted to local conditions. For example, seed saved from pumpkins grown locally will produce plants with less pest and disease damage than those grown from imported seed. *If you can't get seeds or planting material from local gardens – it is probably not a suitable local plant!*

Growing a garden of mixed plants

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

Different types of plants for food security

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

Looking after the soil

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

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

Building up the soil

When a new garden has been cleared, it has lots of leaf mulch and other old plant material. This provides plant nutrients for new plants to grow. There is a simple rule for growing plants and improving the soil - "If it has lived once, it can live again." Any old plant material can provide nutrients for new plants to grow, but it must be allowed to rot into mulch or compost for this to happen. If this plant material is burnt, some nutrients, especially phosphorus and potassium ("potash"), get left behind in the ashes for new plants to use, although it also allows these important nutrients to be lost by being washed away by rain. But with burning other important nutrients, such

as nitrogen and sulphur, get lost in the smoke and disappear from the garden and soil. These last two plant nutrients are especially important for growing green leaves and when their levels are low, plants grow small or pale green. When nitrogen is lacking, the old leaves of the plant go pale and fall off early, and when sulphur is lacking, the young leaves go pale. Wherever possible, old plant material should be covered with some soil to allow it to rot down and not simply dry out or get burnt.

Poor soils where crops won't grow

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

Soil nutrients

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

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

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

Making compost

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

whole process off. As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil.

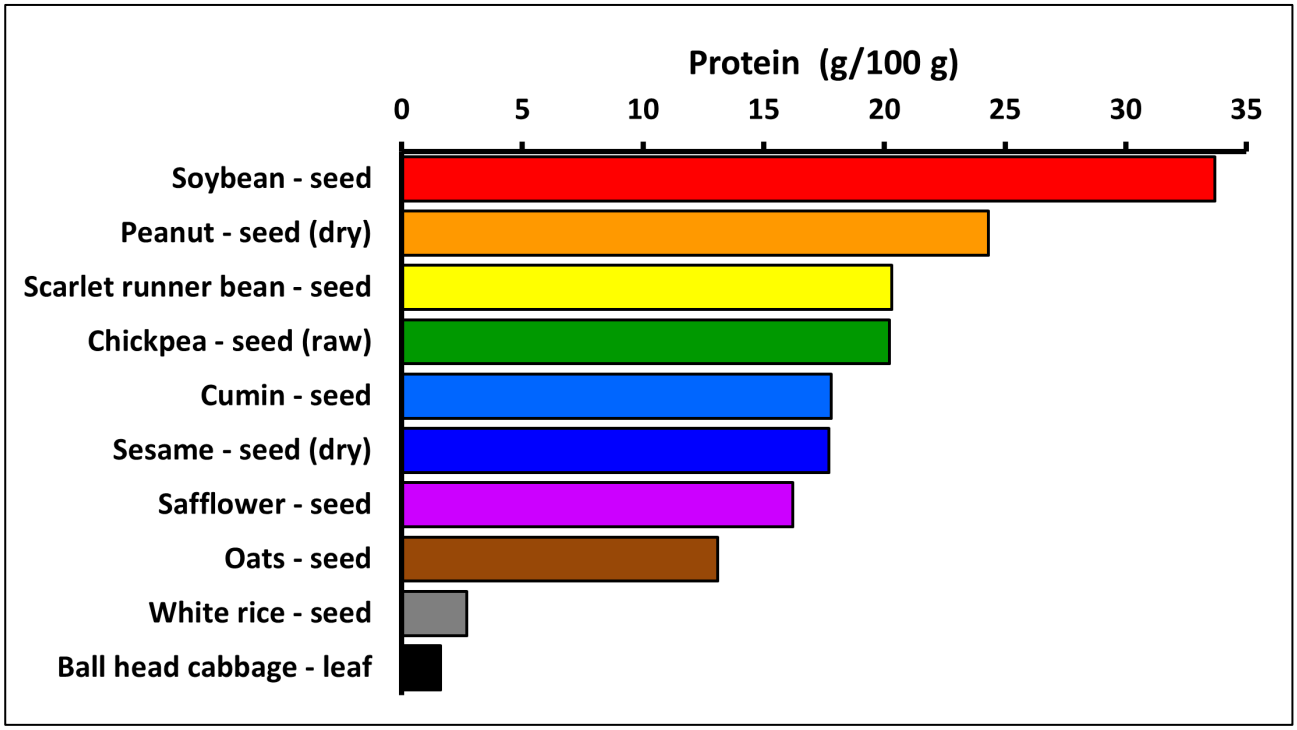
Pests

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

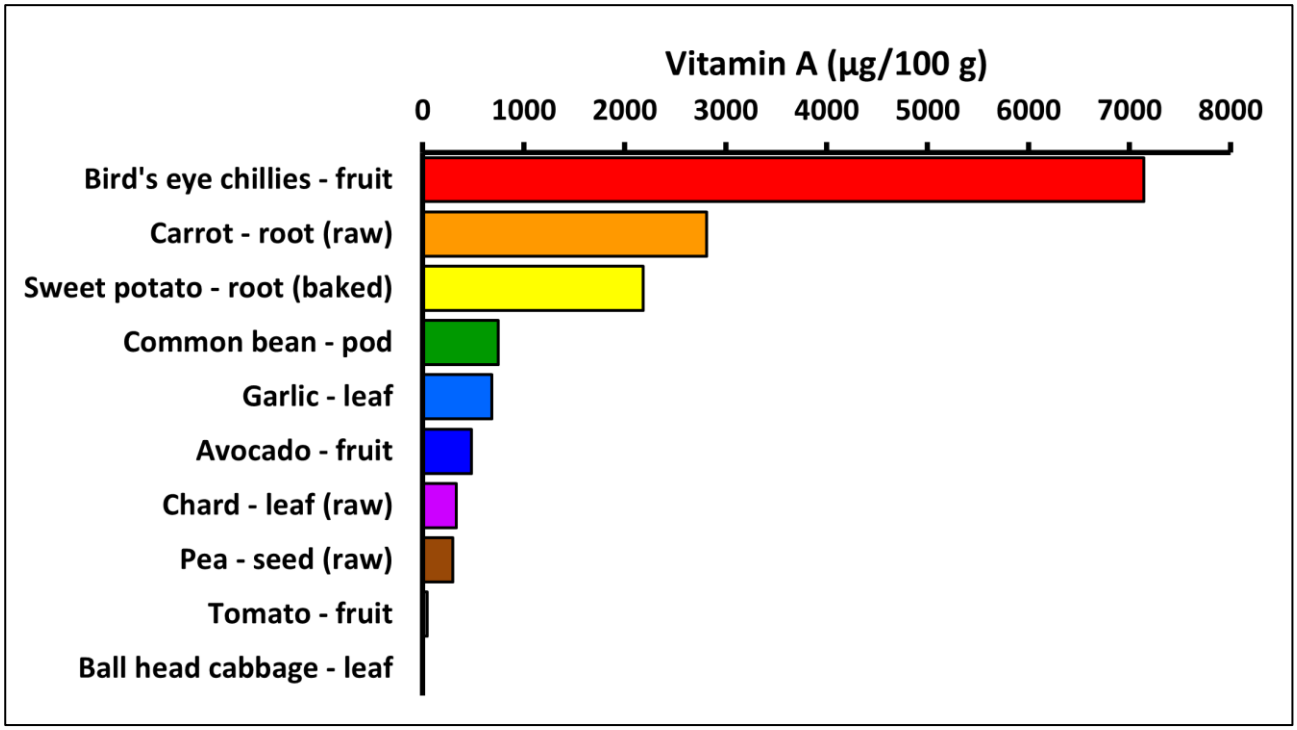
Diseases

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

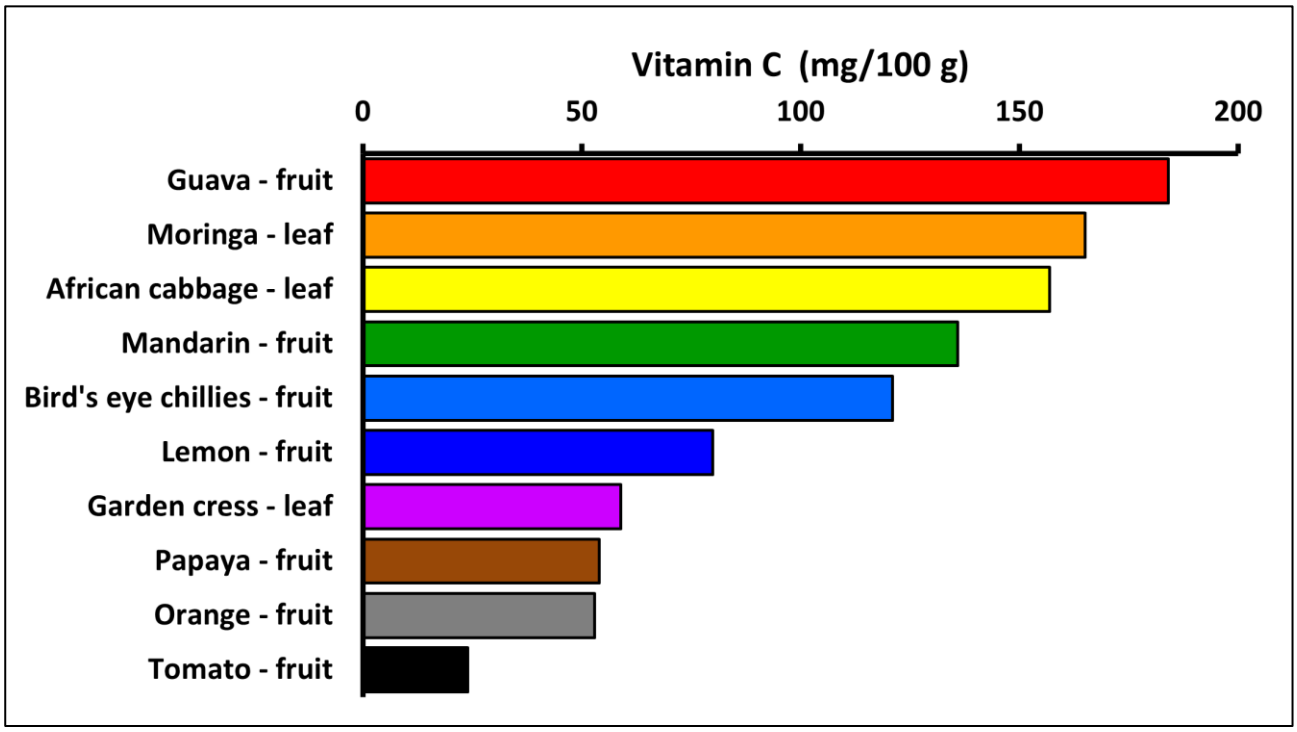
Food value charts for a selection of plants from Dire Dawa, Ethiopia



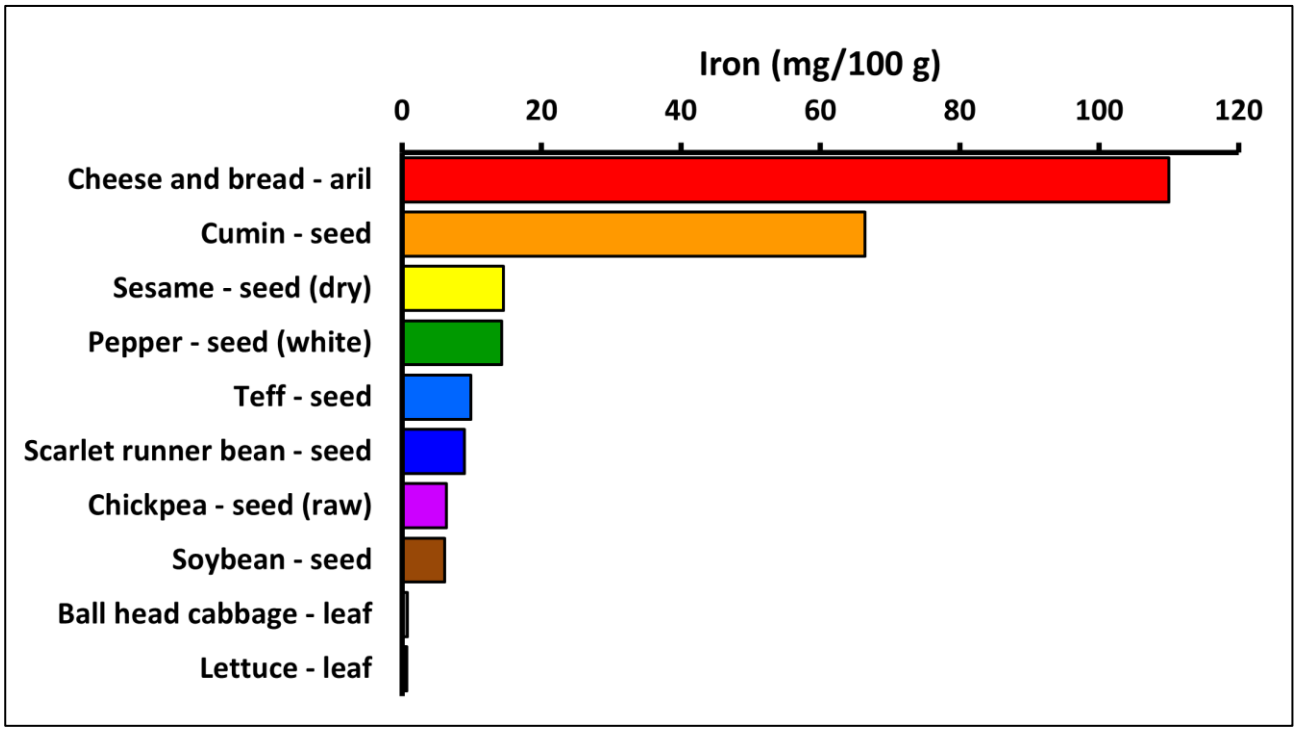
Protein helps the body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women. Symptoms of protein deficiency include wasting and shrinkage of muscle tissue, and slow growth (in children).



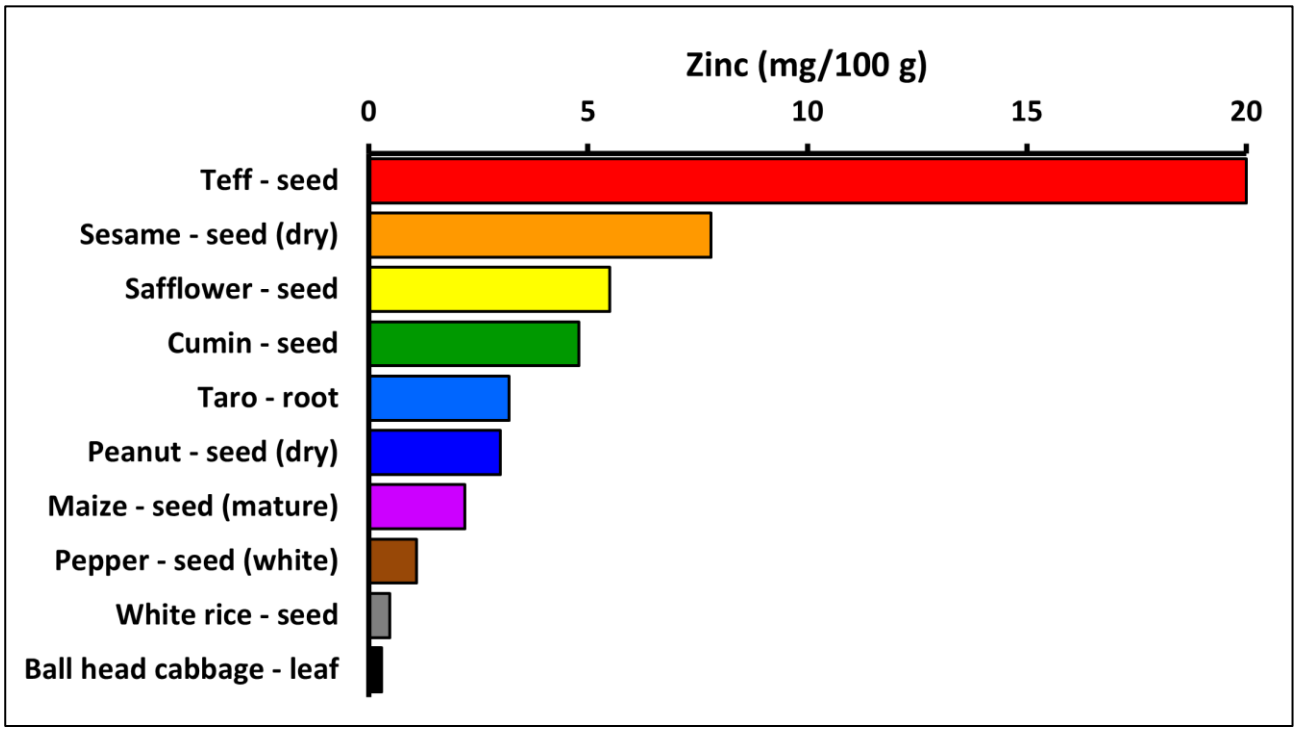
Vitamin A is very important for eyesight and fighting disease, particularly in infants, young children and pregnant women. People who are short of Vitamin A have trouble seeing at night.



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



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



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

Note regarding plant selection: In compiling these field guides, we acknowledge that some staple foods and commercial crops which are 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.

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

Starchy staples

Common name: Oats
Local:

Scientific name: *Avena sativa*
Plant family: POACEAE

(Food commonly bought from markets)

Description: An annual grass plant and cereal with an open spreading flower head. It can grow up to 1.5 m tall. The stalks are moderately stout. The leaves are narrow and sword shaped. They are flat and 45 cm long by 25 cm wide. The flower arrangement is an open panicle. This is in a head 50 cm long. The flowers are held to one side of the stem. The fruit is a grain tightly enclosed by the glume.

Distribution: It would suit some highland areas in the tropics. It will grow in slightly colder areas than wheat.

Use: The seeds are used as food after the outer layer is removed. They are used as rolled oats, porridge, breakfast foods and in cakes and biscuits. The young seedlings are juiced or dried and used as a food supplement. Sprouted seeds are used in salads.

Cultivation: Plants are grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	11.0	1563	13.1	-	-	4.6	-

Starchy staples

Common name: Teff
Local:

Scientific name: *Eragrostis tef*
Plant family: POACEAE

(Food commonly bought from markets)

Description: It is an annual tufted millet grass that grows 60-120 cm tall. It has a slender stem and long narrow smooth leaves. The flowers occur in loose open panicles 15-35 cm long. The branches are very thin and droop over. The seeds are very small (1-1.5 mm long). There are about 2500-3000 seeds per gram. Brown and white-seeded types are recognised.

Distribution: A drought resistant tropical grass. It grows in places with a distinct dry season. It grows best at about 2000 m altitude in Ethiopia in temperatures of 25-28°C. It is grown from 1700-2800 m. Brown teff is grown at the higher locations. The rainfall in this region is about 950-1000 mm. It can be grown with rainfall of 400 mm. Soils should be permeable. It can tolerate frost and can grow in arid places.

Use: Seeds are ground into flour and cooked in a variety of ways. It can be used in stews or to make unleavened bread. This is called *injera* in Ethiopia.

Cultivation: Teff is best grown in fallowed land or after legume crops. Land preparation needs to be very thorough. A fine firm weed-free seed bed is needed. Seed are mostly broadcast. Driving sheep or cattle over the land is used to trample in the seed. Seed is sown at 25-30 kg per hectare. Nitrogen fertiliser is recommended. It is usually harvested with sickles.

Production: It is fast growing. Plants take 90-120 days for early varieties and 120-160 days for late maturing varieties. Yields range between 300 and 3000 kg per hectare. Seeds can be stored for many years as a reserve food supply.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	9.3	1541	8.9	-	-	9.9	20

Starchy staples

Common name: Barley
Local:

Scientific name: *Hordeum vulgare*
Plant family: POACEAE

(Food commonly bought from markets)

Description: An erect annual grass. It grows 80-120 cm tall. The nodes are solid and the internodes are hollow. The leaves are narrow. There are 5-10 leaves. They are produced alternately on opposite sides of the stem at the nodes. The leaves are narrowly sword shaped and 5-40 cm long by 0.5-1.5 cm wide. The flowers are greenish. Flowers have long awns. The fruit is a grain. It is oval and narrow. There are a range of named cultivated varieties.

Distribution: A temperate plant. It requires full sun and well-drained soil. It can tolerate saline conditions.

Use: The grains are eaten. They are mixed with wheat for chappatis. They are also used in soups. They are also used for bread and breakfast cereals. They have a low gluten content. The sprouted seeds are eaten in salads. Barley water is made by soaking the barley in water and flavouring with lemon. The young seedlings are dried and powdered and marketed as *barleygreen.* Roasted seeds are added to coffee. The seeds are also soaked until they sprout and produces malt. This is used for alcohol production.

Cultivation: Plants are grown from seed. Seed can be planted 2-6 cm deep. Often 200-250 plants are grown per square metre.

Production: It has a relatively short growing season and matures quickly.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (boiled)	69.6	510	2.7	-	-	0.2	0.7
seed	13.7	1367	10.5	-	-	6.0	-

Starchy staples

Common name: Rice
Local:

Scientific name: *Oryza sativa*
Plant family: POACEAE

(Food commonly bought from markets)

Description: An annual grass with hollow stems. The stems can be 30-150 cm tall. (Floating varieties can be 5 m long.) The nodes are solid and swollen. The stem is protected by a skin layer which can often be high in silicon. A clump of shoots are produced as tillers from buds in the lower leaf axils. The leaves are narrow and hairy. They taper towards the tip. Each stem produces 10 -2 0 leaves and the seeds hang from the flower stalk at the top. Some varieties are glutinous and cling together when cooked.

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Wheat
Local:

Scientific name: *Triticum aestivum*
Plant family: POACEAE

(Food commonly bought from markets)

Description: An annual grass that easily forms tillers to produce a clump of shoots. Plants grow 30-80 cm tall. The stems are erect and simple. They are usually without hairs. The stems have 5-7 nodes and are hollow between these. The leaf sheath is wrapped around the stem. It is entire at the lower section but split further up. The strap like part where the leaf blade forms is colourless and jagged. The blade is flat, narrow and pointed. It is about 20-37 cm long and 1.2 cm wide. The veins are parallel. The flower stalk or ear is at the end of the stem as a compound spike. It is 5-10 cm long. There are 2 rows of spikelets along each side. Usually 2 grains per spike develop and these are oval with a groove along the centre. There is a tuft of hairs at the end. There are more than 25000 cultivated varieties.

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Maize
Local:

Scientific name: *Zea mays*
Plant family: POACEAE

(Food commonly bought from markets)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: True millet
Local:

Scientific name: *Panicum miliaceum*
Plant family: POACEAE

(Food commonly bought from markets)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Taro
Local:

Scientific name: *Colocasia esculenta*
Plant family: ARACEAE

(Food commonly grown in gardens)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

Common name: Sweet potato
Local:

Scientific name: *Ipomoea batatas*
Plant family: CONVOLVULACEAE

(Food commonly grown in gardens)

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

Distribution: A tropical and subtropical plant. They grow from sea level up to about 2700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21-26°C. It can grow with a pH between 5.2-6.8. Sweet potato are not tolerant to shading. It suits hardiness zones 9-12.

Use: Roots 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 roots 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. Enlarged roots won't form if the ground is waterlogged when the plant roots start to develop. Sweet potato is grown by cuttings of the vine. About 33000 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 root yield. Dry matter percentage increases with increasing age of the crop. Higher dry matter roots are normally preferred.

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

Under lowland conditions in the tropics sweet potato roots undergo active 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. Initiation of root enlargement is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor root production. For this reason, sweet potatoes are often grown on mounded beds. In well drained or high organic matter soils, digging or mounding is not as essential. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage, plants need to be hilled or have the roots well covered with soil. Cracking soils can allow the weevil access to roots.

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	Vitamin C mg	Iron mg	Zinc mg
root (baked)	72.9	431	1.7	2182	24.6	0.5	0.3
root (raw)	70.0	387	1.2	4000	25	0.7	0.4
root (boiled)	72.0	363	1.1	1705	15	0.6	0.3
leaf	86.3	168	3.9	105	58	2.9	-

Starchy staples

Common name: Potato
Local:

Scientific name: *Solanum tuberosum*
Plant family: SOLANACEAE

(Food commonly grown in gardens)

Description: A branched annual plant up to 50 cm tall. The stems are soft and 4 angled with compound leaves. The leaves are irregular shape and have 6-8 pairs of leaflets as well as small irregular leaflets between the others. It has swollen stem tubers under the ground. The tubers can vary in colour from white to red and purple. The tuber shape can also vary greatly. The flowers are white, pink or purple. The fruit is a berry. It is smooth, round and green but often striped.

Distribution: In the tropics they mostly grow at high altitude above 1500 m, but they are grown between 900 and 2800 m. Tubers form best when soil temperatures are 15.5°C. Tuber formation stops with a soil temperature of 30°C and decreases with temperatures above 20°C. Potatoes should have a mean temperature below 18°C. They are damaged by frost but slightly more frost tolerant than sweet potato. Short day length helps tuber production. They can grow with a soil pH of 5.2-6.6. It suits hardiness zones 7-11.

Use: The tubers are cooked and eaten. They are also fried, canned and made into starch. The tubers are boiled, baked, roasted, mashed and used in soups, stews, dumplings, pancakes and potato salads. Potatoes are also use for alcoholic drinks. The tender leaves are also occasionally eaten. **Caution:** The green tubers and leaves contain solanine, a poisonous alkaloid.

Cultivation: Plants are grown from tubers. Due to virus diseases, it is necessary to get fresh seed tubers every few years. Large tubers can be cut to include a bud or "eye". A seed piece of 40-50 g is suitable. It is best to inter-crop as this stops bacterial wilt spreading. The plant is surrounded by dirt when 20-25 cm tall. Later the tubers need to be kept covered with dirt. Providing extra light (4-5 hours) allows plants to form flowers and true seed to be collected.

Production: The time to maturity is between 17 and 24 weeks. Yields of 5-12 t/ha can be expected. Higher yields can be obtained with good care.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
tuber (baked)	71.2	456	2.3	-	12.9	1.4	0.3
tuber	77.0	344	2.0	25	21	0.8	0.27
leaf	86.1	-	-	3.4	-	-	-

Legumes

Common name: Peanut
Local:

Scientific name: *Arachis hypogaea*
Plant family: FABACEAE

(Food commonly bought from markets)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

Common name: Chickpea
Local:

Scientific name: *Cicer arietinum*
Plant family: FABACEAE

(Food commonly bought from markets)

Description: Chickpeas are erect, annual herbs with a strong taproot. Plants grow up to 60 cm high and all parts are hairy. Plants are often bluish green in colour. The leaves are up to 5 cm long and have 9-15 pairs of leaflets along a stalk and a single leaflet at the end. The leaflets are 1-2 cm long by 0.3-1.4 cm wide and are strongly pointed and with a toothed edge. The flowers are carried singly on long stalks in the axils of leaves and are white, pink or purple. The flowers normally never open and are self pollinated. The pods are inflated, 2-3 cm long and have 1 or 2 seeds. The seeds are angular and up to 1 cm across. They have a pointed beak. The seed colour can vary from brown, white, red or black. There are many named varieties.

Distribution: Chickpea is a sub-tropical crop. It suits high altitudes in the tropics because it needs cold nights with dew. It is well suited to semi arid regions. It can tolerate salt and drought. It does not do well in warm, humid places. It needs well drained soil and is damaged by frost. For best growth, night temperatures between 18-26°C, and day temperatures of 21-29°C, are required. The temperature range of 8°C between day and night is required. Annual rainfall of 600-750 mm and a relative humidity of 20-40% is suitable. The best soil pH is 5.5-7.5 but they will grow on alkaline soils.

Use: Mainly the ripe seeds are eaten. They are most commonly boiled and mashed but they can also be roasted or fried or used in stews and soups. The young leaves, shoots and pods are sometimes eaten. Sprouted seeds can be eaten. When roasted they can be eaten as a snack. The seeds can also be used to make flour. Chickpeas are used in hummus, couscous, falafel, and to make pita bread. They can be fermented into miso and tempeh and the roasted roots and seeds can be used as a coffee substitute.

Cultivation: Chickpeas are grown from seed. Often other crops are grown mixed with chickpeas but these are planted 3-4 weeks after sowing the chickpeas. Seed should be planted 2-12 cm deep. Seed will germinate at temperatures above 5°C but are best above 15°C. Spacing plants 10 cm apart in rows 25-30 cm apart is suitable if plants are put in rows. Plants are cut and harvested when leaves turn brown.

Production: Yields of 400-1600 kg per hectare of seed are average for chickpeas. Plants can reach maturity in 4.5-5 months, but 7 months or longer are taken for some types.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (raw)	9.9	1362	20.2	190	3	6.4	-

Legumes

Common name: Soybean
Local:

Scientific name: *Glycine max*
Plant family: FABACEAE

(Food commonly bought from markets)

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

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

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

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

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

Food Value: Per 100 g edible portion

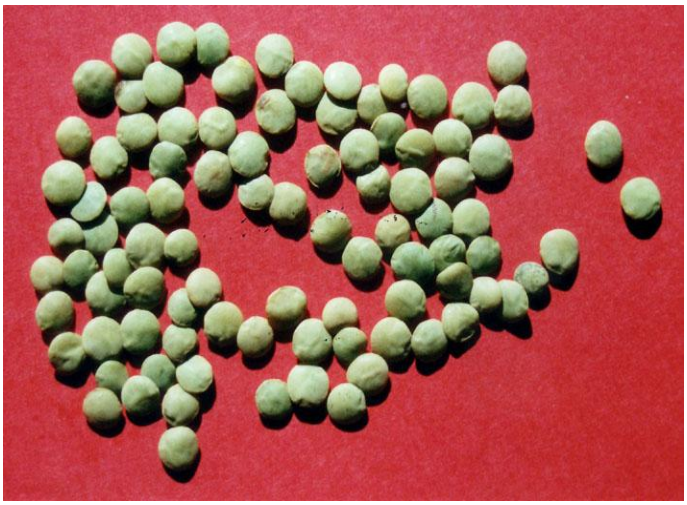
Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	9.0	1701	33.7	55	-	6.1	-
seed (immature)	68.0	584	13.0	16	27	3.8	0.9
sprout	79.5	339	8.5	1.0	8.3	1.3	1.0

Legumes

Common name: Lentil
Local:

Scientific name: *Lens culinaris*
Plant family: FABACEAE

(Food commonly bought from markets)



Description: A slender, annual plant. They grow to about 25-40 cm high. It is erect with many branches. Plants are softly hairy. The leaves are compound with leaflets along the stalk. There is usually a tendril at the end. There are 4-7 pairs of leaflets and these do not have a stalk. They are sword shaped and 1.3 cm long. The flowers are in the axils of leaves. There are 1-4 flowers in a group. The flower stalk is slender. The flowers are small and up to 8 mm long. The flowers are bluish. The pods are oblong and 1.3 cm long. There are 1-2 seeds per pod. The pods are flat and the seeds are about 3-6 mm across. There are also large-seeded kinds with seeds 6-9 mm across. The seeds are lens shaped, round and curved out on both sides. The seeds become reddish brown when ripe. There are several named cultivated varieties.

Distribution: A plant of warm temperate and tropical zones. It prefers a sandy soil in a warm position. It produces most seed when grown on poorer soils. They grow in subtropical, warm temperate and high altitude tropical places. In India they grow from sea level to 3500 m altitude. In Ethiopia it grows between 1600-2350 m above sea level. They can grow on a range of soils. It suits hardiness zones 7-11.

Use: The seeds are cooked, sprouted or eaten raw. Young seedpods can be cooked and eaten. The ground seed can be used with cereals. The seeds are often eaten in soups and stews. Lentil flour can be mixed with cereal flour to bake bread. The sprouted seeds are eaten in salads, vegetable dishes and soups.

Cultivation: Seed are sown where they are to grow. Plants are normally self-pollinated but cross pollination can occur. In India it is often grown mixed with rice. When grown as a pure stand it can be broadcast or planted in rows.

Production: Yields of 2 ton per hectare are possible. For sprouts, the seeds are soaked for 12 hours in warm water then allowed to sprout for 5 days. Crops mature in about 3.5 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
sprouted & cooked	68.7	423	8.8	4	12.6	3.1	1.6
split & boiled	72.1	420	7.6	20	-	2.4	1.0

Legumes

Common name: Pea
Local:

Scientific name: *Pisum sativum*
Plant family: FABACEAE

(Food commonly grown in gardens)

Description: A short-lived herb plant. A creeping plant with white or pink flowers. Plants can be 30-150 cm tall. It has a well developed tap root and many slender side roots. The stem is weak and round. Leaves are made up of 1-3 pairs of leaflets and a branched tendril at the end. There are large leaf-like stipules at the base of the leaf. The lower half of these stipules has teeth. The flowers occur in the axils of leaves and are either on their own or in 2-3 flowered clusters with equal length stalks. The flowers are pink or purple in varieties grown for dry seeds and usually white in kinds grown for fresh pods. The pods are swollen and green and can have up to 10 seeds inside. Seed shape can vary. Large numbers of varieties have been recorded.

Distribution: A temperate plant that grows best at altitudes over 1000 m in the tropics. They suit a humid climate. Hot dry weather interferes with seed setting. They are frost tolerant except at flowering. They need temperatures of 13-18°C. They need a soil pH of 5.5-6.5 and reasonably good fertility. They cannot tolerate waterlogging or very acid soils.

Use: Mostly the young seeds are eaten. They can be eaten raw or cooked. Sometimes the young pods and leaves are eaten. The sprouted and dry seeds are eaten and are used in soups and stews and ground into flour. Roasted seeds are used as a substitute for coffee. The young leaves and buds are cooked as a vegetable.

Cultivation: Plants are grown from seed. Seed can be collected for re-sowing. A spacing about 5 cm apart in rows 25 cm apart is suitable. Seed can be sown 3-5 cm deep. If rotting is a problem, plants can be supported off the ground. Plants need inoculation with bacteria for good production. For dried peas, plants are cut when mature then dried and threshed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (raw)	78.5	283	5.8	300	25	1.9	0.7
seed (boiled)	80.0	223	5.0	300	15	1.2	0.5

Legumes

Common name: Common bean
Local:

Scientific name: *Phaseolus vulgaris*
Plant family: FABACEAE

(Food commonly grown in gardens)

Description: There are many bush and climbing varieties of this bean. Climbing forms can be 2-3 m tall. Bush types are 20-60 cm tall. The leaves have three leaflets, one after another along the stem. The leaf stalk has a groove on the top. The side leaflets are unequal in shape, and can be 8-15 cm by 5-10 cm. The flowers are in the axils of leaves (where the leaves join the stem) and occur in a loose form. Flowers are white to purple. Pods are smooth, slender and 8-20 cm long by 1-1.5 cm wide. They are straight or slightly curved with a beak at the end and often have 10-12 coloured, kidney-shaped and seeds.

Distribution: It is a temperate plant that grows in many temperate and subtropical countries, including Solomon Islands. It mostly grows from 700-2000 m altitude in the tropics. It suffers from pest and disease damage in the lowlands, but can be grown to sea level. It is not suited to the wet tropics. It is shallow-rooted and damaged by excess moisture near the roots. A crop lifecycle needs about 350 mm of water. It is sensitive to frost and high temperatures. Flowers will not form below 9.5°C. Night temperatures above 37°C cause flowers to drop. The best temperature range is 15-21°C. It does not suit very acid soils. It suits hardiness zones 8-11.

Use: The young pods, leaves and mature seeds are edible. Dry seeds are soaked in water and boiled until soft.

Cultivation: Plants are grown from seed, preferably sown in raised beds. Seeds remain viable for 2 years. Germination is normally good if seed has been well stored. Climbing types need stakes. Plants are self-fertilised. These beans are intercropped with other plants in many places. If grown on their own, bush types can be spaced at 25 cm x 25 cm. They can be sown closer together in rows wider apart to make weeding and harvesting easier. For dried beans, once the pods are mature and turning yellow, the whole plants are pulled, then dried and threshed. About 50-75 kg of seed will sow a hectare. Flowering in most French bean varieties is not affected by day length.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (dry)	10.0	1386	25.0	10	1	8.0	2.8
seed (young)	92.0	142	3.0	-	20	0.8	0.2
pod	88.0	151	2.5	750	27	1.4	0.2
sprout	90.7	121	4.2	-	38.7	0.8	0.4

Legumes

Common name: Scarlet runner bean
Local:

Scientific name: *Phaseolus coccineus*
Plant family: FABACEAE

(Food commonly grown in gardens)

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

Distribution: A tropical plant. It is grown in the highlands in the tropics. On the tropical coast seedlings die and pods are not formed. It is damaged by frost. It suits hardiness zones 8-10.

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

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

Production: It grows quickly.

Food Value: Per 100 g edible portion

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

Legumes

Common name: Broad bean
Local:

Scientific name: *Vicia faba*
Plant family: FABACEAE

(Food commonly grown in gardens)

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

Distribution: A temperate plant only suitable for the highlands over about 1200 m. in the tropics. It mainly occurs from 1900-2700 m altitude in equatorial zones. It is frost tolerant and is resistant to drought. It can grow with temperatures down to 4°C. In the lowland hot tropics it often flowers but does not set seed. It requires fertile soils. It does best with adequate lime needing a soil pH of 6.4-7.2. It can tolerate some salinity.

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

Common name: Cabbage
Local:

Scientific name: *Brassica oleracea* var. *capitata*
Plant family: BRASSICACEAE

(Food commonly grown in gardens)

Description: A short, leafy plant with a thick stalk. In cold areas, it forms a thick, tightly-packed ball of leaves called a "head". If the plant is left growing in the ground, it will later produce a flower stalk. The flowers are yellow. There are 3 main types – the white cabbage, a purple kind and one with wrinkled leaves.

Distribution: It is grown in most temperate countries and, unfortunately, in many tropical countries as well. It is a temperate crop and grows best at altitudes over 1000 m in the tropics where there is a greater difference between day and night temperatures. Seeds germinate when soil temperature is between 13-16°C. It does not grow well when temperatures are above 26°C. New varieties grow in warmer places. They are frost-resistant. It suits hardiness zones 8-11.

Use: The leaves can be eaten raw or cooked. They have very little food value and are too bulky to be used as a food in poorer subsistence diets.

Cultivation: Plants are normally first grown from seeds, but in most places they are re-grown from cuttings or sprouts that develop on the cut stalk.

Production: Cabbages take 5-7 months to be ready for harvest.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	93.0	125	1.6	1.0	41	0.8	0.3
leaf (raw)	93.0	96	1.5	280	46	0.8	0.2

Leafy greens

Common name: Chard
Local:

Scientific name: *Beta vulgaris* subsp. *cicla*
Plant family: CHENOPODIACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

Common name: African cabbage
Local:

Scientific name: *Brassica carinata*
Plant family: BRASSICACEAE

(Food commonly grown in gardens)

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 fewer 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 that occurs in the highlands of Ethiopia and Kenya. 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 which 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. 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. Plants can be established from cuttings.

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	88.0	86.1	3.5	-	157	1.3	0.9

Leafy greens

Common name: Lettuce
Local:

Scientific name: *Lactuca sativa*
Plant family: ASTERACEAE

(Food commonly grown in gardens)

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

Distribution: A temperate plant grown in most temperate countries, and also in many tropical countries. It suits hardiness zones 6-11.

Use: Leaves are eaten raw or used in soups.

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

Common name: Garden cress
Local:

Scientific name: *Lepidium sativum*
Plant family: BRASSICACEAE

(Food commonly grown in gardens)

Description: A cabbage family herb. It is an annual plant about 60 cm high. It has narrowly lobed leaves. The leaves near the base have long stalks and the leaves higher on the plant do not have stalks. The flowers are small and white. The fruit is a pod. These are oval and deeply notched. The seed pods are reddish brown. The plant develops tuberous roots and grows for a second season. There are some named cultivated varieties.

Distribution: A temperate plant. In tropical Africa it grows between 750-2900 m and is best at cooler locations. It suits plant hardiness zones 4-10.

Use: The leaves are used in salads. They are cut when young. The tender leaves are cooked as a vegetable. They are used in curries. The fresh or dried seed pods can be used as a pungent seasoning. The seeds also yield an edible oil. The seeds can be sprouted and eaten.

Cultivation: Seeds are sown at regular intervals of about 2 weeks throughout the year. They need to be sown shallowly in a fine soil. Plants can start to be harvested in a few weeks.

Production: It is fast growing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	87.2	150	4.2	58	59	2.9	0.2
leaf (boiled)	92.5	96	1.9	2310	23	0.8	0.2

Image accessed from: https://i.pinimg.com/originals/5a/4e/3a/5a4e3a1ef0846df605fb7be2781d45bc.jpg

Leafy greens

Common name: Moringa
Local:

Scientific name: *Moringa oleifera*
Plant family: MORINGACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

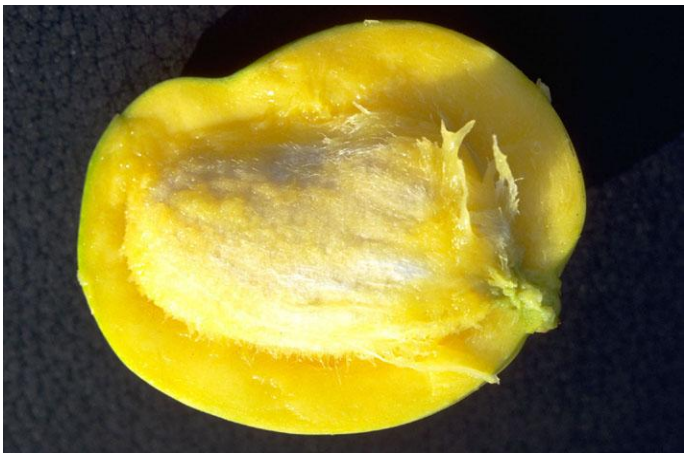
Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	883	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	7	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Fruit

Common name: Mango
Local:

Scientific name: *Mangifera indica*
Plant family: ANACARDIACEAE

(Food commonly bought from markets)



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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Common name: Papaya
Local:

Scientific name: *Carica papaya*
Plant family: CARICACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

Common name: Lemon
Local:

Scientific name: *Citrus limon*
Plant family: RUTACEAE

(Food commonly grown in gardens)

Description: A small, evergreen tree with short spines. It grows to 7 m tall and spreads to 3 m across. It branches freely. Young branches are often reddish. Leaves are about 5-12 cm long. They are green and drawn out to a point with notched edges. The leaf stalk is usually not winged. The leaves do not have much of a scent. The flowers are white, with 5 petals and have a strong sweet smell. They are 4-5 cm across. The fruit is oval-shaped with a knob at the end. Fruit can be 7-15 cm long. The skin is fairly thin, rough and light yellow. The flesh is sour and the seeds are oval.

Distribution: It does not do well on the coast in the tropics, but will grow well at about 1300 m. It prefers a light to medium, well-drained soil. It is drought-resistant, but most varieties are frost tender. It needs a temperature above 3-5°C for growth. It suits warm temperate regions. It suits hardiness zones 9-11.

Use: The fruit is mostly too sour to eat fresh, but the juice is used to make drinks. The peel is candied.

Cultivation: Many trees are seedlings. Better trees are grafted.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	83.3	65	1.1	-	80	0.4	0.1
juice	91.3	31	0.3	-	50	0.1	-

Fruit

Common name: Mandarin
Local:

Scientific name: *Citrus reticulata*
Plant family: RUTACEAE

(Food commonly grown in gardens)

Description: A small, evergreen tree that grows 4-8 m tall and 2 m across. The stem is erect, branching and thorny. The leaves are dark green, and long and narrow in shape. They are 3-4 cm long. There is only a narrow wing on the leaf stalk. It has a few or no spines. The flowers are white and star-shaped. They are 2.5-4 cm across and have a scent. Fruit are almost round and the skin peels off easily. The fruit are 4-8 cm long. The flesh is red, juicy and sweet.

Distribution: It is grown in many tropical countries. It is the hardiest of the citrus. It grows from sea level up to 2300 m altitude in the tropics. It does best between 800 m and 1200 m altitude. A well-drained soil is needed. It also prefers a drier climate. It is drought and frost resistant. It needs a temperature above 3-5°C. It suits hardiness zones 9-11.

Use: The fruit are eaten fresh.

Cultivation: Trees are often grown from seed. Some breed true from seed. Seedling trees take a long time to start producing fruit. Budded trees are best. A spacing of about 8 m between trees is suitable. Several seedlings can grow from one seed. Using seedlings of seeds with three or more shoots helps produce trees true to type. Cuttings or layering can also be used.

Production: Fruit tend to be produced seasonally, generally autumn and winter.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	87.6	184	1.5	42	136	0.8	-

Fruit

Common name: Orange
Local:

Scientific name: *Citrus sinensis*
Plant family: RUTACEAE

(Food commonly grown in gardens)

Description: An evergreen tree that grows 8-10 m tall and spreads to 4 m across. The stem is short, stout and spiny. It has a dense, rounded crown. The leaves are dark green, sword-shaped and taper towards the tip. They are 5-15 cm long. The leaves have a sweet smell when crushed. The leaf stalks have narrow wings and the stalk is jointed to the blade. The flowers are white and have a scent. The flowers have five petals and occur either singly or in clusters. The fruit often remain green in colour and don't turn orange when ripened below 600 m altitude in the tropics. The fruit are about 9 cm across. They have 10-14 segments.

Distribution: It is not suited to very wet areas, and not suited to high altitudes. It needs a well-drained, fertile, sandy soil. It is drought and frost sensitive. Trees need temperatures above 3-5°C to grow. Seeds won't start to grow below 13 °C. It suits hardiness zones 9-11.

Use: The fruit is eaten fresh, and the juice used in drinks. It is not of such great importance in the humid tropics.

Cultivation: Trees are often grown from seeds but these do not breed true. Seeds grow most easily between 27-32°C. It is better to use budded plants. Plants can also be grafted.

Production: Green fruit can be treated with ethylene to give an orange colour if people think an "orange" fruit is not supposed to have green colour.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	86.8	197	0.94	21	53.2	0.1	0.1

Fruit

Common name: Apple
Local:

Scientific name: *Malus domestica*
Plant family: ROSEACAE

(Food commonly grown in gardens)

Description: A small to medium sized deciduous tree. It grows 5-10m tall. It has a single trunk and branches freely. There can be long shoots and short spurs. Young stems and twigs have a covering. The leaves are oval and 4-13 cm long by 3-7 cm wide. They are rounded at the base. The edges have irregular teeth. The flowers are usually near the ends of branches on spurs. Several flowers occur together. There are 5 white to pink petals. The fruit is usually almost round and over 5 cm across. There are two brown seeds in each cell.

Distribution: A temperate plant that grows at higher altitudes in the tropics. In the tropics a short growth cycle requires mild temperatures throughout the year. This is found near the equator at altitudes of 800-1200 m where temperatures are 16-27°C. A rainfall of 1600-3200 m and a relative humidity of 75-85% are required. The growing season should have good sunlight while the off season should be overcast and cool. Most apple varieties require 1000 hours of chilling at temperatures below 7°C during the dormant season. Low chilling varieties occur. It suits hardiness zones 3-9.

Use: The fruit are eaten fresh. They are also cooked and used to make juice. The fruit can be sliced and dried. **Caution:** Apple seeds contain amygdalin, a cyanogenic glucoside.

Cultivation: Plants are grown by seed and by grafting. In the tropics the plants are almost evergreen with little shoot growth and flowers and fruiting can occur throughout the year. To produce consistent fruiting, branches are bent horizontal and tied down. Sometimes leaves are picked off. Cross pollination is less important in the tropics. Apples are normally produced by budding, using shoots of good clones. In Indonesia a root stock from wild apple is produced by root suckers or air layering. The dormancy of seeds is broken by putting them in a freezer for 30-150 days.

Production: The fruit ripen 3.5-5 months after flowering. In the tropics flower buds can greatly exceed leaf buds so trees can produce more fruit than the leaves can support. Fruit thinning is then necessary.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	85	235	0.3	-	10	-	-

Fruit

Common name: Banana
Local:

Scientific name: *Musa spp (A &/or B genome) cv.*
Plant family: MUSACEAE

(Food commonly grown in gardens)

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 2000 m altitude in the tropics. They are rarely an important food above about 1600 m. 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 1000-3000 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	Vitamin 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	-

Fruit

Common name: Cheese and bread
Local:

Scientific name: *Paullinia pinnata*
Plant family: SAPINDACEAE

(Food commonly grown in gardens)

Description: A woody creeper. It can be 5-10 m long. The leaves have 5 leaflets. The leaf stalk has wings. The flower racemes occur singly in the axils of leaves. They can be 10 cm long. The flowers are in clusters without stalks. The flowers are white. The fruit is an oblong or pear shaped capsule. It is 3 cm long by 1.4 cm wide. It is pinkish red and has fine lines along it. The valves are woody and there is 1 or sometimes 3 seeds inside. These are 1 cm long by 0.8 cm wide and 0.6 cm thick. They are shiny and blue-purple to black. There is a white aril or layer around the seed. This is edible.

Distribution: It is a tropical plant. It grows on coastal plains, swamps and sandy beaches. It grows in seasonally flooded forests. It grows along riverbanks and can grow on sand or clay. It grows from sea level to 1600 m above sea level. It can grow in arid places.

Use: The aril or soft layer around the seeds and the pulp of the fruit are sometimes eaten. The flowers are eaten. The leaves are eaten.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
aril	83.0	1203	0.7	-	-	110	-

Image sourced from: https://www.zimbabweflora.co.zw/speciesdata/image-display.php?species_id=137290&image_id=9

Fruit

Common name: Avocado
Local:

Scientific name: *Persea americana*
Plant family: LAURACEAE

(Food commonly grown in gardens)

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

Distribution: A subtropical plant that grows from sea level up to 2250 m in the tropics. It cannot stand water-logging. Branches are easily damaged by wind. It needs a frost free location or where frosts are rare. West Indian varieties thrive in humid, tropical climates, freeze at or near 0°C and can stand some salinity. Mexican types come from dry subtropical plateaus and thrive in a Mediterranean climate. They are hardy to -7° C. They are salt sensitive, have the smallest fruits and the thinnest skin. The best daytime temperature is 25-33°C. Guatemalan types come from cool, high-altitude tropics and are hardy to -3° C. It does best with neutral or slightly acid and well aerated soil. Growth is disrupted when soil temperature is below 13°C. It needs high humidity at flowering and fruit set. It can grow in arid places.

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

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

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

Food Value: Per 100 g edible portion

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

Image sourced from:
https://upload.wikimedia.org/wikipedia/commons/7/7d/Avocados_(Persea_americana)_(18159574242).jpg

Fruit

Common name: Guava
Local:

Scientific name: *Psidium guajava*
Plant family: MYRTACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

Common name: European grape
Local:

Scientific name: *Vitis vinifera*
Plant family: VITACEAE

(Food commonly grown in gardens)

Description: A woody vine which keeps growing from year to year. It is often pruned to reduce its size. It climbs by coiled tendrils which attach to objects. It has large leaves which are roughly heart shaped. They can be entire or deeply divided into 3-5 lobes, and can be 20 cm across. The edges of the leaf are sharply and irregularly toothed. The tip of the leaf is pointed and the base is rounded. Sometimes the leaves are hairy. The flowers are small and yellow-green. They occur in clusters which are 5- 20 cm long and beside the leaves. The 5 green petals drop off together to show 5 central stamens and the ovary. These bear clusters of fleshy fruit. The fruit is a berry which is generally oval, juicy and edible. The skin can be yellow or violet-black. They are 1-4 cm long. They contain a few hard seeds. There are 10000 cultivated varieties.

Distribution: A subtropical plant that grows mainly in Mediterranean-type climates with hot, dry summers and cool, rainy winters. It needs shelter from the wind. A soil pH of 6.5-7.5 is suitable. It suits hardiness zones 6-9.

Use: The fruit are eaten ripe and also used for juice and wines, champagnes and brandies. Sometimes young, slightly acid leaves are eaten. They are rolled around a filling of rice or minced meat. The dried fruit are eaten as raisins. The flowering shoots are eaten as a vegetable. They can also be pickled.

Cultivation: They are mostly grown from hardwood cuttings. It needs a trellis for support. It is normally pruned to control growth when the vines have lost their leaves. Pruning in the first year is designed to form the permanent shape of the plant. It is normally pruned to allow a single stem with two branches just below the trellis. A spacing of 2.4 m by 3 m is suitable.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit (fresh)	80.6	297	0.7	7	10.8	0.3	0.1
fruit (dry)	19.2	1184	4.1	7	4.7	3.3	0.7
leaf	73.3	389	5.6	2699	11.1	2.6	0.7

Vegetables

Common name: Okra
Local:

Scientific name: *Abelmoschus esculentus*
Plant family: MALVACEAE

(Food commonly grown in gardens)

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	Vitamin 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
fruit (raw)	90.0	71	2.0	90	25	1.0	-

Vegetables

Common name: Broccoli
Local:

(Food commonly grown in gardens)

Scientific name: *Brassica oleracea var. italica*
Plant family: BRASSICACEAE

Description: A cabbage family plant with a thickened green or blue flower at the centre. The flower is often in several small heads. They are surrounded by broad leaves attached to a thick stalk. Calabrese is a variety with tightly packed green or purple heads.

Distribution: It is mostly grown in the highlands in the tropics. It is frost resistant. The ideal temperature is 20-25°C. It forms heads best with temperatures of 14-21°C. A soil pH of 5.0-6.0 is suitable. It suits hardiness zones 8-11.

Use: The central flower is cooked and eaten. The leaves are edible. The sprouted seeds are eaten.

Cultivation: It is normally grown from imported seed. The seeds are planted in a nursery then transplanted. They are transplanted after 4-6 weeks. A spacing of 60 cm x 60 cm is suitable.

Production: Plants are ready for harvest about 3 months after transplanting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf (raw)	90.7	117	3.0	800	93.2	0.9	0.4
flower (raw)	89.0	96	3.3	150	110	1.5	0.6
flower (boiled)	89.9	78	3.1	150	34	1.0	0.4

Vegetables

Common name: Bush okra
Local:

Scientific name: *Corchorus olitorius*
Plant family: MALVACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Cucumber
Local:

Scientific name: *Cucumis sativus*
Plant family: CUCURBITACEAE

(Food commonly grown in gardens)

Description: A hairy annual climber with tendrils and yellow flowers. It grows to 0.5 m high and spreads to 2 m wide. The stem is trailing and has bristles. The leaves are heart-shaped and the lobes taper. Leaf-shape varies with different varieties. The tendrils are not branched. The flowers are yellow and funnel-shaped. They occur in clusters in the axils of leaves. Male and female flowers are separate, but on the same plant. Male flowers are normally in groups of 2-3 and develop first, and female flowers are borne singly and open later. Fruit are long and often have a slightly lumpy skin. The flesh inside is greenish-white. The fruit are edible and contain many seeds. Fruit 20-100 cm long are called cucumbers, and fruit which are much smaller and darker green are called gherkins.

Distribution: It occurs from sea level up to at least 2200 m in the tropics. Protection from wind is needed. It is killed by frost. It suits hardiness zones 9-11.

Use: Unripe fruit are usually eaten raw. Young stem tops, leaves and the kernels of the seeds are edible. Cucumbers are normally eaten fresh, while gherkins are pickled in vinegar. It is a popular vegetable.

Cultivation: Batches of 2-3 seeds are normally sown together in new gardens during the dry season. A spacing of 1 m apart per plant is suitable.

Production: Harvesting can commence 6-8 weeks after sowing. Up to 10 fruit per plant can be produced.

Food Value: Per 100 g edible portion

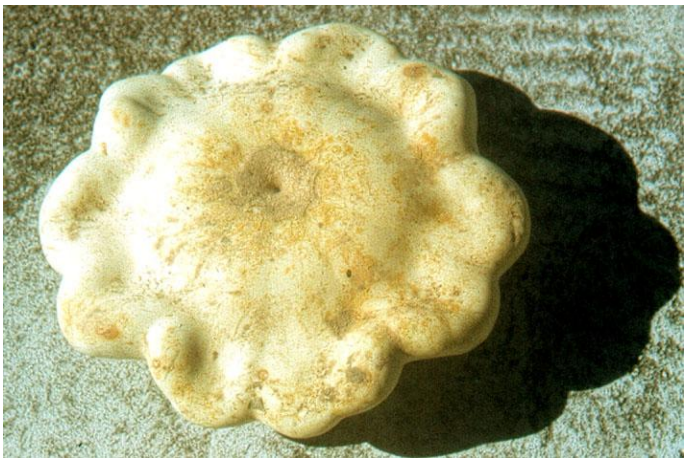
Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	96.4	43	0.6	-	8	0.3	0.1

Vegetables

Common name: Pumpkin
Local:

Scientific name: *Cucurbita pepo*
Plant family: CUCURBITACEAE

(Food commonly grown in gardens)



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	Vitamin 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

Common name: Carrot
Local:

Scientific name: *Daucus carota* subsp. *sativus*
Plant family: APIACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Bitter cucumber
Local:

Scientific name: *Momordica charantia*
Plant family: CUCURBITACEAE

(Food commonly grown in gardens)

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

Common name: Tomato
Local:

Scientific name: *Solanum lycopersicum*
Plant family: SOLONACEAE

(Food commonly grown in gardens)

Description: A short lived perennial plant. It is upright but with weak stems. It can grow to 2 m tall with support for the stems. The stems have long hairs. It is bad smelling. The leaves are deeply lobed with an odd number of leaflets. They have irregular teeth around the edge. There are up to 12 star shaped flowers on each raceme. Flowers are yellow. The fruit are round and red when ripe. Yellow coloured fruit also occur. There are many varieties.

Distribution: A warm temperate plant. It grows from sea level to 2400 m altitude in the tropics. It needs to be grown in fertile soil. For best production it requires much water, plenty of sunshine and low night temperatures. For germination it does best between 20-30°C. It is frost susceptible. A pH of 6.0-7.9 is best. It suits hardiness zones 9-12.

Use: The fruit are eaten raw or added to salads. They can be cooked, stewed, pureed, stuffed, made into sauces, juice, and used in soups and stews. Unripe fruit are pickled, roasted, fried and dried. **Caution:** Leaves and green fruit are poisonous.

Cultivation: Plants are sown from seeds. These are normally sown in a nursery and transplanted. They are transplanted when 40-45 days old or 15 cm high. They are spaced about 60-90 cm apart. Seeds can also be sown directly in the field. They can also be grown from cuttings. To give fewer and larger fruit the side branches of upright types are removed. Upright plant types need to be tied to stakes. Plants are often grafted into stronger rootstocks.

Production: Harvesting commences after about 14 weeks. Yields can be 3-4 kg of fruit per plant.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
fruit	93	88	1.2	45	26	0.6	0.1

Nuts, seeds, herbs and other foods

Common name: Safflower
Local:

Scientific name: *Carthamus tinctorius*
Plant family: ASTERACEAE

(Food commonly bought from markets)

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

Distribution: It grows in both tropical and temperate zones. It does better in drier regions. It cannot tolerate waterlogging. It does not suit the low, wet tropics. It needs a good dry season for drying. It is resistant to drought. It can stand some wind and salinity. High temperatures can result in poor seed set. It does best where temperatures are 17-20°C on average. At the equator it can grow at 1600-2000 m altitude but most commonly in other regions it grows below 900 m altitude. A soil pH of 5-8 is suitable. It can grow in arid places.

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

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

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

Food Value: Per 100 g edible portion

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

Image accessed from: http://1.bp.blogspot.com/-Vyvwpq5La4c/U-gCRoPVHaI/AAAAAAAAWPg/_54ALJ6_Xuk/s1600/13+Carthamus+tinctorius+1.jpg

Nuts, seeds, herbs and other foods

Common name: Sesame
Local:

Scientific name: *Sesamum indicum*
Plant family: PEDALIACEAE

(Food commonly bought from markets)

Description: A small, erect annual plant. It is 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 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 1200 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 a light harrow, or sown 2-15 cm apart in rows 20-45 cm apart. Plants can be thinned or weeded during early growth to produce a better crop. Seeding rates of 9-11 kg/ha are used. 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	Vitamin C mg	Iron mg	Zinc mg
seed (dry)	4.7	2397	17.7	1	-	14.6	7.8
leaf (raw)	85.5	188	3.4	-	-	-	-
oil	0.1	3683	0.2	-	-	-	-

Common name: Garlic
Local:

Scientific name: *Allium sativum*
Plant family: AMARYLLIDACEAE

(Food commonly grown in gardens)

Description: An onion family plant. It is an erect herb with a number of tightly packed bulbs (cloves) wrapped in papery scale leaves. It grows one year, then flowers the next. It grows about 40 cm tall. he true leaves of the plant are long, flat and solid and 2.5 cm wide. The roots are side roots. The number of cloves per bulb varies from 16-50 depending on variety. Flowers are borne on a long stalk in a head where the flowers are on equal length stalks from one point forming a rounded head.

Distribution: A temperate plant that grows in the tropical highlands mostly between 1600 and 2200 m, but will grow satisfactorily down to 500 m. There are varieties that will grow in hot coastal tropical places. Best bulb development occurs with temperatures up to 30°C. It is frost resistant. High humidity or high rainfall is not suitable. It is best grown in low rainfall areas with irrigation. Bulb development is favoured with long day lengths. It does best with a soil pH of 6-7. It suits hardiness zones 8-10.

Use: The cloves are used in small amounts to flavour food. The leaves can also be used. Leaves should be cut before they are mature.

Cultivation: Plants are grown by planting individual cloves. The individual segments of the clove are separated out then planted. A spacing of 20 cm is suitable. They should be planted into a deeply dug but firm seedbed and almost covered with fine soil. Cloves or "rounds" are best planted at the end of the wet season. Plants rarely produce fertile flowers or seed. They can be grown from seed.

Production: Bulbs should be ready about 90-120 days from planting. Bulbs can be stored at 25-30°C for 90 days with low humidity and good air circulation.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
leaf	87	50	2.1	684	38	0.4	1.0
bulb	66	512	5.0	-	7	1.2	-

Nuts, seeds, herbs and other foods

Common name: Bird's eye chillies
Local:

Scientific name: *Capsicum frutescens*
Plant family: SOLANACEAE

(Food commonly grown in gardens)

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 1800 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 300-2500 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	Vitamin C mg	Iron mg	Zinc mg
fruit	74.0	395	4.1	7140	121	2.9	-

Nuts, seeds, herbs and other foods

Common name: Cumin
Local:

Scientific name: *Cuminum cyminum*
Plant family: APIACEAE

(Food commonly grown in gardens)

Description: A slender annual herb. It grows about 30-60 cm high. It spreads 30 cm wide. The stems are angular. The lower leaves have stalks and the upper leaves do not. The leaves are like fronds. They are divided into long narrow segments. The leaves are 10 cm long. The flowers are white. They occur in a compound umbel. The fruit is like a cylinder and has ridges. It is 4-5 mm long. It tapers at the ends and is only slightly curved.

Distribution: A warm temperate to tropical plant. It suits hot climates. It needs full sun. It needs fertile, well-drained soils. It needs 3-4 warm months to ripen the seed. It suits hardiness zones 8-12.

Use: The fruitlets are used as a spice. They are used whole or ground. They are common in curries. They are also used to flavour cheese, cakes and liqueurs. The oil is used to flavour sauces and sausages.

Cultivation: Plants are grown from seed. They can be transplanted.

Production: The stems are harvested when the plant has finished flowering and before the fruit are ripe. These are dried before threshing. The seeds are rubbed to remove the hair like tails. The ground seeds produce a coarse textured, dark green, oily-feeling powder.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed	8.1	1567	17.8	127	7.7	66.4	4.8

Image sourced from: https://tse3.mm.bing.net/th?id=OIP.NZCr_Im70aZifmt2ykMJBAAAAA&pid=Api

Nuts, seeds, herbs and other foods

Common name: Pepper
Local:

Scientific name: *Piper nigrum*
Plant family: PIPERACEAE

(Food commonly grown in gardens)

Description: A woody, climbing, green, leafy vine. The nodes are enlarged. The plant has roots on the main stem which attach to tree trunks. The vines can be 8-10 m long. The leaf stalk is 1-2 cm long. The leaf blade is oval and 10-15 cm long by 5-9 cm wide. It is thick and leathery. The base of the leaf is rounded and it tapers to a short tip. The flowers are usually of one sex, but many flowers occur together. The flower spikes are opposite the leaves. The spikes are 3-3.5 cm long by 0.8 mm wide. They can be 10 cm long. It has clusters of berries on the side branches. The berries are red when ripe and 3-4 mm across.

Distribution: It is a tropical plant. It grows from sea level up to at least 1100 m altitude in equatorial places. It suits areas with a temperature between 24-26°C. It cannot tolerate frost. It likes high humidity and shade. It does best with an annual rainfall of 1200-2500 mm. It originally came from the tropics of India. It suits hardiness zones 10-12.

Use: The berries are used as a spice. The dried fruit are used as pepper. Immature green berries are sold in brine or dried. As a spice, it is unlikely that sufficient is eaten to contribute to the diet.

Cultivation: Plants are normally grown from cuttings of the main (rooted) vine. Pruning of the tips can increase branch formation on which berries are produced. It needs a support to climb.

Production: Berries, dried with the skin on, give white pepper. Berries, with the skin soaked off in water for a few days, produce black pepper. Plants produce in the third year. They can continue producing for 20 years. Flowering normally follows rain. Fruit ripen after 3-4 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	Vitamin C mg	Iron mg	Zinc mg
seed (white)	11.4	1238	10.4	0	21.0	14.3	1.1
seed (black)	10.5	1067	11.0	19	21.0	28.9	1.4

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
AMARYLLIDACEAE	*Allium sativum*	Garlic	leaf	87	50	2.1	684	38	0.4	1.0	66
ANACARDIACEAE	*Mangifera indica*	Mango	fruit	83.0	253	0.5	180	30	0.5	0.04	38
APIACEAE	*Cuminum cyminum*	Cumin	seed	8.1	1567	17.8	127	7.7	66.4	4.8	68
APIACEAE	*Daucus carota* subsp. *sativus*	Carrot	root (raw)	89.9	180	1.0	2813	6	0.6	0.4	59
ARACEAE	*Colocasia esculenta*	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	17
ASTERACEAE	*Carthamus tinctorius*	Safflower	seed	5.6	2163	16.2	5	0	4.9	5.5	63
ASTERACEAE	*Lactuca sativa*	Lettuce	leaf	94.0	84	1.2	180	15	0.7	0.2	34
BRASSICACEAE	*Brassica carinata*	African cabbage	leaf	88.0	86.1	3.5	-	157	1.3	0.9	33
BRASSICACEAE	*Brassica oleracea* var. *capitata*	Cabbage	leaf (raw)	93.0	96	1.5	280	46	0.8	0.2	31
BRASSICACEAE	*Brassica oleracea var. italica*	Broccoli	flower (boiled)	89.9	78	3.1	150	34	1.0	0.4	55
BRASSICACEAE	*Lepidium sativum*	Garden cress	leaf	87.2	150	4.2	58	59	2.9	0.2	35
CARICACEAE	*Carica papaya*	Papaya	fruit	88.0	163	0.5	290	54	0.4	0.18	40
CHENOPODIACEAE	*Beta vulgaris* subsp. *cicla*	Chard	leaf (raw)	92.0	80	1.8	330	30	1.8	0.4	32
CONVOLVULACEAE	*Ipomoea batatas*	Sweet potato	root (baked)	72.9	431	1.7	2182	24.6	0.5	0.3	19
CUCURBITACEAE	*Cucumis sativus*	Cucumber	fruit	96.4	43	0.6	-	8	0.3	0.1	57
CUCURBITACEAE	*Cucurbita pepo*	Pumpkin	fruit (mature)	92.0	105	1.6	17	16	2.4	-	58
CUCURBITACEAE	*Momordica charantia*	Bitter cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	60
FABACEAE	*Arachis hypogaea*	Peanut	seed (dry)	4.5	2364	24.3	0	-	2.0	3.0	22
FABACEAE	*Cicer arietinum*	Chickpea	seed (raw)	9.9	1362	20.2	190	3	6.4	-	24
FABACEAE	*Glycine max*	Soybean	seed	9.0	1701	33.7	55	-	6.1	-	25
FABACEAE	*Lens culinaris*	Lentil	seed (boiled)	72.1	420	7.6	20	-	2.4	1.0	26
FABACEAE	*Phaseolus coccineus*	Scarlet runner bean	seed	12.0	1419	20.3	-	7	9.0	-	29
FABACEAE	*Phaseolus vulgaris*	Common bean	pod	88.0	151	2.5	750	27	1.4	0.2	28
FABACEAE	*Pisum sativum*	Pea	seed (raw)	78.5	283	5.8	300	25	1.9	0.7	27
FABACEAE	*Vicia faba*	Broad bean	seed (fresh, boiled)	83.7	259	4.8	27	20	1.5	0.5	30
LAURACEAE	*Persea americana*	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	48
MALVACEAE	*Abelmoschus esculentus*	Okra	fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6	53
MALVACEAE	*Corchorus olitorius*	Bush okra	leaf (cooked)	87.2	155	3.4	156	33.0	3.1	0.8	56
MORINGACEAE	*Moringa oleifera*	Moringa	leaf	76.4	302	5.0	197	165	3.6	-	36
MUSACEAE	*Musa spp*	Banana	fruit (sweet)	70.7	365	1.7	-	2	0.9	0.4	46
MYRTACEAE	*Psidium guajava*	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	50

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
PEDALIACEAE	*Sesamum indicum*	Sesame	seed (dry)	4.7	2397	17.7	1	-	14.6	7.8	65
PIPERACEAE	*Piper nigrum*	Pepper	seed (white)	11.4	1238	10.4	0	21.0	14.3	1.1	69
POACEAE	*Avena sativa*	Oats	seed	11.0	1563	13.1	-	-	4.6	-	10
POACEAE	*Eragrostis tef*	Teff	seed	9.3	1541	8.9	-	-	9.9	20	11
POACEAE	*Hordeum vulgare*	Barley	seed	13.7	1367	10.5	-	-	6.0	-	12
POACEAE	*Oryza sativa*	Rice	seed (brown)	13.5	1480	7.6	-	-	2.8	-	13
POACEAE	*Panicum miliaceum*	Common millet	seed	9.6	1548	11	-	-	-	-	16
POACEAE	*Triticum aestivum*	Wheat	seed	12.5	1387	11.7	-	-	3.3	-	14
POACEAE	*Zea mays*	Maize	seed (mature)	10.4	1528	10.0	100	4	4.9	2.2	15
ROSEACAE	*Malus domestica*	Apple	fruit	85	235	0.3	-	10	-	-	45
RUTACEAE	*Citrus limon*	Lemon	fruit	83.3	65	1.1	-	80	0.4	0.1	42
RUTACEAE	*Citrus reticulata*	Mandarin	fruit	87.6	184	1.5	42	136	0.8	-	43
RUTACEAE	*Citrus sinensis*	Orange	fruit	86.8	197	0.94	21	53.2	0.1	0.1	44
SAPINDACEAE	*Paullinia pinnata*	Cheese and bread	aril	83.0	1203	0.7	-	-	110	-	47
SOLANACEAE	*Capsicum frutescens*	Bird's eye chillies	fruit	74.0	395	4.1	7140	121	2.9	-	67
SOLANACEAE	*Solanum tuberosum*	Potato	tuber (baked)	71.2	456	2.3	-	12.9	1.4	0.3	21
SOLONACEAE	*Solanum lycopersicum*	Tomato	fruit	93	88	1.2	45	26	0.6	0.1	62
VITACEAE	*Vitis vinifera*	European grape	fruit (fresh)	80.6	297	0.7	7	10.8	0.3	0.1	52

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