

Potentially Important Food Plants of Myanmar



**FOOD PLANT
SOLUTIONS
ROTARIAN ACTION GROUP**

*Solutions to Malnutrition
and Food Security*



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

www.foodplantsolutions.org

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Dedication

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

Preface

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

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

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

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

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

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

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Introduction

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

Growing food

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

A country with very special plants

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

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

Getting to know plants

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

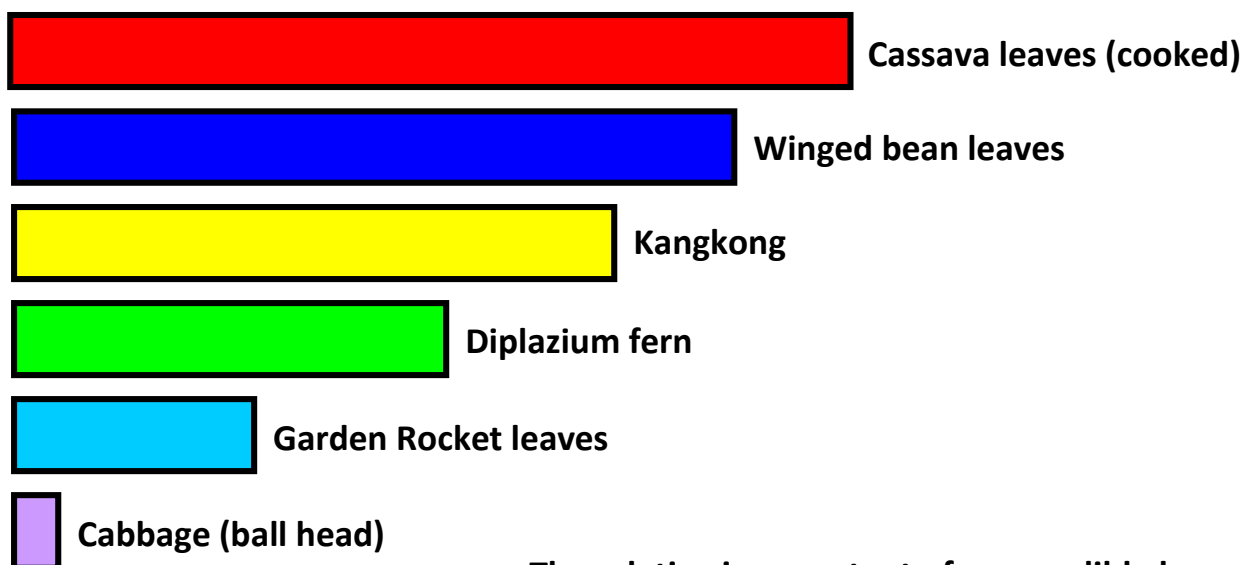
Naming of plants

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

Local food plants are often very good

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

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



The relative iron content of some edible leaves

A healthy balanced diet

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

Learning to cook well

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

Learning to grow “wild” food plants

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

Saving better types of plants

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

Growing from cuttings and suckers

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

Saving seed

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

already adapted to local conditions. For example, seed saved from pumpkins grown locally will produce plants with less pest and disease damage than those grown from imported seed. *If you can't get seeds or planting material from local gardens – it is probably not a suitable local plant!*

Growing a garden of mixed plants

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

Different types of plants for food security

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

Looking after the soil

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

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

Building up the soil

When a new garden has been cleared, it has lots of leaf mulch and other old plant material. This provides plant nutrients for new plants to grow. There is a simple rule for growing plants and improving the soil - "If it has lived once, it can live again." Any old plant material can provide nutrients for new plants to grow, but it must be allowed to rot into mulch or compost for this to happen. If this plant material is burnt, some nutrients, especially phosphorus and potassium ("potash"), get left behind in the ashes for new plants to use, although it also allows these important nutrients to be lost by being washed away by rain. But with burning other important nutrients, such as nitrogen and sulphur, get lost in the smoke and disappear from the garden and soil. These last two plant nutrients are especially important for growing green leaves and when their levels are low, plants grow small or pale green. When nitrogen is lacking, the old leaves of the plant go pale and fall off early, and when sulphur is lacking, the young leaves go pale.

Wherever possible, old plant material should be covered with some soil to allow it to rot down and not simply dry out or get burnt.

Poor soils where crops won't grow

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

Soil nutrients

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

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

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

Making compost

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

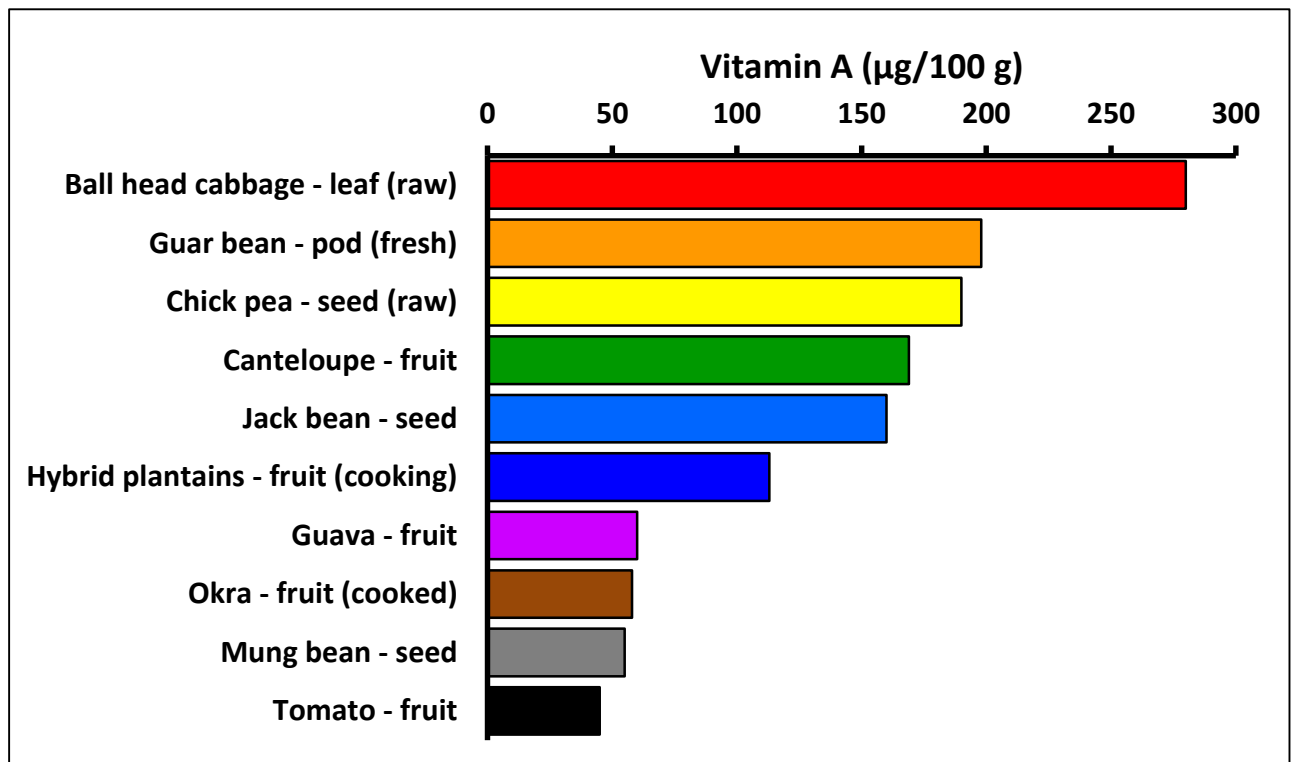
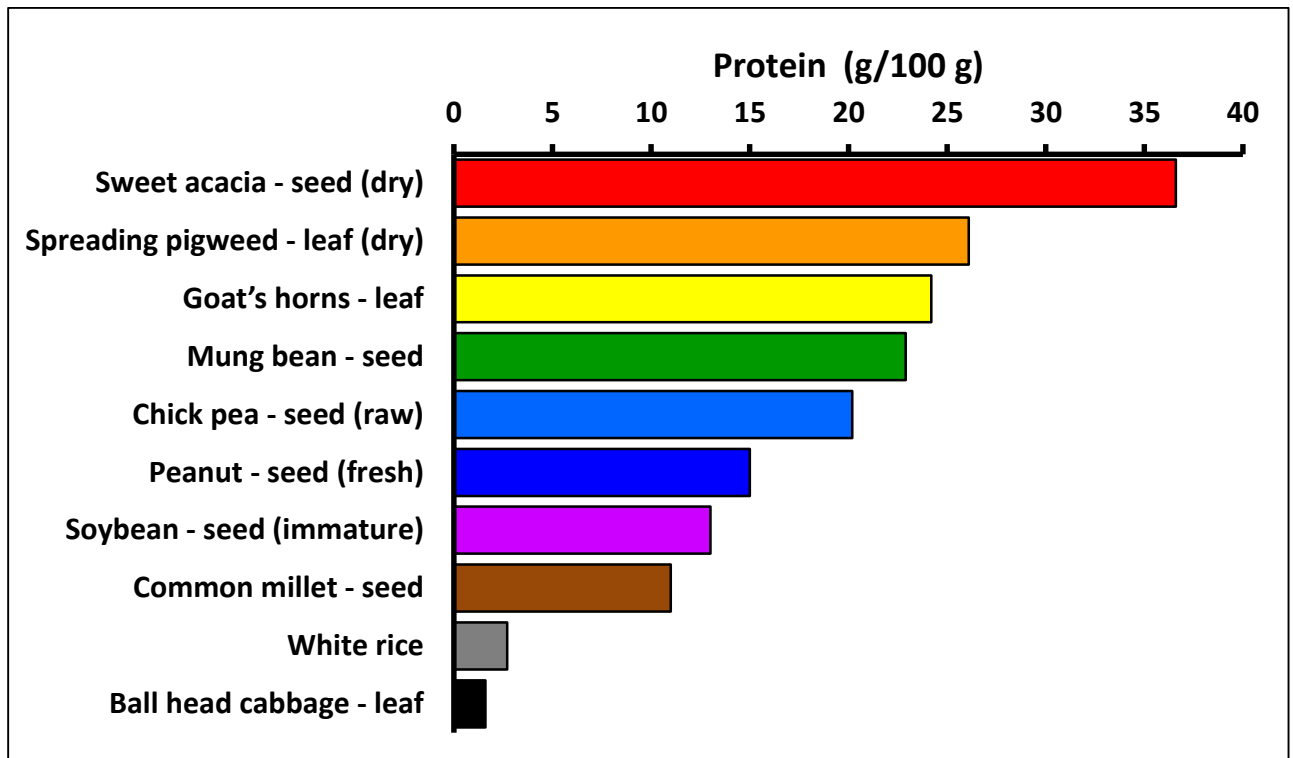
Pests

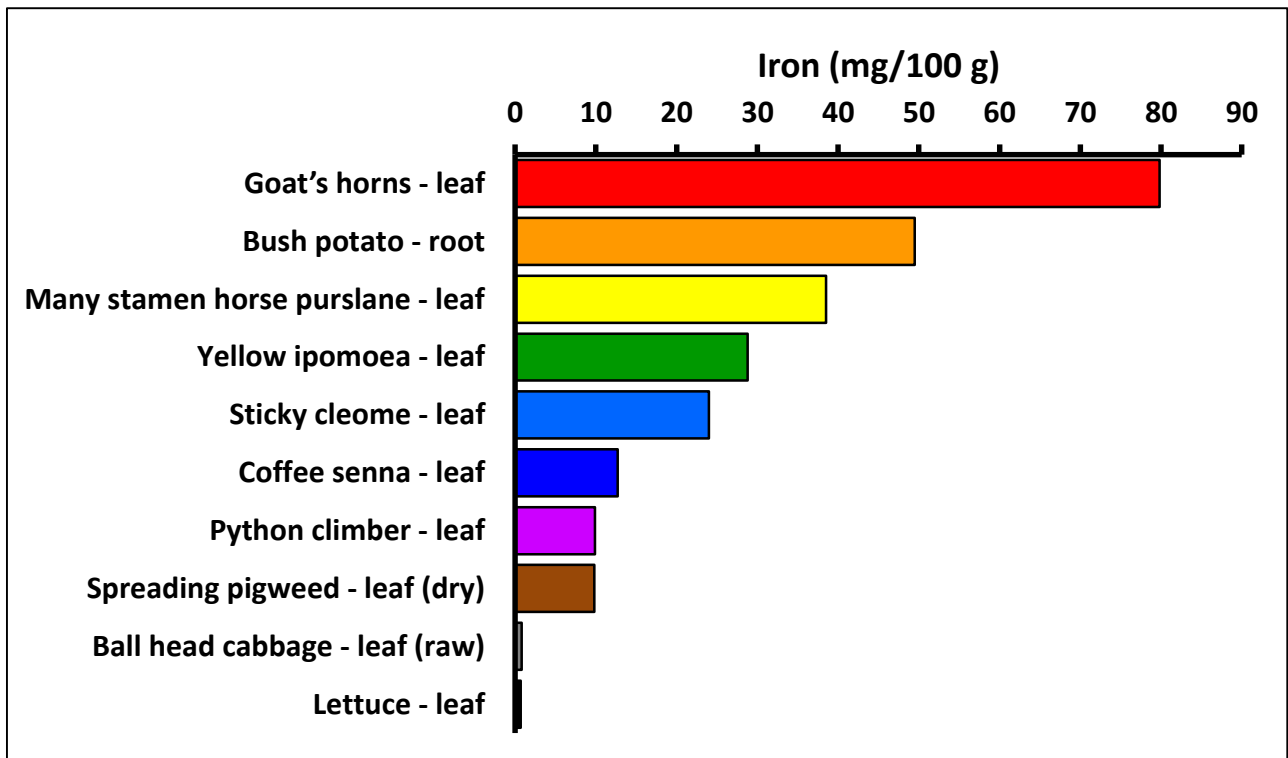
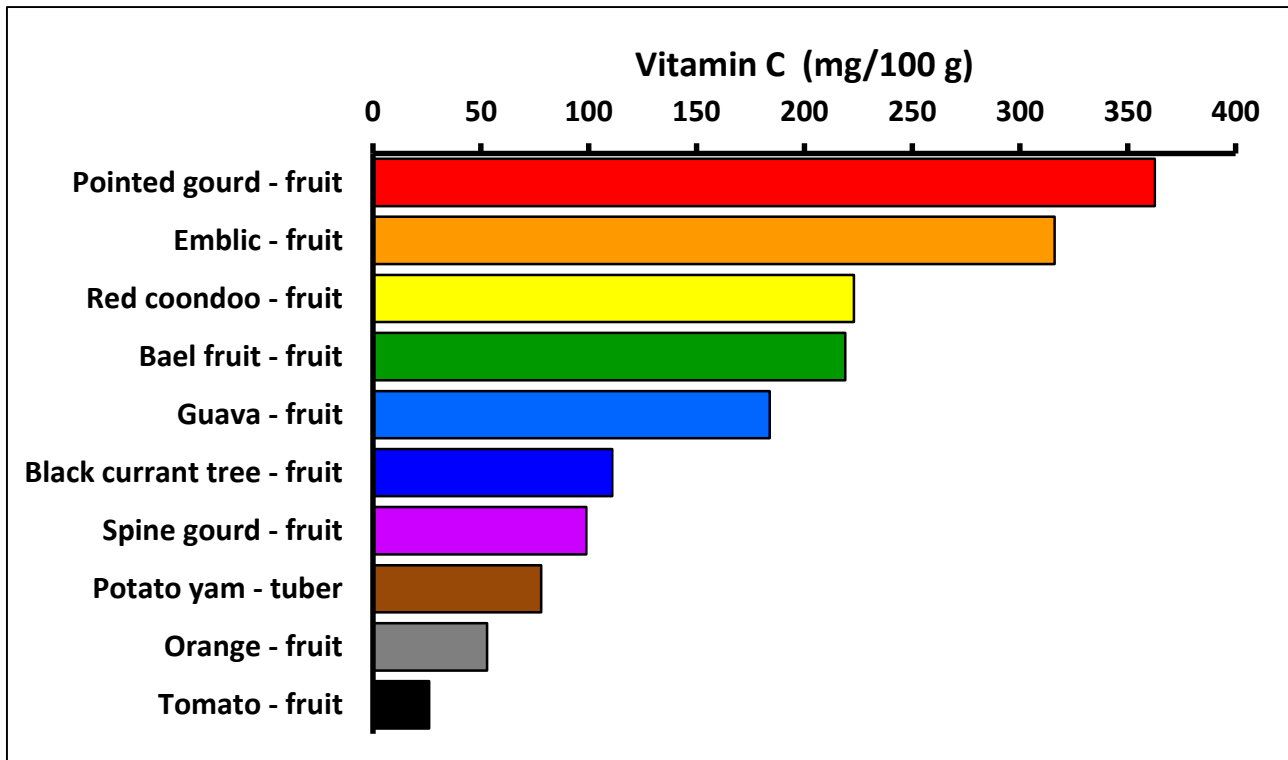
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects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

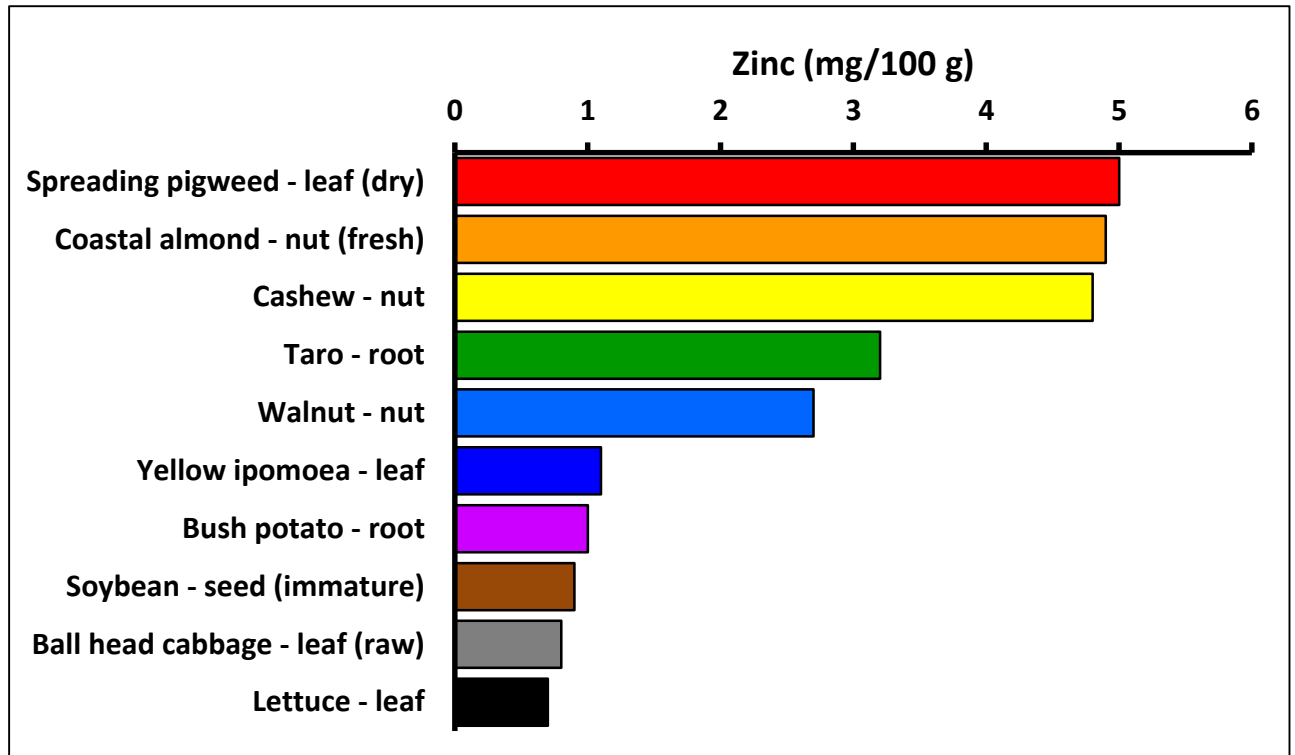
Diseases

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

Food value charts for a selection of plants from Myanmar







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

Starchy staples

English: Taro

Local:

Scientific name: *Colocasia esculenta*

Plant family: ARACEAE

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



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

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

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

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

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

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

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Hybrid plantains

Local:

Scientific name: *Musa x paradisiaca*

Plant family: MUSACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Potato yam

Local:

Scientific name: *Dioscorea bulbifera*

Plant family: DIOSCOREACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Bush potato

Local:

Scientific name: *Eriosema chinense*

Plant family: FABACEAE

Description: An erect small shrub. It grows 50 - 90 cm high. The rootstock is tuberous and woody. It has a hairy covering of slightly curved grey hairs close to the plant with more brown and longer hairs spreading out. These last ones are 2.5 mm long. The leaves have one leaflet. These are narrow and oval. They are 2 - 8 cm long by 0.7 - 1.8 cm wide. There are a few hairs on the top surface of the leaf and it is very hairy underneath. The flowers are in the axils of leaves. They are 0.7 cm long. The fruit is a pod which does not have a stalk. It is oblong and about 1 cm long by 0.6 cm wide. It turns black eventually. The seeds are mottled brown and green. They are oblong and 4 - 5 mm long by 2.5 mm wide.



Distribution: A tropical plant that mostly grows in drier grassland areas. It can grow in open forest and wet locations. In Papua New Guinea it grows up to 750 m altitude. In Asia it grows to 2,000 m altitude.

Use: The root tubers are eaten raw or cooked.

Production: In Australia, the plant flowers December to January and produces seeds from January to June.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A μ g	proVit C mg	Iron mg	Zinc mg
root	66.9	401	2.2		5	49.5	1.0

Starchy staples

English: Finger millet

Local:

Scientific name: *Eleusine coracana*

Plant family: POACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Elephant foot yam

Scientific name: *Amorphophallus paeoniifolius*

Local:

Plant family: ARACEAE

Description: A taro family plant but with a very divided leaf. It grows to 1 m tall. It is a herbaceous plant with rough and mottled leaf stalks. It has a straight stem and the leaf is divided into leaflets. The leaves can be 1 m wide. The leaves usually come singly from the ground. The flower stalk can be 3 - 20 cm long. The edge is curved back and wavy. The flower is dull purple and up to 30 cm across. The flower gives off a bad smell like rotting meat and this attracts flies. The flower only develops after the leaves have died off. The leaves and corms especially in the wild varieties contain many stinging crystals. It has a large round tuber up to 25 cm across. The large round underground corm produces small corms around the side. These can be 10 cm long.



Distribution: A tropical plant. It occurs mainly in seasonally dry areas and grassland up to 800 m altitude in equatorial zones. It requires an average temperature of 25 - 35°C and rainfall of 1,000 - 1,500 mm during the growing season. Soils need to be well drained as it cannot stand waterlogging.

Use: The corm is cooked and eaten. The leaves are edible. The young petioles or leaf stalks are eaten cooked.

Cultivation: The cormels are planted. Seeds will grow but flowers need hand pollination. Small corms from around the side are the normal part planted. If a very small corm is planted, the plant may need to grow for several seasons to produce a large yield. Setts or small cormels of 200 g are suitable for use planted at 30 cm x 30 cm spacing and produce seed corms of about 500 g. Larger corms take 3 - 4 years to produce. This is achieved by digging up corms and replanting next season. Each crop takes about 8 months to mature. Corms are planted 15 cm deep. Spacing is increased between plants in successive years of growth. After harvest, the corm needs to be kept for a few months before it is ready to produce a new shoot and re-grow.

Production: The stalk dies back when the plant is mature. The corm will keep for several months. An individual corm can finally weigh 8 kg. Eventually the corm under the ground increases in size then the leaf dies back. The corm could be harvested and stored, or eaten at this stage. If it is just left, a very large flower is produced. This type of growth pattern where vegetative growth is followed by a storage organ with dormancy is the type of growth that suits areas with a distinct wet and dry season. It has the advantage that the corm will store well after harvest and can be eaten in the dry season when food is short.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
tuber	78.0	340	2.0		6.0	2.4	1.1
corm	76.1	352	1.3		3.5	0.6	0.2

Starchy staples

English: Common millet

Local:

Scientific name: *Panicum miliaceum*

Plant family: POACEAE

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



Distribution: It is a temperate plant. It requires a moderately fertile well-drained soil in full sunlight. Once established it can tolerate heat and drought. It suits warm temperate and subtropical climates. Plants are frost sensitive. In Nepal it grows up to 2,200 m altitude. It can grow in arid places. It suits hardiness zones 5 - 9.

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Sorghum

Local:

Scientific name: *Sorghum bicolor*

Plant family: POACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Winged bean

Scientific name: *Psophocarpus tetragonolobus*

Local:

Plant family: FABACEAE

Description: A climbing perennial bean up to 4 m tall. It can re-grow each year from the fattened roots. Stems twine around supports or trail over the ground. Leaves have 3 leaflets 8 - 15 cm long with long leaf stalks. Flowers are blue or white and occur on the ends of branches from within the axils of leaves. Pods have wavy wings and are roughly square in cross section. They are 6 - 36 cm long with 5 - 30 seeds. Seeds can be white, yellow, brown or black and are bedded in the solid tissues of the pod. The seeds are round and smooth with a small hilum. The root has large nodules.



Distribution: A tropical plant that grows from sea level up to about 1,850 m altitude in the tropics. It normally only produces tubers at 1,200 - 1,850 m altitude. It is a short day plant and needs a day length less than 12 hours. It will not produce flowers or pods at places far from the equator. The main areas of production are between 20°N and 10°S latitudes. It is ideally suited to the tropics including the hot humid lowlands. For maximum seed production, temperatures of 23 - 27°C are needed, and for tubers the temperatures should be 18 - 22°C. Winged beans can grow on a wide variety of soils and have been grown on soils with pH from 3.6 - 8.0. Very acid soils have soluble aluminium to which winged beans are sensitive. Soils should not be waterlogged.

Use: Young leaves, flowers, young pods, ripe seeds and root tubers are edible. The seeds can be used to extract an edible oil.

Cultivation: Seeds are sown at the beginning of the rainy season. Seeds germinate and grow slowly for the first 3 - 5 weeks. For tubers, vines are pruned off at about 1 m high (or left unstaked) and some flowers are removed. Cultivation procedures vary slightly depending on which part of the plant is to be eaten. Short podded winged bean is used for tubers and long podded ones have poor tubers. Tuber production is not as efficient in tropical lowland conditions.

Production: The first green pods are ready about 10 weeks after sowing. Tubers are ready after 4 - 8 months. Seed yields of 1.2 tons/ha and tuber yields of 4 tons/ha are possible. A single plant can produce up to 75 pods. Dry bean yields of 45 - 330 g per plant can be produced depending on variety. Tuber yields of 5,500 - 12,000 kg per hectare have been produced. Seeds can contain a trypsin inhibitor which reduces protein digestibility. This inhibitor is destroyed by soaking seeds then boiling them well. Tubers can also contain this chemical and need to be well cooked.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.5	1764	41.9	-	-	15.0	4.5
pod (fresh)	92.0	105	2.1	-	-	-	-
leaf	95.0	197	5.0	809	30	6.2	1.3
seed (young)	87.0	205	7.0	13.0	18.3	1.5	0.4
root	57.4	619	11.6	-	-	2.0	1.4

Legumes

English: Soybean

Local:

Scientific name: *Glycine max*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Guar bean

Scientific name: *Cyamopsis tetragonolobus*

Local:

Plant family: FABACEAE

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



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

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

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

Production: Plants mature in 3 - 3.5 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.9	1452	30.5	-	-	-	-
pod (fresh)	82.0	-	3.7	198	49	5.8	-

Legumes

English: Pigeon pea

Local:

Scientific name: *Cajanus cajan*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Mung bean

Local:

Scientific name: *Vigna radiata*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Lablab bean

Local:

Scientific name: *Lablab purpureus*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Jack bean

Scientific name: *Canavalia ensiformis*

Local:

Plant family: FABACEAE

Description: A perennial climber, although short kinds do occur. Often it is a more bushy plant than the sword bean. Plants grow up to 1.5 m long. Stems can be hairy. Leaves have 3 leaflets. The leaflets are oval and 5.7 - 20 cm long by 3.2 - 11.5 cm wide. The leaf tends to be wedge shaped at the base. The leaf stalks are 2.5 - 11 cm long. Flowers are red/purple. They occur on flower clusters 5 - 12 cm long and with flower cluster stalks which are 10 - 34 cm long. The individual flower stalks are 2 - 5 mm long. Pods are long and sword shaped. Pods can be 15 - 35 cm long. Seeds are white with a light brown hilum half as long as the seed. Seeds are 2 cm long, by 1 cm across.



Distribution: It grows in tropical and subtropical places. It requires a fairly high temperature (15° - 30°C). It will possibly grow up to 900 m altitude. It is fairly drought resistant and also has some resistance to water-logging and salt in the soil. It can tolerate shade. It can tolerate pH from 4.5 - 8.0 but does best at about 6.1. The optimum mean annual temperature is 14.4° - 27.8°C. Seed germinate between 24 - 27.5°C. It is a short day plant growing well with a day length of 10 - 12 hours of sunlight. It can grow in arid places.

Use: The leaves and top shoots are eaten. The very young pods are boiled and eaten. The flowers can be eaten. The young seeds are eaten boiled, roasted, or peeled and cooked. The seeds are also fermented. The ripe seeds are roasted and used as a coffee substitute. **Caution:** The ripe seeds can contain poison and need to be well cooked and the water changed before eating. They are also often left under running water or fermented.

Cultivation: It is grown from seeds. Seeds need to be 2 cm deep. A spacing of about 60 cm is suitable. Plants preferably need a support to climb over. It benefits from a fertile soil but adding nitrogen depresses yield.

Production: Green pods are produced in 3 - 4 months, but ripe seeds need 6 - 9 months. Yield of seeds can range from 700 - 5,400 kg/ha.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	10.0	1423	20.4	160	-	4.9	-
pod (fresh)	88.0	155	2.4	-	-	-	-

Legumes

English: Chick pea

Local:

Scientific name: *Cicer arietinum*

Plant family: FABACEAE

Description: Chick peas 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: Chick pea 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. Chick peas are used in hummus, coucous, 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: Chick peas are grown from seed. Often other crops are grown mixed with Chick peas but these are planted 3 - 4 weeks after sowing the Chick peas. 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 - 1,600 kg per hectare of seed are average for chick peas. 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	proVit C mg	Iron mg	Zinc mg
seed (raw)	9.9	1362	20.2	190	3	6.4	-

Leafy greens

English: Goat's horns

Local:

Scientific name: *Sida cordifolia*

Plant family: MALVACEAE

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



Distribution: A tropical plant that grows in open waste places in the tropics and sub-tropics. It is common and widely distributed in the Philippines. It grows in hot arid places with a marked dry season. It grows in places with an annual rainfall below 520 mm. It grows in dry sandy soils and can grow in salty soils. It grows below 1,100 m altitude. It can tolerate shade and can grow in arid places.

Use: The leaves are edible when cooked.

Food Value: Per 100 g edible portion

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

Image accessed from

[http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_\(Bala\)_in_Hyderabad,_AP_W_IMG_9420.jpg](http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_(Bala)_in_Hyderabad,_AP_W_IMG_9420.jpg)

Leafy greens

English: Many stamen horse purslane

Local:

Scientific name: *Zaleya decandra*

Plant family: AIZOACEAE

Description: A herb. It is succulent and lies along the ground. The stems are long, angular and branched. The leaves are simple and opposite. They are 2 - 4 cm long by 1 - 2 cm wide and unequal. The flowers are 4 mm across and without petals. They are in clusters in the axils of leaves. The fruit is a 4-seeded capsule. It is 4.5 mm long. It has a cap that opens releasing the seeds. The seeds are kidney shaped and 1.5 mm across.



Distribution: A tropical plant. It grows near Mumbai. It grows in wet places.

Use: The leaves are eaten as a vegetable.

Cultivation: It can be grown by seeds or cuttings

Production: Harvested leaves can only be stored for a few days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	91.3	100	2.0	-	70	38.5	-

Image sourced from www.indiabiodiversity.org

Leafy greens

English: Yellow ipomoea

Local:

Scientific name: *Ipomoea obscura*

Plant family: CONVULVULACEAE

Description: A slender trailing herb that lies along the ground. It can be a climber or twining. It has a taproot and can keep growing from year to year. The leaf stalks are 1.5 cm long. The leaf blades vary but are long and tapering to the tip with a broadly heart shape base. They are 4 cm long. The flowers occur singly or as a few together in the axils of leaves. The flowers are funnel shaped and 4 cm long and 3 cm across. They are pale yellow or white.



Distribution: It is a tropical plant. It grows up to 1,800 m above sea level. It grows in woodland, grassland, savannah and coastal sands. It can grow in arid places.

Use: The leaves are cooked and eaten as a relish. The leaves are added to soup.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	56.6	569	8.8	-	-	28.8	1.1

Image sourced from: https://en.wikipedia.org/wiki/Ipomoea_obscura

Leafy greens

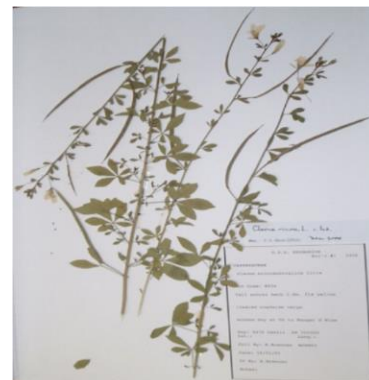
English: Sticky cleome

Local:

Scientific name: *Cleome viscosa*

Plant family: CLEOMACEAE

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



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

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

Cultivation: Plants are grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kj	Protein g	proVit A μ g	proVit C mg	Iron mg	Zinc mg
leaf	80.4	-	5.6	-	-	24	-

Leafy greens

English: Angled loofah

Local:

Scientific name: *Luffa acutangula*

Plant family: CUCURBITACEAE

Description: A herb of the pumpkin family plant. It is an annual climber with square stems. They have 4 - 7 branched tendrils which attach to objects helping the plant to have a climbing habit. Leaves are pale green, hairy and shallowly five lobed. The leaves have a bad smell when rubbed. Male and female flowers are separate. Male flowers are in clusters, female flowers singly (ratio 43:1) Flowers open late in the afternoon and stay open during the night. The flowers are yellow. Fruit can be up to 40 cm long and with 10 long ridges. It is green-brown outside and white inside. Three varieties have been distinguished.



Distribution: A tropical plant. It grows from sea level to 500 m altitude in the hot humid tropics. It won't tolerate excessive rainfall so does best in drier areas or in the dry season in wetter areas. Day temperatures above 25°C are suitable. Some varieties require short day length. Adding additional nitrogen fertiliser can stimulate female flower formation in short day varieties. In Nepal it grows from 1,000 - 1,600 m altitude. It can grow in arid places.

Use: The immature fruit are cooked and eaten as a vegetable. The ridges are removed with a vegetable peeler. The fruit are boiled, steamed or stir-fried. They can be added to soups, stews and curries. The leaves are edible. They can be eaten in salads or cooked as a vegetable. The flower buds are dipped in batter and sauteed. Mature seeds are roasted, salted and eaten as a snack.

Cultivation: Seeds are sown direct at 40 cm by 80 cm spacing and need stakes to climb. Because seeds can have a hard coating, soaking seed in water for 24 hours before planting can assist germination. 5 kg of seed per hectare are required. The plant benefits from full sunlight. Good soil fertility is beneficial. The soil needs to be well drained and adequate organic matter helps. Pinching out the growing tips when plants are 1.5 - 2 m long can promote fruit development. Hand pollination once female flowers develop helps fruit set. This is best done in the evening.

Production: Immature fruit are ready 6 - 10 weeks after planting. On maturity the fruit become bitter and inedible. Fruit do not store well so are harvested when they are to be used.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	94.6	71	0.7	-	-	0.5	-
leaf	89.0	-	5.1	-	98	11.5	-

Leafy greens

English: Python climber

Local:

Scientific name: *Cocculus hirsutus*

Plant family: MENISPERMACEAE

Description: A woody vine or climbing shrub. It is densely hairy. The bark is light grey and textured. The leaves are 4 - 8 cm long by 5 - 7 cm wide. They are oval. They can have 3 - 5 lobes. The leaves have 3 prominent veins that start at the base. The flowers are separate. The fruit is dark purple and fleshy. It is 4 - 8 mm long.



Distribution: A tropical plant. It grows in hot arid places. It grows in dry rocky soils. It grows between 50 - 1,200 m above sea level. It can grow in arid places.

Use: The leaves can be eaten raw. The leaves are boiled and eaten with salt and chilli peppers.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.5	-	3.9	-	-	9.9	0.6

Image sourced from <http://tropical.theferns.info/image.php?id=Cocculus+hirsutus>

Leafy greens

English: Spreading pigweed

Local:

Scientific name: *Amaranthus graecizans*

Plant family: AMARANTHACEAE

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



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

Use: The leaves and seeds are eaten cooked. The seeds can be ground and made into flat bread.

Caution: This plant can accumulate poisonous nitrates if grown with high nitrogen inorganic fertilisers. The plant will cause diarrhoea if eaten in large amounts.

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: Breadfruit

Local:

Scientific name: *Artocarpus altilis*

Plant family: MORACEAE

Description: A large tree that grows 20 - 26 m in height. The trunk can be 6 m tall before branching, and up to 1 m across. It is an evergreen tree, but can lose its leaves in dry weather. The leaves are large and vary from rough to smooth and shiny, and from entire to deeply lobed. They can be entire or divided into 5 to 11 lobes. The leaves are bright green on the upper surface with yellow veins and are pale and dull on the under surface. They have very small stiff hairs underneath. Male and female flowers grow separately on the same tree and normally appear at the same time. The flowers are in the axils of leaves. Male flowers form a drooping, oblong catkin 12 - 30 cm long. Female flowers form a globular head. The flower head develops into the compound fruit. The fruit are large and green and vary from round to oblong. They can be 12 - 22 cm long and 9 - 17 cm wide. Seeded fruit have projecting tubercles on the surface of the fruit. Seedless kinds are smoother with rounded or 5 to 6 sided processes on the surface. Seeded, small-seeded, and non-seeded types occur. There are a number of cultivars of each. Seeded fruit have 30 - 90 seeds per fruit. Seed can be 2 cm across and with darker lines.



Distribution: A tropical plant that grows in the hot, humid, tropical lowlands. The plant is purely tropical and normally grows below about 650m altitude, but they can grow from sea level up to about 1,150 m. Seeded types are more dominant in the west of Papua New Guinea. Trees are killed by temperatures below 5°C. It tends to grow in the temperature range 16°C to 38°C and probably requires an average temperature over 22°C to grow well. It grows on a range of soils providing they are well drained. There is some cultivar difference in drought and salt tolerance. Uniformly warm humid climates suit it best. An annual rainfall of 200 - 250 cm and a relative humidity of 70 - 80% suits. It suits hardiness zone 11 - 12.

Use: The large seeds are boiled in salted water or roasted before eating. The flesh of the fruit is eaten cooked. It can be boiled, baked, steamed, mashed, or turned into soups, puddings, cakes and pies. Dried fruit are made into flour. Young leaves and flowers are edible. The central core and the skin are not eaten.

Cultivation: Seeded forms are self-sown by birds or bats. The presence or absence of seeds significantly affects the production. Seeded trees are mostly propagated by seed which needs to be sown fresh, without seed drying out. Seedless trees are propagated by root cuttings. Cuttings of roots 1.5 - 4 cm across and 25 cm long are suitable. Cuttings can be rooted in sand during the wet season. They should be placed horizontally and kept moist and shaded. Using intermittent mist improves root formation and cutting establishment. Rooting hormones also assist. This process takes 10 weeks or more and then rooted cuttings should be hardened off in a sunny position for up to 3 more months before planting out into the field. Young plants do best with adequate sun and no shade. Root suckers produced naturally, or by damaging the roots, are a common method of production of new material. Marcottage or budding can also be used for propagation. The vegetatively propagated trees are therefore clones and the variation is presumably therefore somatic.

Fruit set can be improved by dusting male flowers onto female flowers 3 days after they emerge. Artificial pollination has resulted in increased yields in some places. This is both an increase in fruit size and more fruit retained on the tree to maturity. The pollen in the male flower is available 10 - 15 days after emergence. It is about 3 months from flowering to fruit maturity.

Because trees often occur from natural seed dispersal by fruit bats and marsupials, trees are often randomly spaced and common in secondary forest. A spacing of 10 - 13m is suitable between cultivated trees.

Trees rarely receive much attention after establishment but pruning of branches to allow easier access to fruit is sometimes undertaken. Seedless fruit are picked before maturity when the fruit is eaten by boiling. Mature fruit can be sweeter but they need to be cooked by baking or roasting. Seeded fruit are normally allowed to drop and are then harvested. The seeds are about 20 % dry matter as protein with a good nutritional balance. The essential amino acid levels are high for vegetable protein. Fresh fruit are highly perishable and need to be handled carefully.

Pit preservation of breadfruit involves lactic acid fermentation. The fermentation needs to be last for 2 - 3 months to produce a palatable product. Breadfruit slices can be stored under refrigeration in a fresh marketable state at 14°C for up to 10 days. Segments can be boiled for 2 - 5 minutes then frozen at minus 15°C for at least 11 weeks.

Production: Trees begin to bear after 3 - 6 years. Growth of the trees is vigorous, with fruiting starting after about 3 years. Trees grow to 10 - 15 m in 10 - 12 years. Fruiting can occur over 5 - 8 months in some locations and this is partly due to varieties with overlapping fruiting seasons. A tree can produce 50 - 150 fruit, weighing 1 - 1.6 kg each, per year. Large trees can give 700 fruit per year of 1 - 4 kg each. An average seed weighs 5 g. Fruit are harvested 65 - 95 days after flowering.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	74.4	506	1.5	4	25	0.4	0.2
leaf	75.5	314	5.0			17.5	
fruit & seed	87.1	192	2.0				

Fruit

English: Emblic

Local:

Scientific name: *Phyllanthus emblica*

Plant family: PHYLLANTHACEAE

Description: A small deciduous tree. It grows 2 - 20 m tall. The trunk is bent and has many branches. The branches are spreading. The bark is greyish-brown and peels off in flakes. The leaves are pale green and feathery. New leaves are pinkish. The leaves have short stalks. The leaves are 1 - 1.5 cm long by 0.2 - 0.3 cm wide. The leaves are arranged on slender branches to appear like feathery compound leaves. They are like tamarind leaves. Male and female flowers occur on different trees. The flowers are small and yellow. They are densely clustered on the branches. The fruit are small and yellow to green. They are 2 cm across and edible. They have 6 - 8 faint lines along them. They are fleshy and edible. They are sour. Some improved kinds have fruit 8 - 9 cm across.



Distribution: A tropical plant. It suits the hot humid tropical lowlands. It is native to tropical Asia. It grows in arid bushy savannah. It grows to 1,500 m altitude. It often grows on poor shallow soils. It is light demanding and drought tolerant. It can tolerate forest fires. They are common in tropical deciduous forest in India. It suits the subtropics. It needs warm temperatures at time of flower bud formation. Dry times during fruiting cause fruit to drop. It can tolerate low and high temperatures once established. It can tolerate soils with a pH 6 - 10. Some varieties can tolerate saline soils.

Use: The fruit are cooked and used in preserves. The fruit are acid and can be eaten fresh or used for flavouring. They are also used as a seasoning in cooked food. They are pickled and made into jams, jellies, preserves, tarts and other foods. The dried fruit chips are seasoned with caraway seeds, salt and yoghurt and eaten. Unripe seeds and leaves are edible.

Cultivation: Plants are grown from seed. They are best grown using ring budding or veneer grafting. Trees can be pruned to form 4 - 6 branches from one trunk. They can be grown from cuttings, grafting or by air layering.

Production: Early growth is fast. Some budded trees produce fruit after 3 years. Seedling trees take 7 - 8 years. Best yields are produced after 10 - 12 years and trees can keep bearing for 70 - 75 years. In India fruit are available October to December.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	78.4	281	0.6	-	316	0.9	0.5

Fruit

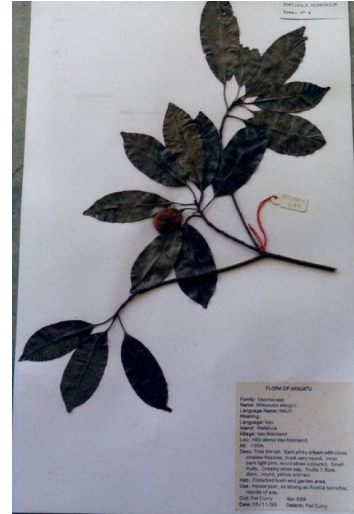
English: Red coondoo

Local:

Scientific name: *Mimusops elengi*

Plant family: SAPOTACEAE

Description: A large tree that grows 10 - 15 m tall. It has a tall trunk. The crown is dense and umbrella shaped and spreads 5 - 15 m across. The bark is rough, hard and dark grey, and is cracked along its length or forms a checkered pattern. The leaves are produced alternately and are simple. They are smooth and crowded. They are oval and 5 - 14 cm long by 2.5 - 6 cm across. They are glossy and dark green on top and paler underneath. The midrib is easy to see. Leaves have a sharp pointed tip. The scented flowers are star-shaped, cream and hairy. The flowers are 0.5 - 1 cm long in clusters in the axils of the upper leaves. The outer ring of flowers form a spiky cup at the base of the fruit. The oval berries have soft hairs that become smooth. They are 1.3 - 1.5 cm long by 1 - 1.2 cm wide. The fruit are orange-red when ripe and contain several orange-red wedge-shaped seeds.



Distribution: A plant that suits the hot tropical lowlands. It is native in Asia from India to the Pacific. Plants need well-drained soils. It grows naturally in coastal monsoon vine forests and will grow on a range of soils. It is often on sand dunes and cliffs near the beach. In tropical Australia it grows from sea level to 320 m altitude. It is drought resistant. Plants need a sunny position and are damaged by frost. It suits hardiness zones 10 - 12.

Use: Ripe fruit are eaten raw. They can be used in preserves or pickles. The kernels yield a fatty oil which can be used for cooking. The bark is used in the distillation of *arrack*.

Cultivation: Plants can be grown from seed. The seed should be sown fresh. They germinate in 6 - 14 days. They can be transplanted when the first true leaf appears. The plants can be pruned.

Production: Plants are slow growing. In Australia, plants flower from November to January and fruit from April to June.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	46.6	825	2.9	-	223	-	-

Fruit

English: Bael fruit

Local:

Scientific name: *Aegle marmelos*

Plant family: RUTACEAE

Description: A medium sized tree that grows 3 - 12 m tall and spreads 2 m across. The stem is erect and thorny. The aromatic leaves are green, with 3 leaflets and generally sword shaped. It loses its leaves. The flowers are yellowish-white and have a strong sweet smell. They contain both sexes and occur in clusters. The fruit is large and with a hard shell about 3 mm thick. It is 8 - 10 cm across and is yellow-green when ripe. The edible pulp is reddish or orange. The fruit is made up of small cells (about 15) each with woolly seeds.



Distribution: A tropical plant that prefers rich well drained soils in an open sunny position. It suits tropical or warm places. It appears to do best where there is a distinct dry season. It is drought and frost tender. A hot dry summer is best. It can tolerate some alkalinity and saline soils. It can grow in arid places.

Use: The fruit are eaten raw. They are also used to make drinks. The fruit are often sliced and dried. Marmalade can be made from ripe pulp. They can also be pickled or used in jams and jellies. The young shoots and leaves can be eaten raw in salad. They are also used in chutneys. The flowers are used to make a drink. **Caution:** There are reports that leaves make women sterile or cause abortions.

Cultivation: It is grown from seed. Seed are taken from freshly picked ripe fruit. Seedlings are planted out after one year. It can be grown from root offshoots. They are best grown using patch budding. Trees are spaced 6 - 9 m apart. Trees can be pruned to have 4 - 6 strong branches. Suckers should be removed. It can also be grown from root suckers or air layering.

Production: It is slow growing. Trees produce in 3 - 4 years. Full production is gained after 15 years. Fruit are produced throughout the year. Fruit should be picked and not allowed to drop. There can be 200 - 400 fruit per tree. Fruit ripen in the dry season and can be ripened off the tree. Trees can continue bearing for 50 years. The fruit can be stored for 2 weeks at 30°C and for 4 months at 10°C.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	58	577	2.3	0.13	219	0.55	-

Fruit

English: Guava

Local:

Scientific name: *Psidium guajava*

Plant family: MYRTACEAE

Description: A small evergreen tree 8 - 10 m tall with smooth, mottled bark which peels off in 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	proVit C mg	Iron mg	Zinc mg
fruit	77.1	238	1.1	60	184	1.4	0.2

Fruit

English: Indian jujube

Local:

Scientific name: *Ziziphus mauritiana*

Plant family: RHAMNACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.0	360	0.8	21	71	0.4	0.4
fruit (dry)	17.4	1201	4.3	-	-	-	-

Fruit

English: Mangosteen

Local:

Scientific name: *Garcinia mangostana*

Plant family: CLUSIACEAE

Description: Mangosteens are a medium sized tree, growing up to 20 m high. Trees keep their leaves all year. Leaves are 15 - 25 cm long, bright, glossy and leathery. Male and female flowers occur on separate trees. Commercial trees only have female flowers. Male trees occur but are rare. Flowers are produced on shoots near the end of branches. Female flowers have 4 cream petals and 4 sepals and a round ovary with a thick stigma composed of 4 - 8 lobes. No pollination is required because fruit develop without fertilisation. The fruit is dark blue with 4 - 8 white juicy segments inside the thick skin. Each segment is enclosed in fine pinkish veins. It is 8 cm across and has flower sepals attached to the stalk end. It leaks yellow sap from wounds. The fruit is produced on side branches near to the tips of the main branches. Fruit often have no seeds or up to 2. These are not true seeds but they will grow.



Distribution: Mangosteens are tropical plants and require a hot humid climate (25 - 35°C). Temperatures below 5°C will kill the plant and temperatures below 20°C slow growth. It grows from sea level to 1,000 m altitude in the equatorial tropics although it grows very slowly at higher altitudes. It can stand light shade but does not do well with sea breezes, and needs protection from wind. It cannot tolerate drought or alkaline soils. It needs fertile soil. Good fertility enables earlier bearing. It suits high rainfall areas over 2,500 mm per year. It suits hardiness zones 11 - 12.

Use: Fruit is best eaten fresh. They are also cooked and used in desserts. The seeds are eaten after boiling or roasting. They can be ground to produce a vegetable butter.

Cultivation: Trees breed true from seed because they are produced asexually. This means trees are very uniform. Some seeds can produce more than one seedling. They germinate between 10 and 54 days after planting. Seeds need to be fresh (less than 5 days after extraction), undamaged, and cleaned of pulp. They quickly lose their viability. Transplanting is done with care after 2 years. Long tap roots make this difficult. Young trees require shade during hot weather. The slow early growth is because the original roots of the seedling are replaced by new roots from the base of the stem. A spacing of 7 - 10 m suits. Grafting onto vigorous root stocks is difficult. It has been performed on *Garcinia tinctoria*. Budding, cuttings and layering have been unsuccessful.

Production: Trees are grow slowly and begin to bear after 8 - 20 years. Fruit are produced on shoots more than two years old so pruning is unnecessary. Fruiting is seasonal once or twice a year. Often more fruit are produced every second year. The main fruiting season is November to March. Fruit need to be harvested when mature and ripe. Fruit can only be transported with difficulty. They can be stored under refrigeration (10°C for up to eight weeks). Between 500 and 1,500 fruit are produced per tree. Fruit are best opened by cutting the skin around the middle to prevent tannins from the skin spoiling the flavour. Fruit can be stored for 3 weeks if undamaged.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	81.3	299	0.6	-	2.7	0.4	-

Fruit

English: Black currant tree

Scientific name: *Antidesma ghaesembilla*

Local:

Plant family: PHYLLANTHACEAE

Description: A stout and erect tree. It grows 3 - 8 m tall and spreads 2 - 4 m across. The trunk is covered with chalky yellowish-brown bark. It is rough and mottled. The timber is light coloured and hard. The young branches and new leaves have woolly hairs. The tree loses its leaves during the dry season. The leaves are 3 - 7.5 cm long by 2 - 3 cm wide. They are broadly oval with a blunt tip. The leaves are thinly textured and shiny on the upper surface but paler underneath. The leaves are numerous. The flowers are numerous and densely clustered. Male and female flowers occur on separate trees. The male flower spikes are 2.5 - 5 cm long and the female flowers are on short thick stalks at the ends of branches. The individual flowers are very small and about 1 - 2 mm long. The fruit are small, oval and fleshy. They are 0.4 - 0.6 cm long and purple when ripe. The fruit are edible.



Distribution: A tropical plant. They are common at low and medium altitudes throughout the islands of the Philippines. It grows to 120 m altitude in Malaysia. In Vietnam it grows along riverbanks.

Use: The fruit are eaten raw when ripe. They are sour. They can be used for jam. The fruit are also used with meat and fish dishes. The leaves are used as acid flavouring in food.

Cultivation: Plants can be grown from seed or cuttings.

Production: In India plants flower and fruit March to February.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	71.9	450	1.4	-	111	2.5	0.4

Vegetables

English: Okra

Local:

Scientific name: *Abelmoschus esculentus*

Plant family: MALVACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Pointed gourd

Local:

Scientific name: *Trichosanthes dioica*

Plant family: CURCUBITACEAE

Description: A pumpkin family plant. It is a climber. It is a herb. The stems are slender and angled. They have soft hairs. The tendrils are divided 2 - 4 times. The leaves have stalks. The leaves are 5 - 10 cm long. They are oval or heart shaped. There are teeth along the edge. Leaves are rigid and rough on both surfaces. Flowers are of one sex and white. The fruit are oblong or pointed on both sides. They are orange-red when ripe. They are 10 cm long and 5 cm wide. Seeds are slightly compressed.



Distribution: A tropical plant. It grows in tropical India. It suits a warm humid climate. It is common in NE India. In Nepal it grows to 600 m altitude. The soil needs to be well drained.

Use: The young fruit are cooked as a vegetable. They are used in curries. They are also fried, pickled and used in stews. They are also used in confectionary and pickled. The leaves are eaten as a vegetable. They are used in soups and stews.

Cultivation: Plants are grown from seed. It is often grown by stem cuttings. Pieces 60 cm long are taken from male and female plants. They are planted out of the nursery after 90 days.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	92.0	-	2.0	-	362.5	-	-

Image sourced from: www.hygeiajournal.com

Vegetables

English: Spine gourd

Local:

Scientific name: *Momordica dioica*

Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is a climbing herb which keeps growing from year to year. It has a tuberous root. The leaves have stalks. The leaves are 3.5 - 10 cm long. They are oval to heart-shaped. They taper to the tip. There are 3 - 5 lobes. There are teeth near the tip. The flowers are white. The fruit have a short beak. They are densely covered with soft spines.



Distribution: A tropical and subtropical plant. In Nepal it grows to about 1300 m altitude. It grows on sandy soils.

Use: The young fruit are cooked as a vegetable or in curries. The ripe fruit are eaten. They are slightly bitter. The tuberous roots are also cooked as a vegetable. The tender shoots and leaves are also eaten, cooked.

Cultivation: Plants are grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	81.5	294	2.2	-	99	2.6	-

Image sourced from; https://en.wikipedia.org/wiki/Momordica_dioica

Vegetables

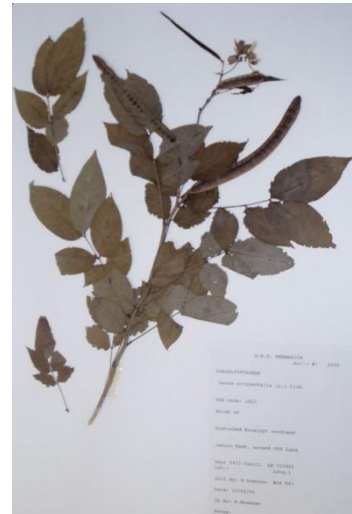
English: Coffee senna

Local:

Scientific name: *Senna occidentalis*

Plant family: FABACEAE

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



Distribution: A tropical plant. It grows in monsoon forest as well as arid areas. In Africa it grows up to 2,400 m altitude. It can grow in acid, neutral or alkaline soils. It can grow in arid places. Temperatures which average 12.5 - 28°C are suitable. It grows in areas with rainfalls between 500 and 4,000 mm per year. A rainfall of 500 to 1,000 mm is enough.

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Broad bean

Local:

Scientific name: *Vicia faba*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Shallots

Local:

Scientific name: *Allium cepa* var *aggregatum*

Plant family: AMARYLLIDACEAE

Description: These onion like plants produce a cluster of bulbs. They are narrowly oval. It grows to 1.2 m high. The leaves are round and hollow. This is a genuinely perennial form of *Allium cepa*, the bulb grows deeper in the soil and divides to produce a number of underground bulbs each year in much the same way as shallots. Large bulbs divide to form 5 - 15 bulbs whilst smaller bulbs grow into one large bulb. They do not produce bulbils in the flower-head.



Distribution: A temperate plant. They can be grown throughout the country but do best in the cooler higher places. They need a fertile well drained soil. They are frost resistant. They tolerate a pH in the range 4.5 - 8.3. It suits hardiness zones 5 - 10.

Use: The bulbs are eaten raw or cooked. The leaves are eaten raw or cooked. The flowers are used raw or to flavour salads.

Cultivation: Normally plants are grown by planting one bulb. It is best to plant them on slightly raised beds. Plants should be about 20 cm apart.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	90.0	126	1.8	945	19	3.7	-
bulb	81	281	1.9	-	2	0.8	-

Vegetables

English: Lotus-seed herb

Local:

Scientific name: *Alternanthera sessilis*

Plant family: AMARANTHACEAE

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



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

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

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

Production: The first harvest of leaves can be taken 50 - 60 days after planting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	89.3	109	4.5	57	77	-	-
shoot	-	-	5.0	577	-	16.7	-

Image sourced from: commons.wikimedia.org

Nuts, seeds, herbs and other foods

English: Sweet acacia

Local:

Scientific name: *Acacia farnesiana*

Plant family: FABACEAE

Description: An evergreen shrub. It grows 5 - 7 m tall and 3 m across. The stem is slender and erect. The crown is open. It is a spreading, densely branched shrub. The bark is smooth and brown. The leaves are branched and green. There are 4 - 6 pairs of larger leaves and 10 - 20 pairs of small leaflets. They have tiny leaflets and thorns up to 2 cm long, occur in pairs. The leaf stalk has a gland at or above the middle. The flowers are large orange balls. They are strongly perfumed. (The oil is used as a perfume in France.) The pods are long and dark brown to black. They are 5 - 8 cm long by 0.5 - 1 cm wide. They are inflated and sausage like. Often they are curved. They are marked with narrow lines. The pods have hard grey seeds imbedded in a pithy substance. The pods do not split open at maturity. The seeds are chestnut brown and 7 - 8 mm long by 5.5 mm wide.



Distribution: It is a tropical plant. This tree occurs naturally in Australia, Asia and Africa. It will grow on most soils. It is drought and frost resistant. It most commonly grows naturally on clay soils. In Papua New Guinea the plants are coastal below 60 m altitude. It grows in areas with an annual rainfall between 400 - 4,000 mm. It can grow in acid or alkaline soils. It can grow in arid places. It suits hardiness zones 11 - 12.

Use: The pods have been recorded as eaten after cooking. The gum is eaten. The ground up seeds are eaten. The germinated seeds are claimed to be eaten. The gum is used to prepare sweets. The young leaves are used in India as a substitute for tamarind in chutneys.

Cultivation: It is grown from seed.

Production: It is fast growing. Flowering can occur almost continuously if watering is regular. In northern Australia, flowering is normally May to July, with pods available from September to November.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	8.1	1522	36.6	-	-	6.0	0.6

Nuts, seeds, herbs and other foods

English: Peanut

Local:

Scientific name: *Arachis hypogea*

Plant family: FABACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Coastal almond

Local:

Scientific name: *Terminalia catappa*

Plant family: COMBRETACEAE

Description: A large tree, up to 25 - 40 m tall. It loses its leaves during the year. The trunk can be straight or twisted. There can be buttresses up to 3 m tall. The branches lie horizontally and come out in layers. The leaves are long, smooth and shiny, with an abrupt point at the tip and a rounded base. Leaves tend to be near the ends of branches. Leaves can be 17 - 29 cm long and 10 - 15 cm wide. Young leaves have soft hairs. The leaves turn red and fall off twice a year. Flowers are greenish-white and in a spike at the end of the branches.

The lower flowers on a spike are female, and the others are male. The fruit is about 6 cm long by 3 - 4 cm wide, thick and flattened, with a flange around the edge. The fruit are green and turn red when ripe. The pulp is edible.



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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut (fresh)	31	1810	15.9	-	4	4.6	4.9
nut (dry)	4.2	2987	20.0	-	2	6.3	8.8

Nuts, seeds, herbs and other foods

English: Walnut

Local:

Scientific name: *Juglans regia*

Plant family: JUGLANDACEAE

Description: A large, deciduous tree that grows up to 30 m tall. The straight trunk can be 120 cm across. The leaf stalks are 5 - 7 cm long. Leaves are often 30 cm long and with 5 - 9 leaflets. Leaflets can be 6 - 15 cm long by 3 - 6 cm wide. They are smooth except for a tuft of hair in the axils of the veins. Male and female flowers are separate but on the same tree. Flowers are small and greenish. Male flowers are compact in hanging spikes. Female flowers are on short stalks. The fruit has a green leathery husk. Nuts are hard shelled and about 4 cm across. The surface is figured. The kernels are edible.



Distribution: It is native to China and S.E. Europe. Trees can stand hard frosts when no flowers are on the tree. It is a cold temperate plant. It does best with a temperature of 29 - 32°C near harvest time. It does not bear in the highlands of India, but does produce in Garhwal Himalayas. In China they are common in the northern regions, between 23 - 42°N. They grow on mountain slopes between 500 - 1,800 m altitude. It suits hardiness zones 4 - 10.

Use: The kernels of the nuts are eaten raw or cooked. They are used in cakes, ice cream sauces, soups etc. The young green fruit can be pickled in vinegar and eaten. They can also be made into jams and preserves. Oil is extracted from the fruit. The remainder can be used in bread. The trees yield a sweet sap made into syrup or sugar.

Cultivation: Trees can be grown from seeds but quality is often variable. It is best to use grafted trees. Trees can be pruned, which should be done during the summer as calluses form more easily preventing bleeding. Seedling plants are spaced 10 m apart and budded plants are spaced 8 m apart. They easily become boron deficient.

Production: Seedling trees can produce nuts in 8 - 12 years. Grafted trees can produce in 4 years. Trees can live for 150 years. A good tree produces about 150 kg of nuts per year but 40 - 50 kg is more common. Nuts are harvested when the hulls start to turn yellow and crack. Nuts can also be collected from the ground.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut	4.4	2903	14.4	4	3	2.5	2.7

Nuts, seeds, herbs and other foods

English: Cashew

Local:

Scientific name: *Anacardium occidentale*

Plant family: ANACARDIACEAE

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



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

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

Cultivation: It is usually grown from seeds. Seeds germinate poorly and slowly. Only nuts which sink in water (or a solution of 150 g of sugar in a litre of water) should be planted. Seeds are sun dried for 2 - 3 days to improve germination. Seeds can be sown in a nursery then transplanted, or more commonly, are sown directly. Trees are spaced 7 - 10 m apart. The crop is cross pollinated mostly by insects. For good production, complete fertiliser or appropriate organic material should be applied. Pruning to shape the tree is often undertaken in the first 2 - 3 years. Cashews are often planted scattered in gardens or amongst other trees. Clearing under the tree prevents fire and makes finding nuts easier. Allowing nuts to fall before harvesting ensures only ripe nuts are collected. Resin in the cashew nut shell can damage hands and discolour the nuts. Roasting the nuts before removing the kernel avoids this.

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Canteloupe

Local:

Scientific name: *Cucumis melo*

Plant family: CUCURBITACEAE

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



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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Black fungus

Local:

Scientific name: *Auricularia polytricha*

Plant family: AURICULARIACEAE

Description: A mushroom. This jelly fungus or mushroom grows on logs. The cap is ear-shaped. It is leathery and 8 cm across. The stalk is short. It has frilly, brownish clumps of translucent tissue.



Distribution: A tropical and subtropical plant. In Thailand it grows on logs of Sesbania, Kapok, or mango. In China and the USA it is often near melting snow.

Use: The mushroom is used both fresh and dried. It is used in sour salads and in soups. It can also be fried with chicken. It keeps its crunchy texture if only added to dishes in the last few minutes of cooking.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
mushroom (dry)	14.8	1188	9.3	-	-	5.9	1.3
mushroom (fresh)	87.1	176	1.0	-	-	6.1	-

Image sourced from: www.treknature.com

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
AIZOACEAE	<i>Zaleya decandra</i>	Many stamen horse purslane	leaf	91.3	100	2.0	-	70	38.5	-	29
AMARANTHACEAE	<i>Amaranthus graecizans</i>	Spreading pigweed	leaf (dry)	6.3	903	26.1	-	-	9.8	5.0	34
AMARANTHACEAE	<i>Alternanthera sessilis</i>	Lotus-seed herb	leaf	89.3	109	4.5	57	77	-	-	51
AMARYLLIDACEAE	<i>Allium cepa var aggregatum</i>	Shallots	bulb	81	281	1.9	-	2	0.8	-	50
ARACEAE	<i>Colocasia esculenta</i>	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	11
ARACEAE	<i>Amorphophallus paeoniifolius</i>	Elephant foot yam	corm	76.1	352	1.3	-	3.5	0.6	0.2	17
AURICULARIACEAE	<i>Auricularia polytricha</i>	Black fungus	mushroom (fresh)	87.1	176	1.0	-	-	6.1	-	58
CLEOMACEAE	<i>Cleome viscosa</i>	Sticky cleome	leaf	80.4	-	5.6	-	-	24	-	31
CLUSIACEAE	<i>Garcinia mangostana</i>	Mangosteen	fruit	81.3	299	0.6	-	2.7	0.4	-	43
COMBRETACEAE	<i>Terminalia catappa</i>	Coastal almond	nut (fresh)	31	1810	15.9	-	4	4.6	4.9	54
CONVOLVULACEAE	<i>Ipomoea obscura</i>	Yellow ipomoea	leaf	56.6	569	8.8	-	-	28.8	1.1	30
CUCURBITACEAE	<i>Luffa acutangula</i>	Angled loofah	fruit	94.6	71	0.7	-	-	0.5	-	32
CUCURBITACEAE	<i>Momordica dioica</i>	Spine gourd	fruit	81.5	294	2.2	-	99	2.6	-	47
CUCURBITACEAE	<i>Cucumis melo</i>	Cantaloupe	fruit	93.0	109	0.5	169	30	0.4	0.2	57
CUCURBITACEAE	<i>Trichosanthes dioica</i>	Pointed gourd	fruit	92.0	-	2.0	-	362.5	-	-	46
DIOSCOREACEAE	<i>Dioscorea bulbifera</i>	Potato yam	tuber	70.8	357	2.7	-	78	3.1	0.4	14
FABACEAE	<i>Eriosema chinense</i>	Bush potato	root	66.9	401	2.2	-	5	49.5	1.0	15
FABACEAE	<i>Psophocarpus tetragonolobus</i>	Winged bean	seed (young)	87.0	205	7.0	13.0	18.3	1.5	0.4	20
FABACEAE	<i>Glycine max</i>	Soybean	seed (immature)	68.0	584	13.0	16	27	3.8	0.9	21
FABACEAE	<i>Cyamopsis tetragonolobus</i>	Guar bean	pod (fresh)	82.0	-	3.7	198	49	5.8	-	22
FABACEAE	<i>Cajanus cajan</i>	Pigeon pea	seed (young, boiled)	71.8	464	6.0	-	28.1	1.6	0.8	23
FABACEAE	<i>Vigna radiata</i>	Mung bean	seed	11.0	1432	22.9	55	4	7.1	-	24
FABACEAE	<i>Lablab purpureus</i>	Lablab bean	seed (young)	86.9	209	3.0	14	5.1	0.8	0.4	25
FABACEAE	<i>Canavalia ensiformis</i>	Jack bean	seed	10.0	1423	20.4	160	-	4.9	-	26
FABACEAE	<i>Cicer arietinum</i>	Chick pea	seed (raw)	9.9	1362	20.2	190	3	6.4	-	27
FABACEAE	<i>Senna occidentalis</i>	Coffee senna	leaf	84.9	205	5	-	17.9	12.7	-	48
FABACEAE	<i>Vicia faba</i>	Broad bean	seed (fresh, raw)	76.0	315	7.1	35	140	1.9	0.6	49
FABACEAE	<i>Acacia farnesiana</i>	Sweet acacia	seed (dry)	8.1	1522	36.6	-	-	6.0	0.6	52
FABACEAE	<i>Arachis hypogea</i>	Peanut	seed (fresh)	45	1394	15	-	10	1.5	-	53
JUGLANDACEAE	<i>Juglans regia</i>	Walnut	nut	4.4	2903	14.4	4	3	2.5	2.7	55
MALVACEAE	<i>Sida cordifolia</i>	Goat's horns	leaf	6.6	1296	24.2	-	-	79.8	-	28
MALVACEAE	<i>Abelmoschus esculentus</i>	Okra	fruit (cooked)	90.0	134	1.9	58	16.3	0.5	0.6	45
MENISPERMACEAE	<i>Cocculus hirsutus</i>	Python climber	leaf	76.5	-	3.9	-	-	9.9	0.6	33
MORACEAE	<i>Artocarpus altilis</i>	Breadfruit	fruit	74.4	506	1.5	4	25	0.4	0.2	35
MUSACEAE	<i>Musa x paradisiaca</i>	Hybrid plantains	fruit (cooking)	65.3	510	2.0	113	18.4	0.6	0.1	13
MYRTACEAE	<i>Psidium guajava</i>	Guava	fruit	77.1	238	1.1	60	184	1.4	0.2	40
NACARDIACEAE	<i>Anacardium occidentale</i>	Cashew	nut	4.0	2478	17.5	-	-	2.8	4.8	56
PHYLLANTHACEAE	<i>Phyllanthus emblica</i>	Emblic	fruit	78.4	281	0.6	-	316	0.9	0.5	37
PHYLLANTHACEAE	<i>Antidesma ghaesembilla</i>	Black currant tree	fruit	71.9	450	1.4	-	111	2.5	0.4	44

POACEAE	<i>Eleusine coracana</i>	Finger millet	seed	11.7	1594	6.2	-	-	5.3	-	16
POACEAE	<i>Panicum miliaceum</i>	Common millet	seed	9.6	1548	11	-	-	-	-	18
POACEAE	<i>Sorghum bicolor</i>	Sorghum	seed	-	1459	11.1	-	-	-	-	19
RHAMNACEAE	<i>Ziziphus mauritiana</i>	Indian jujube	fruit	77.0	360	0.8	21	71	0.4	0.4	41
RUTACEAE	<i>Aegle marmelos</i>	Bael fruit	fruit	58	577	2.3	0.13	219	0.55	-	39
SAPOTACEAE	<i>Mimusops elengi</i>	Red coondoo	fruit	46.6	825	2.9	-	223	-	-	38



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