Potentially Important Food Plants of North East India




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.

Food Plant Solutions Field Guide – North East India, Version 1, July, 2014

Preface

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

The selection of plants included in this guide has been developed by Shivam Sidana 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 North East India. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of North East India, and on the understanding that it will be further edited and augmented by local specialists with appropriate knowledge and understanding of local food plants.

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

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

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

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

Contents

Introduction

This book is designed as a simple introduction to the more common food plants of North East India. 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.

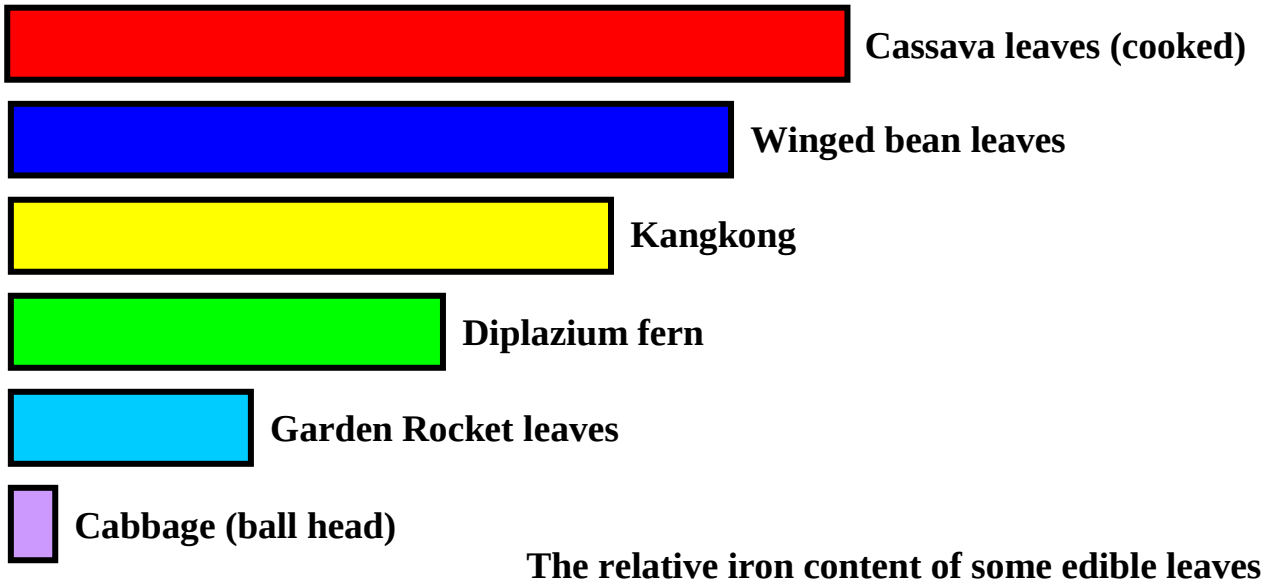
Naming of plants

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.

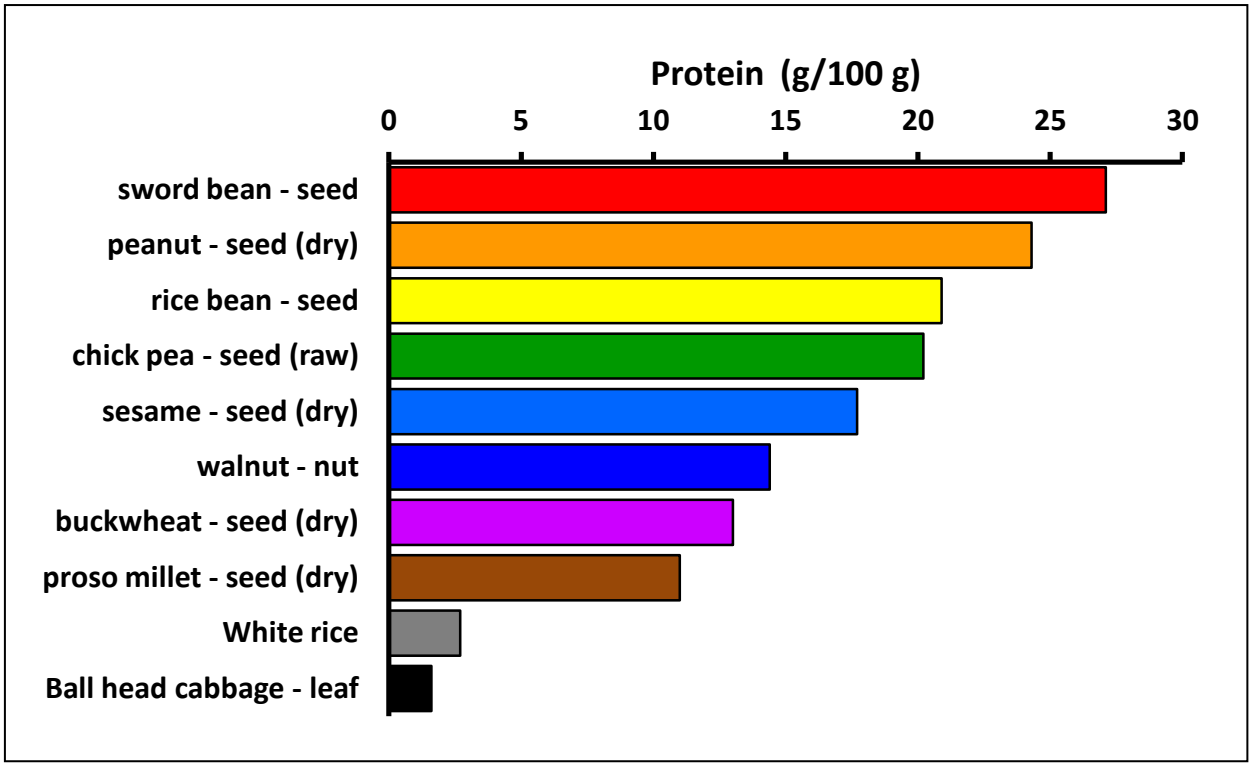
Pests

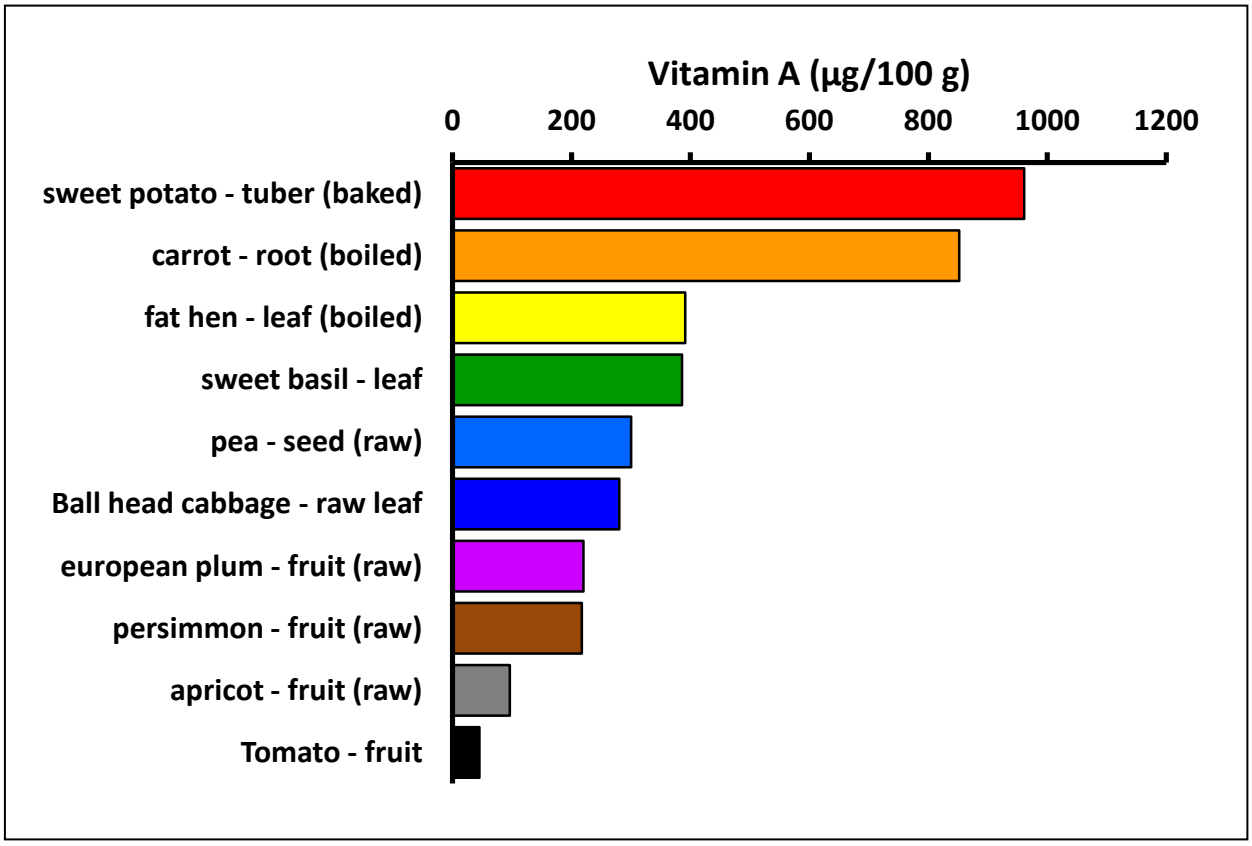
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects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

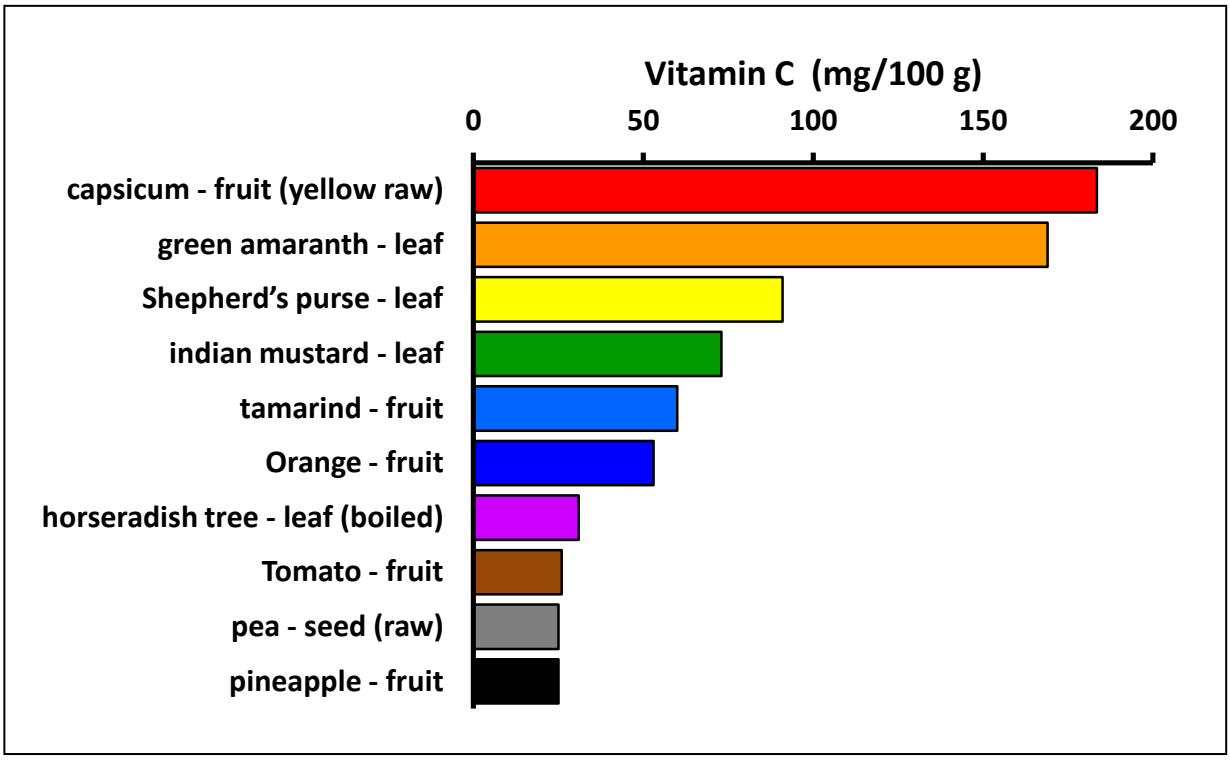
Diseases

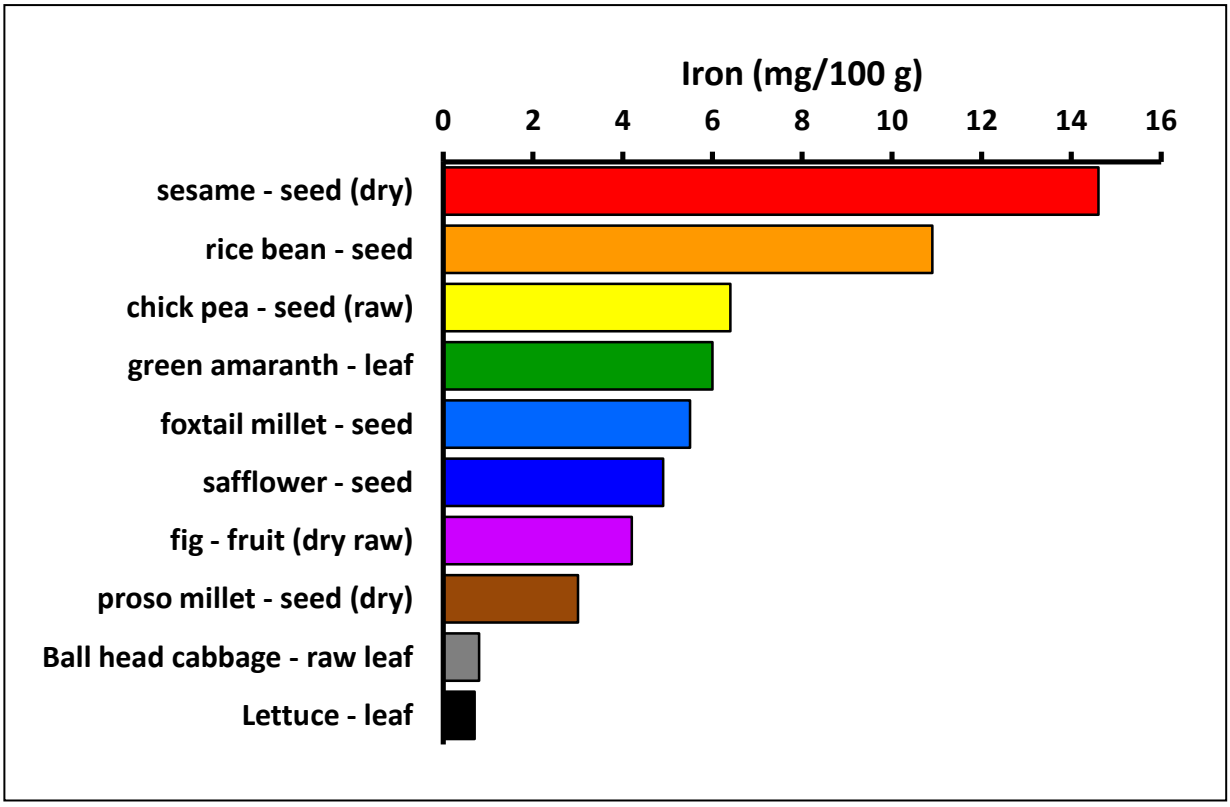
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct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

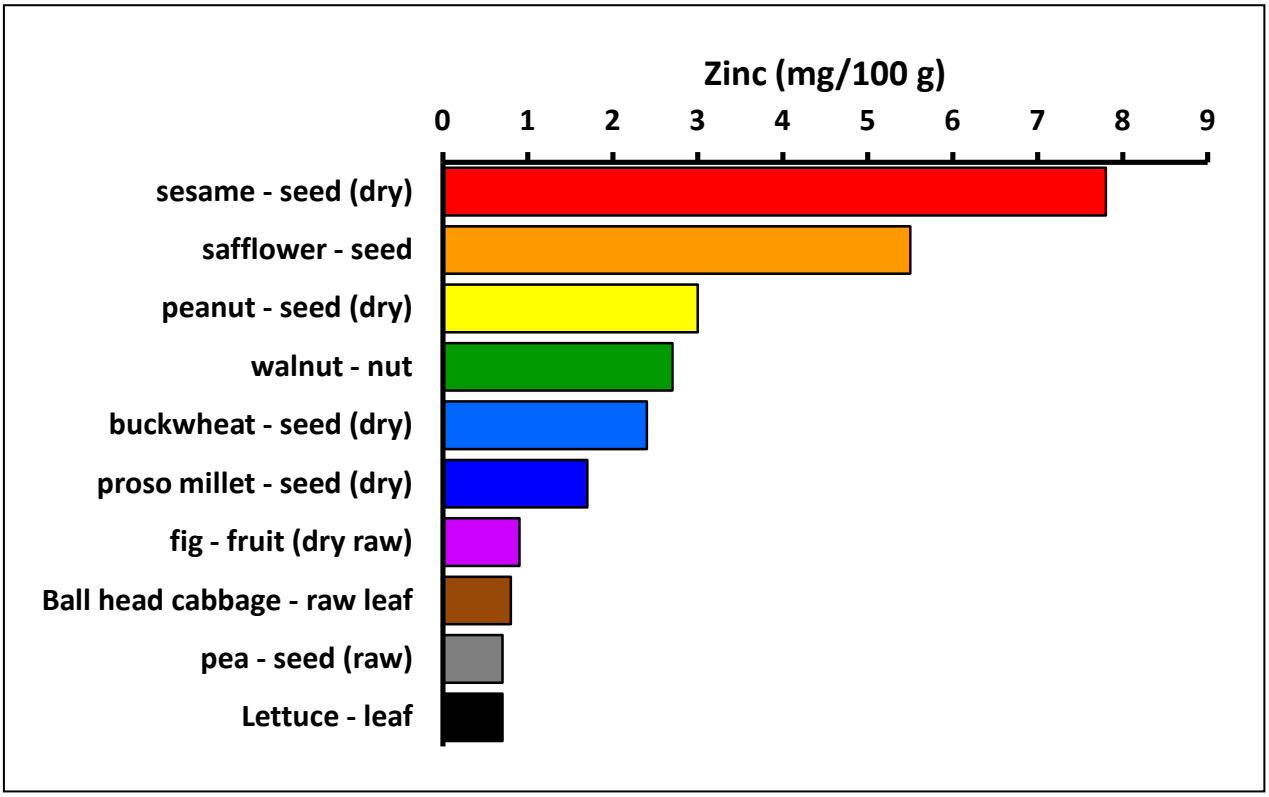
Food value charts for a selection of plants from North East India






Vitamin C (mg/100 g)
0
50
100
150
200
capsicum - fruit (yellow raw)
green amaranth - leaf
Shepherd's purse - leaf
indian mustard - leaf
tamarind - fruit
Orange - fruit
horseradish tree - leaf (boiled)
Tomato - fruit
pea - seed (raw)
pineapple - fruit


Iron (mg/100 g)
0
2
4
6
8
10
12
14
16
sesame - seed (dry)
rice bean - seed
chick pea - seed (raw)
green amaranth - leaf
foxtail millet - seed
safflower - seed
fig - fruit (dry raw)
proso millet - seed (dry)
Ball head cabbage - raw leaf
Lettuce - leaf



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

Starchy staples

English: Chinese taro
Local:

Scientific name: *Xanthosoma sagittifolium*
Plant family: ARACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	67.1	559	1.6	5	13.6	0.4	0.5
leaf	90.6	143	2.5	160	37	2.0	-
shoot	89.0	139	3.1	-	82	0.3	-

Starchy staples

English: Sweet potato
Local:

Scientific name: *Ipomoea batatas*
Plant family: CONVOLVULACEAE

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

Distribution: A tropical and subtropical plant. They grow from sea level up to about 2,700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow with a pH between 5.2 - 6.8. Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivated varieties can be selected for increased production under mild shade but not heavy shade. The survival of cuttings at planting is also reduced under shaded conditions. Under shaded conditions plant become more climbing and with fewer leaves which are however larger. With increasing shade less tubers are produced and these grow more slowly. Sweet potato tends to be responsive to potassium fertiliser. cultivated varieties are often selected for yield under low fertility conditions. Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar but once ground coverage has occurred weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason sweet potatoes are often grown on mounded beds. It suits hardiness zones 9 - 12.

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Foxtail millet
Local:

Scientific name: *Setaria italica*
Plant family: POACEAE

Description: An annual grass. It grows 1 - 1.5 m tall. It can be tinged with purple colour. The stalks are upright and the section between the nodes is hollow. It develops tillers from the base. It has along leaf sheath. The leaf blade is 30 - 45 cm long by 1.2 - 2.5 cm wide. It has a prominent midrib and tapers towards the tip. The flower is a spike-like branching flower 7.5 - 25 cm long by 1.2 - 5 cm wide. The side branches carry 6 - 12 small spikes each with 1 - 3 bristles. The mature grain is 2 mm long. There are many named cultivated varieties.

Distribution: A warm temperate plant. It suits regions of low rainfall. It is grown from sea level to 2000 m altitude. It can tolerate a wide range of soil conditions. It cannot tolerate waterlogging or long periods of drought. It can grow in arid places.

Use: It can be cooked and eaten like rice. The seeds can be parched, popped, added to soups and sauces or made into porridge, cakes, puddings, and dumplings. The sprouted seeds can be used as a vegetable. The seeds can be used for making beer. The seeds can also be made into syrup.

Cultivation: Plants are grown by seed. Seed can be broadcast or drilled. Pure stands require 8-10 kg/ha of seed. Plants are harvested by cutting off the ears.

Production: It grows quickly. Plants mature in 80 - 120 days. Flowering occurs over 10 - 15 days. Plants can be self or cross pollinated. Yields of 800 - 900 kg/ha are common and straw yields for livestock feed can be up to 2500 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	13.5	1425	9.5	-	-	5.5	-

Starchy staples

English: Cassava
Local:

Scientific name: *Manihot esculenta*
Plant family: EUPHORBIACEAE

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

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

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

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

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

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

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

Use: The seeds can be cooked and eaten whole or ground into flour. They can be used in bread, pasta or dumplings. They are often browned in a skillet before using in casseroles, stews and for stuffings. It suits people with Coeliacs disease because it contains no glutin. It has a high alkaline content that makes it easily digested. The seed can be sprouted and added to soups and salads. They are fermented into *tempeh* or *miso*.

Cultivation: It is grown from seed which take 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 (dry)	9	1582	11	0	0	3.0	1.7

Starchy staples

English: Buckwheat
Local:

Scientific name: *Fagopyrum esculentum*
Plant family: POLYGONACEAE

Description: An upright annual plant up to 1 m high. It spreads to 1 m across. It has angular hollow stems. These are erect and branching. Leaves are heart shaped or triangular and small. It has groups of white or pink flowers. These have a smell. They occur in clusters at the ends of branches. Fruit are small and 3 angled. The plants are not grasses but the seeds are normally grouped with other grain crops.

Distribution: It is a temperate plant. It will grow on poor soils but prefers rich soils and a protected sunny position. It is resistant to frost but damaged by drought. In Nepal it grows between 1,000 – 2,500 m altitude. It can grow up to 4,400 m altitude. In Uttar Pradesh it grows up to 3,000 m altitude.

Use: The seeds are eaten in porridge and biscuits etc. The seeds can be made into flour and eaten in pancakes, noodles and breads or for thickening soups and gravies. Seeds can be soaked overnight then sprouted and eaten. The tender leaves and shoots are cooked and eaten. The young leaves can be stored for 4 - 5 days after harvest. The seeds are used mainly for flour and stock feed. **Caution:** Seeds are bitter. If they are eaten in large amounts they can produce an unpleasant skin disorder.

Cultivation: Plants are grown from seed.

Production: Seeds usually germinate in 5 days. It has a very short growing period from sowing to maturity. It can produce a crop of leaves in 8 weeks and seeds in 12 weeks. Seed ripen irregularly over several weeks making harvesting difficult. Under cool conditions plants flower in 7 - 9 months. Commercial grain yields in Australia have been up to 2.5 tonnes/ha. In India, yields of 600 - 800 kg/ha are achieved.

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	1435	13	0	0	2.2	2.4

Starchy staples

English: Sago
Local:

Scientific name: *Metroxylon sagu*
Plant family: ARECACEAE

Description: A clumping palm. It can grow 10 - 70 m tall with a fat trunk (50 - 75 cm across). A palm can have 18 -24 leaves which are 5 - 7 m long. The leaflets can be 50 - 160 cm long by 3 - 6 cm wide with up to 100 per leaf. After about 15 years, the palm produces a large flower on top, then the palm dies. The flowering stalk can be 5 - 7 m long. The palm has suckers near the base. Some types have fertile seeds, about 2 - 3 cm across, on the flower. There is a complete range from very long thorns to short or no thorns on the leaf bases.

Distribution: It grows in India, Indonesia, Malaysia, Philippines and Thailand in Asia, and Australia, Papua New Guinea and Solomon Islands in the Pacific. A high watertable is tolerated by the plant. Temporary flooding does not appear to affect the crop, but permanently flooded sites do not appear to be suitable. Because of the site requirements, sago is almost always on locally level ground. The level ground can be a broad, flat basin or flood plain, or a local depression or stream edge in more hilly countryside. Sago seedlings can tolerate one rather salty flooding per fortnight. The maximum altitude is about 1,200 m, but the optimum is between sea level and 800 m. Sago palms grows well in wet conditions. They can tolerate saline or brackish water. They grow better in well-drained than in poorly-drained conditions. It suits hardiness zones 11 - 12.

Use: Sago starch can be processed from the pith. It is cooked and eaten. The bud can be eaten cooked. The sap can be collected for a drink called "tuba" in the Philippines. Sago grubs are often cultivated and eaten. The starch can be used to produce alcohol for motor fuel. One tonne of starch produces about 325 litres of alcohol.

Cultivation: Suckers or seedlings are planted in fresh water swamps or along creeks. Once stands are established in swamps, they continue to re-grow from suckers. Plants are thinned by removing some suckers. Some "seeds" will not grow, but those that are fertile need to be planted as soon as they form or they won't grow. Seeds germinate within 3 weeks. To plant sago, the planting site near a creek or in a damp place is first cleared of trees and rubbish. Then a sucker of a suitable variety is chosen from an old sago clump. Often the fronds of the sucker are up to 3 m high. It should be checked to see if the sucker is old enough. A sucker ready for planting has a tough woody connection to the base of the old palm. It is also checked to see that fresh roots are being produced from the base of the sucker. A suitable sucker probably has fronds 3 - 4 m long and is about 1.5 years old. This is chopped through with an axe. The sucker is then simply taken to a new site and planted in a shallow hole 30 cm x 30 cm x 30 cm. If several palms are being planted, they should be about 7 m apart. The only other attention the new palm needs is an occasional weeding when competing plants get too thick. If a suitable seedling is available, it can be replanted where it is wanted. Once planted, the sago groves renew themselves through suckers and an almost permanent stand is produced. The optimum spacing is considered to be 275 clumps per hectare. This would be thinner than that which occurs in most naturally established stands. It is also considered that for one clump, thinning out suckers so that only 3 suckers of different ages are maintained, gives the best harvestable yield. Higher yields per trunk reduce the amount of labour involved in processing the pith (the centre of the stem).

Production: Palms are ready to harvest after about 15 years. In swamps, about 10 - 60 trunks are ready per hectare, each year. An average processing rate is 2.2 kg of starch per hour. A single

trunk can yield up to 400 kg of sago. Palms in poor soil grow more slowly. Normally, one main trunk grows up, but several small suckers may shoot up around the base. Sometimes these suckers spread out and the space between the palms becomes crowded. Too much competition between clumps slows down the growth of the main palm, so the grove needs to be thinned out. This is very easily done. A small hole (10 cm x 10 cm) is cut with an axe into the top of the trunk of a sucker that is not wanted. This hole lets the sago beetle in and the sago grubs, which develop quickly, kill the sucker. They don't get into the main palm or other suckers unless a hole is made. After a few months, when the sucker is seen to be dead, it can be split open to provide a feed of sago grubs.

Food Value: Per 100 g edible portion

Edible part	**Moisture %**	**Energy kJ**	**Protein g**	**proVit A µg**	**proVit C mg**	**Iron mg**	**Zinc mg**
trunk	27	1197	0.2	-	0	0.7	-
palm heart	91	179	1.8	0	2.0	0.2	0.5

Legumes

English: Sword bean
Local:

Scientific name: *Canavalia gladiata*
Plant family: FABACEAE

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

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

Use: Young pods are cooked and eaten. Seeds can be cooked and eaten, but the water should be changed and they should be well boiled. They are also fermented. The leaves are blanched and eaten.
Caution: The seeds can be poisonous due to hydrocyanic acid and saponin. Cooking will remove these.

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Lablab bean
Local:

Scientific name: *Lablab purpureus*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1428	22.8	-	-	9.0	-
seed (young)	86.9	209	3.0	14	5.1	0.8	0.4
pod (fresh)	86.7	203	3.9	-	1	2.4	-

Legumes

English: Rice bean
Local:

Scientific name: *Vigna umbellata*
Plant family: FABACEAE

Description: An annual twining, climbing bean plant with a slender hairy vine. It grows from seed each year. It grows to 1.5 - 3 m long. Leaves have 3 leaflets which can vary in shape. They are mostly oval and 3 - 13 cm long by 1.5 - 7 cm wide. They taper towards the tip and are rounded at the base. Usually they are hairy. The leaf stalks are 3 - 16 cm long. Flowers are about 1.5 cm long in dense cone shaped clusters. These flowering stalks can be 3 - 10 cm long. The flowers are yellow. The fruit are straight pods about 10 cm long and 5 mm wide. Seeds are small (5 - 8 mm long) and yellow to brown. The pods split open easily. The seeds can be yellow, green, brown, red, black or mottled.

Distribution: A tropical plant that grows to 1,800 m altitude in the tropics. It suits wet climates. It occasionally becomes self sown in coastal grasslands. It needs a sunny potected position and is drought and frost tender. It can grow in arid places.

Use: The young pods and ripe seeds are eaten cooked. The dried seeds are boiled and served with rice or used in soups and stews. The young leaves can be eaten. The seeds are used in bean sprouts. Seeds should be cooked or crushed if fed to pigs.

Cultivation: It is grown from seeds. Seed collection is easy. Seeds often have a hard skin which must be broken (e.g. by scraping) to help germination.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	13.0	1373	20.9	-	-	10.9	-

Legumes

English: Pea
Local:

Scientific name: *Psium sativum*
Plant family: FABACEAE

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

Distribution: A temperate plant that suits a humid climate. It grows best at altitudes over 1,000 m in the tropics. Hot dry weather interferes with seed setting. It is frost tolerant except at flowering. It needs temperatures of 13 - 18°C. It needs a soil pH of 5.5 - 6.5 and reasonably good fertility. It cannot tolerate waterlogging or very acid soils. It suits hardiness zones 7 - 9.

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

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

Food Value: Per 100 g edible portion

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

Legumes

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	3	3	6.4	-

Leafy greens

English: Celery
Local:

Scientific name: *Apium graveolens* var *dulce*
Plant family: APIACEAE

Description: A herb that grows up to 1 m high. It has leaf stalks with ridges, and they are like a half circle when cut across. The plant is smooth and hairless and has a strong smell. The leaves are divided into a compound leaf. The wild plant has leaves in tufts from the base or spread along creeping stems. The flowers are white and in small, compound arrangements, where each flower is on a stalk from the same point.

Distribution: It is a warm temperate plant. It is mainly grown in the highlands in the tropics. It grows up to about 2,100 m altitude. It is damaged by frost. It often grows naturally in swampy conditions. In the tropical lowlands, it grows as a small leafy plant, but can be used for flavouring. It requires a rich, sandy loam soil. Because celery has shallow roots, it needs plenty of moisture and does best in humus-rich soils.

Use: The leaf stalks are eaten raw or used to flavour foods. The leaves can also be used for flavouring. The dry, ripe fruit can be used for flavouring, e.g. in salt.

Cultivation: Plants are mostly grown from seed and transplanted. Soil is mounded up around the plant, or it is wrapped up, to exclude sunlight to produce white stalks. Newer varieties will naturally form whiter stalks. Plants should be grown close together to keep sunlight off the stalks. This applies especially for the naturally whitening (blanching) varieties. The stalks are cut before the plant flowers.

Production: Leaf stalks take about 9 months from seed 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
stalk	94.6	67	0.8	13	7	0.4	0.1
leaf	95.7	88.2	0.6	13	5	0.4	0.1

Leafy greens

English: Broccoli
Local:

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

English: Green amaranth
Local:

Scientific name: *Amaranthus viridus*
Plant family: AMARANTHACEAE

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	87.3	-	4.5	72	169	6.0	-

Leafy greens

English: Celtuce
Local:

Scientific name: *Lactuca sativa var augustana*
Plant family: ASTERACEAE

Description: An annual lettuce plant with an edible stalk. It develops a stem 3 - 4 cm thick and 30 cm tall. The seed stalk is eaten like celery or cooked. The leaves are curled. There are several cultivated varieties.

Distribution: The soil needs to be well-drained. It suits plant hardiness zones 7 - 12.

Use: Young leaves are eaten raw in salads and also cooked, preserved or served with miso. The leaves can be eaten when young but become bitter 4 - 5 weeks after they first appear. The thick tender stem is peeled, sliced and eaten raw. It can also be pickled, stir fried or cooked in soups.

Cultivation: It is grown from seed. They are sown 5 - 10 mm deep and transplanted to 50 cm between plants.

Production: The cut stems are marketed with a topknot of leaves remaining.

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	94.5	75	0.9	350	20	0.6	0.3

Fruit

English: Pineapple
Local:

Scientific name: *Ananas comosus*
Plant family: BROMELIACEAE

Description: A perennial herb with a rosette of long, thick, spiky leaves, up to 1 m high and spreading 1 - 1.5 m. The leaves are arranged in spirals. Some kinds have thorns along the edges of the leaves. The plant produces suckers, both near the base of the stem and also higher up the stem near the fruit. These are called slips, or suckers, and are broken off and used for planting. The main plant dies after producing a fruit, but the suckers keep growing. The plant produces a flower and fruit at the end. The fruit is made up of about 150 berry-like fruitlets that are almost fused together. There is a small crown of leaves on top of the fruit. The fruit can be 25 cm long and weigh 0.5 - 4 kg. There are two main types of pineapples. The rough-leafed variety has spines on the leaves and produces a smaller but sweeter fruit. The smooth leaf variety has spineless leaves and larger fruit.

Distribution: The plant has been taken to most tropical and subtropical places. It is a tropical plant. It grows up to 1,800 m altitude near the equator. It can survive brief periods down to freezing, but cold retards growth, delays fruiting, and causes fruit to be more acid. A loose, well-drained soil with high organic matter is best. It can survive drought, but adequate soil moisture is necessary for good fruit production. Pineapples need an annual average temperature of 17.2 - 26.9°C. Growth ceases below 20°C. In the equatorial tropics, this is mostly between sea level and 1,800 m altitude. Pineapples need well-drained and fertile soil. It suits an acid soil and can develop roots in soils where lime has been added. The soil acidity can be between pH 3.3 - 6.0. The best range is pH 4.5 - 5.5. Soils which are not sufficiently acid can be treated with sulphur. It suits hardiness zones 9 - 10.

Use: The fruit is eaten fresh or used for juice. Unripe fruit are also cooked and eaten. The young, heart-leaves can be eaten. It is an attractive and popular snack food.

Cultivation: The suckers, slips, and the top of the fruit, can be used for planting. The time to maturity is the fastest for the suckers near the bottom of the plant and slowest when the top of the fruit is planted. Therefore, use suckers that grow from the stem near the ground for earliest yield. Pineapple flowering hormone can be used for fruit production with thorny varieties and calcium carbide for smooth varieties. Fruiting is less seasonal in the highlands than in the lowlands. Pineapples can be planted with 35,000 - 43,000 plants/ha or 3 - 4 plants per square metre. If plants are spaced more widely, they produce more suckers. Fruits become more acid where plants are closely spaced. If too many suckers are left growing from the main plant, then smaller fruit will be produced. They can grow in partial shade and, in this situation, the plants are normally more green. The red colouring of pineapple leaves is due to a deficiency of the nutrient nitrogen. This shows up more quickly in plants in full sunlight. When the plant is sufficiently large, it responds to changes, such as less available nutrients or water, and starts to produce a flower, then a fruit. The number of hours of sunlight, as well as reducing temperature and reduced sunlight, also help the flowers form. The result of this is that flowering and fruiting is often seasonal. This can easily be changed by using a fruiting hormone which allows fruit to be produced at times to suit the grower. Pineapples can grow in semi-arid conditions because the leaves can store some water. They also tend to lose only small amounts of water from evaporation through their leaves, but they can grow well with plenty of water. The roots are very sensitive to water-logging, so the soil must be well-drained.

Pineapples do not cover the soil well, so it is good to use a mulch of plant material to help weed control, provide some nutrients and to stop soil erosion.

Production: Plants usually produce for about 4 years. Fruiting is less seasonal in the highlands than in the lowlands in the tropics. The growth rate for pineapples slows at cooler temperatures. Plants grown in the highlands, or at higher latitudes, take longer to mature. It takes 60 days from when the flower starts to form until the fruit appears, then a further 5 months until the fruit is ready for harvest. The time from planting to harvesting ranges from 11 - 32 months, depending on temperature. The fruit are smaller, poorer shape and more acid where the temperatures are lower or there is less sunlight.

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	84.3	194	0.5	60	25	0.4	0.1

Fruit

English: Persimmon
Local:

Scientific name: *Diospyros kaki*
Plant family: **EBENACEAE**

Description: A tree that grows up to 12 m high and loses its leaves each year. The branches tend to hang over and they have a dense covering of leaves. Leaves are long and pointed (10 x 6 cm). The leaves are dark green and shiny on top and lighter under. Young leaves are pale green and old leaves turn yellow or red before they fall. Male and female flowers are normally on separate trees, so pollinator trees often help. Sometimes male and female flowers occur on the same tree. Fruit are 7 cm across with flattened ends. and are orange with a thin skin. It can have a few large seeds inside or be seedless. Pollination and seeding influence flavour and fruit ripeness.

Distribution: It suits cooler Mediterranean type climates. In the tropics, it needs to grow in highland areas with a distinctly seasonal climate. Dormant trees can tolerate freezing temperatures. They have only a short (100 hours) chilling requirement, but needs 890 hours between 8 - 12°C during the dormant period. They will not tolerate acid soils. A soil pH of 6.5 - 7.5 is preferred. They can stand some waterlogging, but does best in well drained soils. Branches tend to be brittle and easily damaged by strong winds. It suits hardiness zones 8 - 10.

Use: The fruit is eaten raw or can be cooked. It needs to be fully ripe and soft. Freezing fruit overnight can improve sweetness. They are used in pies, puddings, cakes, bread, ice cream and other desserts. Fruit can be stored frozen. Fruit are used to make wine and vinegar. The leaves are used to improve the flavour of pickled radishes.

Cultivation: They are grown from seeds although seeds often germinate poorly. Trees grow slowly. Budded or grafted trees can be used. Trees can be pruned and shaped either along a wall or as a hedge. Pruning when trees are young is important to develop a strong framework of branches. Adequate moisture is needed during the year. Trees can grow and produce with minimal fertiliser.

Production: Fruiting is seasonal. Often trees bear large crops one year and small ones the next year. This can be evened out by thinning out some of the fruit is the high yielding years. Fruit should be cut from the branches cutting the stalk near the fruit. Fruit are often ripened by putting near other ripening fruit like banana. Fruit must be handled carefully to avoid bruising. Fruit can be stored in a refrigerator for one month. Higher yields are obtained if pollination occurs. Trees can live for 60 - 80 years. Fruit mature after about 200 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 (dry)	23.0	1146	1.3	56	-	0.7	0.4
fruit (raw)	80.3	293	0.58	217	0.75	0.2	0.1

Fruit

English: European Gooseberry
Local:

Scientific name: *Ribes uva-crispa*
Plant family: **GROSSULARIACEAE**

Description: A small thorny shrub that loses its leaves during the year. It grows 1 - 2 m tall and spreads 1 m wide. The leaves are small and heart shaped with 3 - 5 lobes and teeth along the edges. The flowers are green. The fruit has a tough skin covered with spiky hairs. The fruit can be green or red.

Distribution: It is a temperate plant that grows on many different soil types. It can tolerate frost and fruits well in cooler climates. They do well in medium to heavy well-drained soils. It is restricted in Canada and the USA because it helps spread white-pine blister-rust. It suits hardiness zones 5 - 9.

Use: The fruit can be eaten raw, stewed or made into jam. The unripe fruit are often used for pies and tarts.

Cultivation: They can be grown from seed but are best grown from cuttings.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (ripe)	83.7	157	0.6	180	40	0.6	0.1
fruit (green raw)	89.9	73	1.1	180	40	0.3	0.1
fruit (green stewed)	91.4	62	0.9	150	31	0.3	0.1

Fruit

English: Fig
Local:

Scientific name: *Ficus carica*
Plant family: MORACEAE

Description: A low spreading deciduous tree with large leaves. It can grow to 10 m high. Trees are widely spreading with many branches. It has milky sap. The small branches are straight and strong. The leaves spread out like fingers on a hand with 3 or 5 lobes. The leaves are rough textured on the upper surface and downy underneath. The flowers are of one sex only. There are two sex forms - the caprifig and the fig. The caprifigs are dry and hard and develop 3 times a year. They harbour the fig wasp which itself goes through 3 different stages of its life cycle in these 3 fruit seasons. The "fruit" is a hollow receptacle with an opening at the tip. Inside this the flowers grow and mature. The true fruit develop inside this large receptacle. They are produced either singly or in pairs in the axils of leaves. Fruit colour can vary from black or brown, to green and yellow. Wild figs have both male and female flower parts but cultivated figs have no male flower parts. There are several hundred cultivated kinds of fig.

Distribution: It is native to S.W. Asia. It suits tropical, subtropical and warm temperate regions. It can stand light frosts once hardened. It suits highland areas in the tropics with a lower rainfall. It produces better if there is not too much rain at flowering. Good summer heat is necessary for sugar-rich fruit. Plants do best in heavy soil in well prepared sites. It needs a neutral soil pH. It has some salt tolerance. It suits hardiness zones 10 - 12.

Use: Fruit are eaten raw or cooked. They can be dried, preserved or used in jam. They are used in syrups, bread, pastries, and pies, and are made into brandy and wine. Food is wrapped in the leaves while cooking to impart flavour. The latex is used to coagulate milk for cheese and junket.

Cultivation: Plants can be grown from seed or stem cuttings. They can also be grown by budding and grafting. Smyrna figs need fig wasps for pollination. This is done by hanging male flowers near female flowers to attract the wasps. Adriatic figs develop fruit without pollination. Trees should be pruned for good production and easy harvesting.

Production: Figs start to bear after about 5 - 7 years and can continue for decades, but they become unprofitable after 50 years. Fruit ripen in their second year. Normally figs have 2 harvests per year. The first crop is from old wood and the second from newer wood.

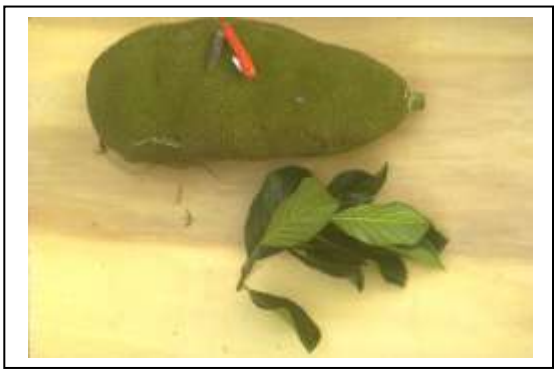
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (dry raw)	16.8	908	3.6	50	0	4.2	0.9
fruit (green raw)	84.6	174	1.3	500	2	0.4	0.3

Fruit

English: Jackfruit
Local:

Scientific name: *Artocarpus heterophyllus*
Plant family: MORACEAE



Description: An evergreen, breadfruit family tree that grows up to 20 m tall. Trees form many branches but have one or two main trunks. The bark is smooth and dark green. Leaves of young trees have 1 or 2 lobes but mature leaves are long (15 cm) and entire. They are leathery, deep green and glossy. Flowers occur on spikes, on stalks from the trunk or main branches. Some stalks only have male flowers, others only have female flowers, while some have both male and female spikes. Generally male flowers are on short stalks among the leaves, and female flowers are on trunks. Male flowers are 5 cm long by 2 cm wide and are dull green. Female flowers are bright green. The very large spiny fruit grow on main branches and the trunk. The fruit is a composite fruit made up from the many individual flowers of the flower cluster. Fruit can be 1 m long and weigh 36 kg. They have 6 sided fleshy spines. Each seed is surrounded by a yellow fleshy sheath. Seed are 2 - 4 cm long and 1 - 2 cm wide. There can be 100 - 500 seed in a fruit. Unlike breadfruit, there are no seedless Jackfruit. When ripe, the unopened fruit has a strong smell.

Distribution: A tropical plant that grows in the tropical lowlands and up to about 1200 m altitude. It can stand some drought, but not water-logging. Trees do best where there is year round rainfall. It yields poorly where humidity is low. It does best in a well drained, frost-free location that is warm and sunny. They are slightly more tolerant of cold than breadfruit. It suits areas with a temperature range 22 - 35°C. Trees can survive occasional frosts down to 0°C. It grows best with a soil pH of 6 - 6.5. They have some wind and salt tolerance.

Use: The flesh of ripe fruits can be eaten raw. Unripe fruit can be cooked and eaten as a vegetable. They are fried in curries, preserved in syrup, dried, cooked in milk or made into alcoholic drinks. Unripe fruit is pickled. The seeds can be boiled or roasted and eaten. Some kinds have more seeds. The young leaves and flowers are edible. They are eaten mixed with chilis, fish paste, sugar and salt.

Cultivation: Trees are usually sown from seeds, but it is normal to sow them in their final location as the plants don't transplant easily. They have a long delicate taproot which makes transplanting difficult. Fresh seed must be used (less than 4 weeks old). If fresh seeds are planted immediately they grow more quickly and more seeds germinate. It is better to use larger seed. The fleshy layer around the seeds should be removed. Seeds can be soaked in water for 24 hours to give better germination. It is best to sow seeds with the embryo pointing and the narrow end pointing downwards. Seeds germinate in 3 - 8 weeks. A spacing of 12 m is suitable. Where trees are used as a wind break, trees are spaced 6 m apart.

Air-layering can be used, and stem cuttings are also possible. Air layering is best done in the rainy season. Rooting hormones can be used to help roots develop. The shoots used for air layering should be 2 - 3 years old and brown in colour. To produce air layers, a small branch 3 - 4 cm across, is cut below a node and only part way around the stem. A ring 5 - 7 cm wide is cut and a layer of sand wrapped around the stem and covered with plastic. Using 1% IBA growth substances helps shoots to strike and form roots. Roots form in about 22 days and the stem can be cut off and planted after about 2 - 3 months. Because trees vary in their growth rate, how quickly they flower and fruit, and in the fruit quality, it is best to grow plants by using vegetative parts from good trees. This can be done by budding or grafting onto 12 month old seedlings already established in the

field. Budding and grafting are not easy with jackfruit. Because the fruit develops on the trunk, early pruning to allow 2 - 3 trunks to develop is helpful. As well, trees can be topped to prevent them becoming too tall and large.

Production: Jackfruit is a fast growing tree. It can be 7 m tall by 3 years old. Trees begin bearing after about 8 years. The fruiting season lasts about 4 months in subtropical places, but fruit can be produced year round in tropical places. Fruiting takes about 100 - 120 days from when the flower is pollinated until a fully mature fruit is developed but can take another 4 months to ripen. Trees tend to have heavy crops every second year. Pollination is by wind but hand pollination has been used to increase the amount of fruit set. Fruit can be up to 50 kg in weight. Fruit change from green to yellow when mature. Up to 250 fruit can be produced each year on large trees. Fruit does not store well but can be kept in a cool store for 4 - 6 weeks at 11 - 12°C and with high humidity.

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 (boiled)	57.6	673	5.0	-	10	0.7	-
fruit (raw)	74.5	395	1.5	30	6.7	0.6	0.4
leaf	75.5	360	5.0	-	-	17.5	-
seed (raw)	60.9	224	4.3	-	10	1.2	-
fruit + seed (immature)	85.8	-	1.6	-	13	0.1	-

Fruit

English: Apricot
Local:

Scientific name: *Prunus armeniaca*
Plant family: ROSACEAE

Description: A medium sized deciduous tree. It grows to 10 m tall. It is a broad spreading shape. The bark is dark red-brown and smooth and shiny. The leaves have stalks. The leaves are broadly oval. They are 10 cm long by 6 cm wide. They are rounded at the base and taper to the tip. They have shallow round teeth along the edge. The leaves are glossy and dark green. The flowers are 2.5 cm across and pale pink or white. They are almost without stalks and have 5 petals. They occur singly on old shoots. The fruit is fleshy and rounded. It is yellow and can be flushed with red. There is a hard covering over the seed. This stone is smooth. The seeds are oval. The flesh is edible. The seeds are edible (but contains toxins).

Distribution: It is native to C. Asia and N. China. It grows in cool areas with hot dry summers. They do best on a free draining soil. In Nepal, plants grow from 2,500 – 3,500 m altitude. It does well in areas with 100 cm rainfall, cool winters with 300 - 900 chilling hours below 7°C and a frost free spring. A soil pH of 6 - 6.8 is suitable. It needs good sunlight. It suits hardiness zones 5 - 10.

Use: The ripe fruit are eaten. The kernels can be eaten. If sweet they are eaten fresh and if bitter they are roasted. The seed oil is used for cooking. The fruit are also used for juice and are dried and eaten dry. They are also used for jam, and in pastries, pies, cakes, and picked.
Caution: The bitter kinds of apricot kernels contain amygdalin which releases cyanide and is poisonous unless removed by cooking.

Cultivation: Plants can be grown from seed but are often grafted onto rootstocks. The flowers are self fertile. Plants require some winter chilling.

Production: Trees fruit in 3 - 4 years. Fruit are picked by hand.

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 (raw)	86	201	0.6	96	10	0.4	0.2
fruit (boiled)	82.6	92	0.4	59	5	0.3	0.1

Fruit

English: European plum
Local:

Scientific name: *Prunus domestica*
Plant family: ROSACEAE

Description: A small deciduous tree that grows 6 - 10 m tall. The young twigs are hairy. The bark is grey-brown and becomes cracked with age. The leaves have stalks and are alternate. They are 2 - 7 cm long by 0.7 - 3.5 cm wide. They are oval and taper to the tip and have fine teeth. The base is rounded. The flowers are white. The fruit are round and golden-yellow, green, red or dark purple. They have a waxy bloom. Fruit can be 7.5 cm long. The stone is large and rough or pitted. There are many cultivated varieties.

Distribution: A temperate plant that needs 1,000 - 1,200 hours of chilling below 7°C during the dormant period. It does best with 90 - 110 cm annual and well-distributed rainfall. A well drained soil with a pH of 5.5 - 6.8 is best. It suits hardiness zones 5 - 9.

Use: The ripe fruit are eaten raw. They are also stewed, and made into jelly and jam and juice. Dried fruit are called prunes. They are used in baked muffins, cookies, cakes and some breads. They are cooked for plum puddings. They are distilled for alcoholic drinks. The flowers are eaten as a garnish for salads and also brewed into tea.

Cultivation: Plants are grown from seed or stem cuttings. It does not need pruning to produce fruit each year. They are often grafted. Plants can be spaced 6 m apart. Fruit develop on spurs and side shoots one year old. Trees are pruned to renew spurs.

Production: A tree starts to bear after about 5 years and produces for about 20 years. A tree may produce 65 - 70 kg of fruit each year.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (raw)	77.5	162	0.5	220	3	0.4	0.1
fruit (boiled)	80.7	144	0.4	180	3	0.3	0.1

Vegetables

English: Capsicum
Local:

Scientific name: *Capsicum annuum var. annuum*
Plant family: SOLANACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Pumpkin
Local:

Scientific name: *Cucurbita maxima*
Plant family: CUCURBITACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Bitter cucumber
Local:

Scientific name: *Momordica charantia*
Plant family: CUCURBITACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Vegetables

English: Carrot
Local:

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

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

Distribution: A temperate plant. In the tropics it is mostly grown in the highlands, but will grow from sea level to 2,600 m altitude. Sometimes on the coast only leaves are produced. Carrots are frost resistant. In Nepal carrots are grown up to 1,700 m altitude. It needs a deep loose soil. Seed germinate well in the temperature range 7 - 24°C. Plants grow well with a temperature about 15°C. It grows best with a pH of 6 - 7. It suits hardiness zones 3 - 9.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root (raw)	89.9	180	1.0	835	6	0.6	0.4
root (boiled)	91.5	79	0.6	852	4	0.4	0.3
leaf	87.4	-	2.2	65	-	-	-

Vegetables

English: Shepherd's purse
Local:

Scientific name: *Capsella bursa-pastoris*
Plant family: BRASSICACEAE

Description: A cabbage family herb. It is an annual plant or it can take 2 years to complete its life cycle. The stem is erect and grows to 60 cm high. It has a rosette of leaves near the base. The leaves vary in shape and are toothed along the edge. The upper leaves are smaller, sword shaped and without stalks. The flowers are white. They occur in clusters at the ends of branches. The fruit is a flat, triangular, pod.

Distribution: It grows in temperate and subtropical places. It grows in higher rainfall areas and does best in moist soils. It is resistant to frost and drought and can survive winter snow. In Zimbabwe, it grows from 1,490 – 1,920 m above sea level.

Use: The young tender leaves are cooked and used as a vegetable. They can also be eaten raw in salads. They need to be gathered before the flowers appear. The dried seed pods give a pepper like flavouring. The fresh or dried roots can be used as a ginger substitute.
Caution: Eating this food is not recommended during pregnancy as it can cause miscarriage.

Cultivation: Plants are grown from seed. The seeds can lie dormant in the soil for 30 years.

Production: The seeds contain 15 - 20% oil.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	88.2	-	4.2	150	91	4.8	-

Vegetables

English: Hibiscus
Local:

Scientific name: *Hibiscus rosa-sinensis*
Plant family: MALVACEAE

Description: A shrubby, evergreen, woody, shrub used for hedges. It grows 2 - 5 m tall. The bark is grey and flaky and has fine stripes. The leaves are bright green and oval with long tips. The edges are entire on the lower leaves. The upper leaves are coarsely toothed. The flowers occur singly in the axils of leaves. Flowers can be single or double. They are bell shaped and 10 - 15 cm across. There are a range of colours. The fruit are rounded capsules with many seeds inside. The capsules are beaked. Plants usually do not produce fruit in the hot humid tropics.

Distribution: A tropical and subtropical plant, common as an ornamental throughout the tropics. It originally came from China. It thrives on any type of soil. Different types are adapted to sunny or shady places. It grows in open, moist places. It grows where average temperatures are 15 - 30°C. It is very sensitive to frost and can grow from sea level to 1,000 m altitude. It requires a minimum rainfall of 700 mm per year and suits hardiness zones 9 - 11.

Use: The leaves are eaten cooked. In some places they are pounded before cooking. The flowers are eaten raw or pickled. They are also added to drinks. They are used to colour foods including preserved fruit, sliced pineapple, agar-agar jellies, and cooked vegetables. The fresh flower ovary is eaten.

Cultivation: It is mostly grown from cuttings.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (dry)	6.4	1339	25.9	-	-	19.6	8.9
leaf (fresh)	76.0	321	2.3	-	-	-	-

Nuts, seeds, herbs and other foods

English: Safflower
Local:

Scientific name: *Carthamus tinctorius*
Plant family: ASTERACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Indian mustard
Local:

Scientific name: *Brassica juncea*
Plant family: BRASSICACEAE

Description: It is an erect leafy annual cabbage plant. It grows to about 1 m high. The plant can vary a lot. The dark green leaves are elliptical and deeply divided. The end segment of the leaves is oval. The leaves taper towards the stem and have a strong mustard flavour. The flowers are pale yellow. They have 4 petals. It produces a flower and seed pods at the top. The seed pod is 3 - 5 cm long and narrow. The seeds are reddish-brown.

Distribution: A warm temperate plant. It is grown in some highland areas in the tropics. It is often grown as a cool season crop. Most varieties are not frost tolerant. It needs a fertile, well drained soil. A pH of 5.5 - 6.8 is suitable. It can tolerate poor soils. It can grow in arid places. It suits hardiness zones 9 - 11.

Use: The leaves are cooked and eaten. They have a bitter taste, so the cooking water needs changing. They can be stir-fried, or added to soups and stews. They can be eaten crystallised in vinegar or salt. They can be used in salads. The seeds can be fried then used as a spice. They also yield an edible oil. They can be sprouted. The leaves are also pickled.

Cultivation: The seed is broadcast. They can be put in a nursery and transplanted. A spacing of 25 cm x 25 cm is suitable. Seed germinate in 5 days at 20 - 25°C.

Production: Plants grow rapidly. Leaves can be harvested one month after planting. Leaves can be harvested several times. Whole plants can be harvested in about 45 days from transplanting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	6.9	1964	24.9	-	3	10.0	-
leaf	92.0	108	2.4	31	73	2.7	-

Nuts, seeds, herbs and other foods

English: Peanut
Local:

Scientific name: *Arachis hypogea*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Tamarind
Local:

Scientific name: *Tamarindus indica*
Plant family: FABACEAE

Description: A large spreading tree up to 24 m tall. It has a broad, dense, evergreen crown. The trunk can be 1 m across. The bark is rough and grey with a checkered pattern. The tree can lose its leaves in dry areas. The leaves are carried one after another along the branch. The whole leaf is 6 - 12 cm long and it is divided into 10 - 17 pairs of leaflets. These are oblong and without stalks. The whole leaf has a leaf stalk about 15 cm long. The leaflets are 1 - 2.5 cm long and 4 - 9 mm wide. They are a dull dark green with a rounded tip. The flowers are pale yellow with brown markings. The flowers are about 2.5 cm across and hang on long, many flowered stalks. The fruit is an oblong, thin-skinned, fleshy capsule. The brown seeds are inside this long rough surfaced, sausage-like fruit. This pod is 6 - 8 cm long and about 2 cm wide and contracted between the seeds. The pod cracks when mature. The seeds are shiny and hard. The edible pulp is date like and reddish brown.

Distribution: A tropical legume. The tree is cultivated in a number of coastal towns in the tropics as a street tree. It is probably best grown below 800 m altitude in the tropics. It is drought resistant and cannot stand water-logging. It does well on coastal dunes above high water level. It suits semi-arid areas. It grows in the Sahel and must be in frost free locations. In Kenya it grows from sea level to 1,600 m altitude. It suits hardiness zones 11 - 12.

Use: The pulp of the fruit is edible and is also used for drinks. The seeds are also edible when cooked. They can be roasted and ground into flour. The outer skin is removed. The young leaves, flowers and young pods are also edible and are eaten in curries. They are used to make dishes acid. They are used in sauces and chutneys. The young seedlings are also edible.

Cultivation: It can be grown by seeds or cuttings. It is best to sow seedlings in pots then transplant them, but seed can be sown direct. There are about 1,400 seeds per kg. Seed should be soaked in hot water or the seed coat nicked before sowing. Seed can be stored for 2 years if kept dry, cool and away from insects. Trees can be topped or cut back and allowed to re-grow. Nothing grows under the trees due to the acidity of the leaves. Trees can be grown by air layering or cuttings.

Production: Trees are long-lived and grow very slowly. Fruiting is seasonal from April to June. It takes 8 - 9 months from flowering to ripe fruit. If plants are grown for shoots, they are planted close together.

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	38.7	995	2.3	20	60	1.1	0.7
flower	80.0	314	2.5	-	-	1.4	-
leaf	78.0	305	3.1	-	-	2.0	-

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 used 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: Sweet basil
Local:

Scientific name: *Ocimum basilicum*
Plant family: LAMIACEAE

Description: An erect, branched, woody shrub. The branches are hairless and smooth. The leaves are hairless and oblong, with a narrow tip and blunt base. The base of the stems is tinged red. The leaf stalk is 1.5 cm long. The leaf blade is 2.5 - 5 cm long by 1 - 2.5 cm wide. The flowers are somewhat purplish, with very short stalks. The small nuts are smooth, oval and slightly flattened. Plants vary a lot, and several varieties have been selected. They can have licorice, cinnamon or lemon flavours, and vary in size.

Distribution: It grows in many warm temperate countries, but also in the tropics. It suits both the lowlands and the highlands in the tropics. It cannot stand frost. It suits warm and hot climates. It needs some shade in tropical areas. It needs protection from wind. It needs rich, moist, well-drained soil. Soil should be at 25 - 30°C for seed to germinate. It suits hardiness zones 10 - 12.

Use: The seeds are soaked in water and eaten. The leaves are used raw or boiled to flavour foods. The seed yields an oil used to flavour sauces, pickles, meats and confectionary.

Cultivation: It is grown from seed. Seed should be sown 2 - 3 mm deep and covered with a light sand or soil. Seeds germinate within 3 - 5 days. Seedlings are thinned out to 20 cm apart. Seedlings can be transplanted. If top shoots are picked off, a more bushy plant is produced and flowering is delayed.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	91.0	113	2.5	386	18.0	3.2	0.9
seed	6.4	1051	14.4	938	61.2	42.0	5.8

Nuts, seeds, herbs and other foods

English: Sesame
Local:

Scientific name: *Sesamum indicum*
Plant family: PEDALIACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	4.7	2397	17.7	1	0	14.6	7.8
leaf (raw)	85.5	188	3.4	-	-	-	-

Nuts, seeds, herbs and other foods

English: Fat hen
Local:

Scientific name: *Chenopodium album*
Plant family: CHENOPODIACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Horseradish tree
Local:

Scientific name: *Moringa oleifera*
Plant family: MORINGACEAE

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

Distribution: A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits hardiness zones 9 - 12.

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	4	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	*Amaranthus viridus*	green amaranth	leaf	87.3	-	4.5	72	169	6.0	-	28
APIACEAE	*Apium graveolens* var *dulce*	celery	stalk	94.6	67	0.8	13	7	0.4	0.1	26
APIACEAE	*Daucus carota* subsp. *sativus*	carrot	root (boiled)	91.5	79	0.6	852	4	0.4	0.3	42
ARACEAE	*Xanthosoma sagittifolium*	chinese taro	root	67.1	559	1.6	5	13.6	0.4	0.5	11
ARECACEAE	*Metroxylon sagu*	sago	trunk	27	1197	0.2	-	0	0.7	-	19
ASTERACEAE	*Lactuca sativa var augustana*	celtuce	leaf	94.5	75	0.9	350	20	0.6	0.3	29
ASTERACEAE	*Carthamus tinctorius*	safflower	seed	5.6	2163	16.2	5	0	4.9	5.5	45
BRASSICACEAE	*Brassica oleracea var. italica*	broccoli	flower (boiled)	89.9	78	3.1	150	34	1.0	0.4	27
BRASSICACEAE	*Capsella bursa-pastoris*	Shepherd's purse	leaf	88.2	-	4.2	150	91	4.8	-	43
BRASSICACEAE	*Brassica juncea*	indian mustard	leaf	92.0	108	2.4	31	73	2.7	-	46
BROMELIACEAE	*Ananas comosus*	pineapple	fruit	84.3	194	0.5	60	25	0.4	0.1	30
CHENOPODIACEAE	*Chenopodium album*	fat hen	leaf (boiled)	88.9	134	3.2	391	37.0	0.7	0.3	52
CONVOLVULACEAE	*Ipomoea batatas*	sweet potato	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	12
CUCURBITACEAE	*Cucurbita maxima*	pumpkin	fruit	69.6	439	1.4	-	-	-	-	40
CUCURBITACEAE	*Momordica charantia*	bitter cucumber	fruit	93.6	105	1.2	-	-	0.2	-	41
EBENACEAE	*Diospyros kaki*	persimmon	fruit (raw)	80.3	293	0.58	217	0.75	0.2	0.1	32
EUPHORBIACEAE	*Manihot esculenta*	cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	15
FABACEAE	*Canavalia gladiata*	sword bean	seed	15.0	1335	27.1	-	-	-	-	21
FABACEAE	*Lablab purpureus*	lablab bean	seed (young)	86.9	209	3.0	14	5.1	0.8	0.4	22
FABACEAE	*Vigna umbellata*	rice bean	seed	13.0	1373	20.9	-	-	10.9	-	23
FABACEAE	*Psium sativum*	pea	seed (raw)	78.5	283	5.8	300	25	1.9	0.7	24
FABACEAE	*Cicer arietinum*	chick pea	seed (raw)	9.9	1362	20.2	3	3	6.4	-	25
FABACEAE	*Arachis hypogea*	peanut	seed (dry)	4.5	2364	24.3	-	-	2.0	3.0	47
FABACEAE	*Tamarindus indica*	tamarind	fruit	38.7	995	2.3	20	60	1.1	0.7	48
GROSSULARIACEAE	*Ribes uva-crispa*	european gooseberry	fruit (ripe)	83.7	157	0.6	180	40	0.6	0.1	33
JUGLANDACEAE	*Juglans regia*	walnut	nut	4.4	2903	14.4	4	3	2.5	2.7	49
LAMIACEAE	*Ocimum basilicum*	sweet basil	leaf	91.0	113	2.5	386	18.0	3.2	0.9	50
MALVACEAE	*Hibiscus rosa-sinensis*	hibiscus	leaf (fresh)	76.0	321	2.3	-	-	-	-	44
MORACEAE	*Ficus carica*	fig	fruit (dry raw)	16.8	908	3.6	50	0	4.2	0.9	34
MORACEAE	*Artocarpus heterophyllus*	jackfruit	fruit (raw)	74.5	395	1.5	30	6.7	0.6	0.4	35
MORINGACEAE	*Moringa oleifera*	horseradish tree	leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2	53
PEDALIACEAE	*Sesamum indicum*	sesame	seed (dry)	4.7	2397	17.7	1	0	14.6	7.8	51
POACEAE	*Setaria italica*	foxtail millet	seed	13.5	1425	9.5	-	-	5.5	-	14
POACEAE	*Panicum miliaceum*	proso millet	seed (dry)	9	1582	11	0	0	3.0	1.7	17
POLYGONACEAE	*Fagopyrum esculentum*	buckwheat	seed (dry)	10	1435	13	0	0	2.2	2.4	18
ROSACEAE	*Prunus armeniaca*	apricot	fruit (raw)	86	201	0.6	96	10	0.4	0.2	37
ROSACEAE	*Prunus domestica*	european plum	fruit (raw)	77.5	162	0.5	220	3	0.4	0.1	38
SOLANACEAE	*Capsicum annuum var. annuum*	capsicum	fruit (yellow raw)	92	113	1.0	24	183.5	0.5	0.2	39