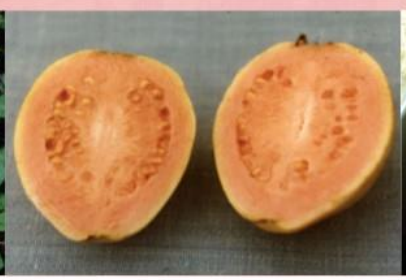
Potentially Important Food Plants of the Philippines

FOOD PLANT SOLUTIONS
ROTARIAN ACTION GROUP

Solutions to Malnutrition and Food Security

muravah foundation

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

www.foodplantsolutions.org

Potentially Important Food Plants of the Philippines

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 – Philippines, Version 3, March 2019

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 Lindsay Jolley 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 the Philippines. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of the Philippines, 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 the Philippines. 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.

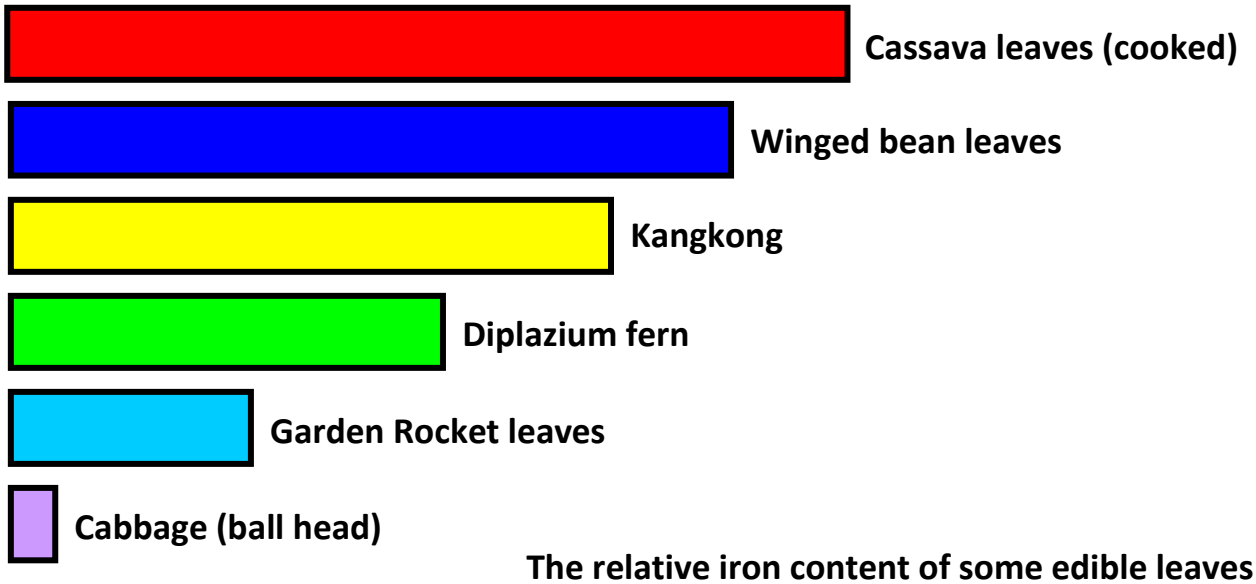
Naming of plants

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.

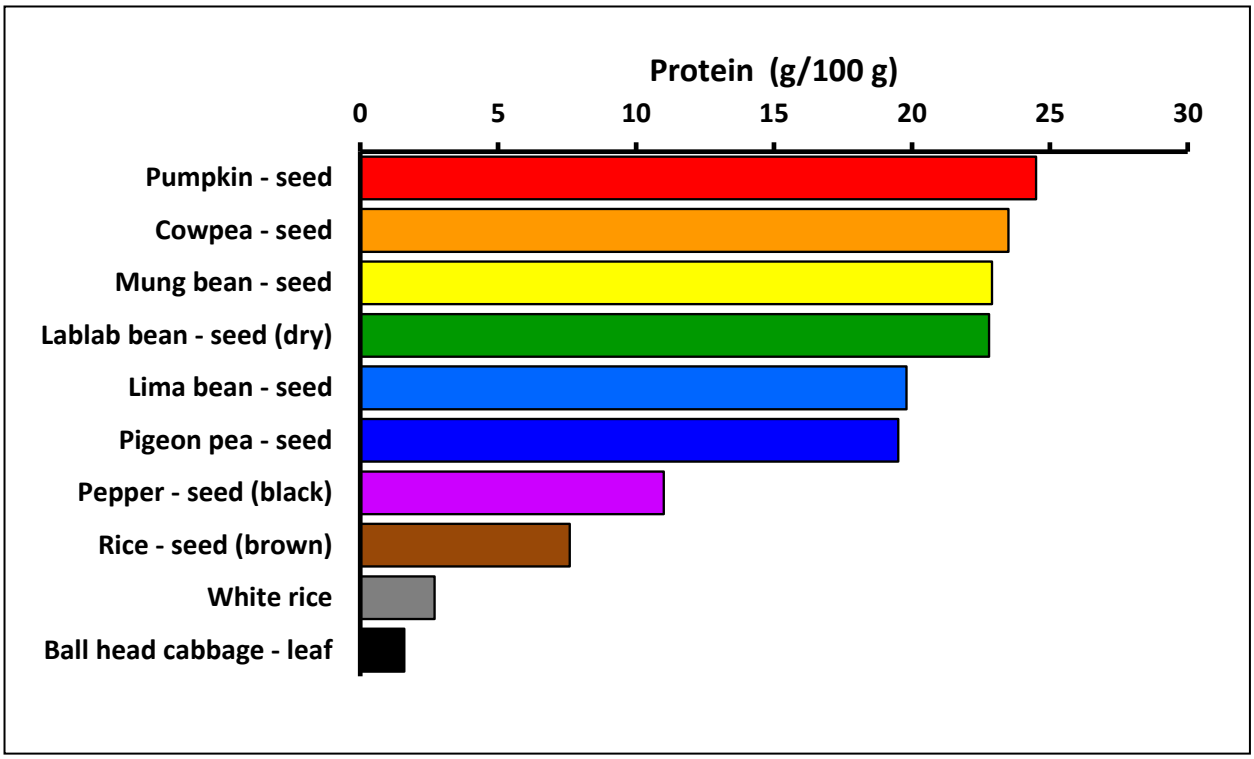
Pests

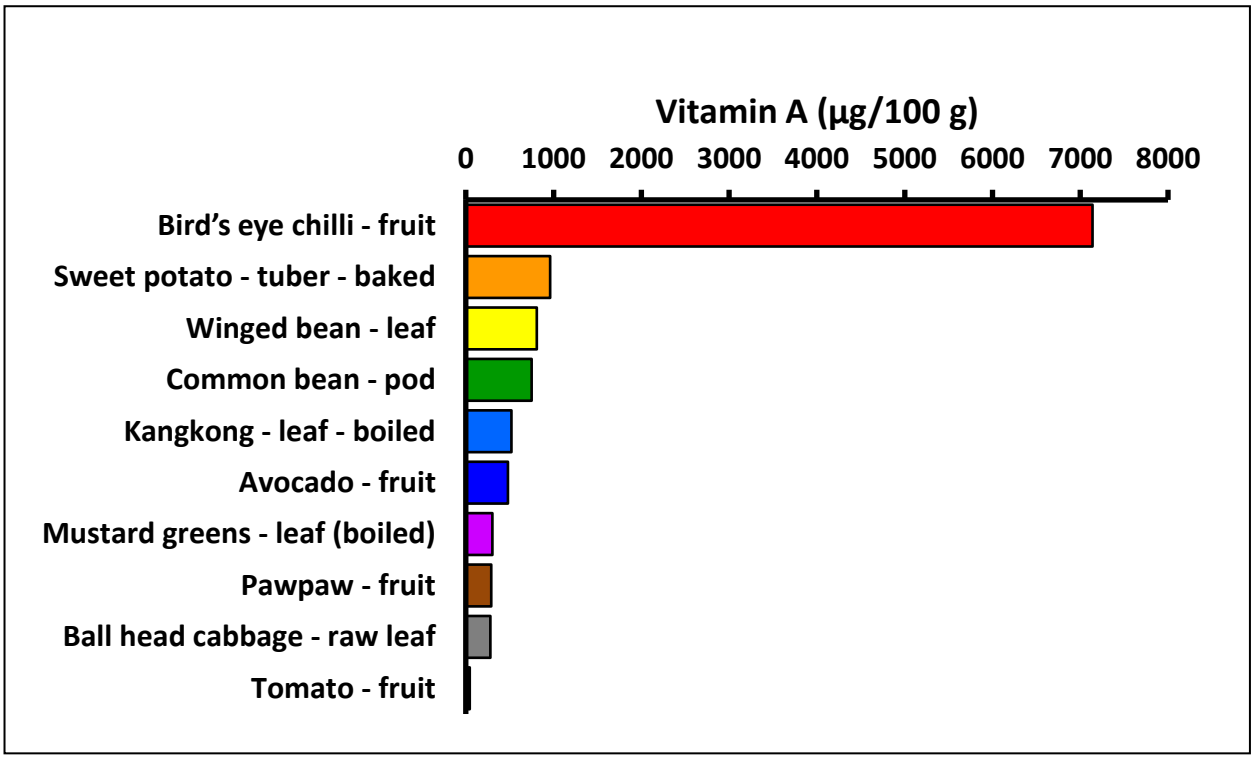
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects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

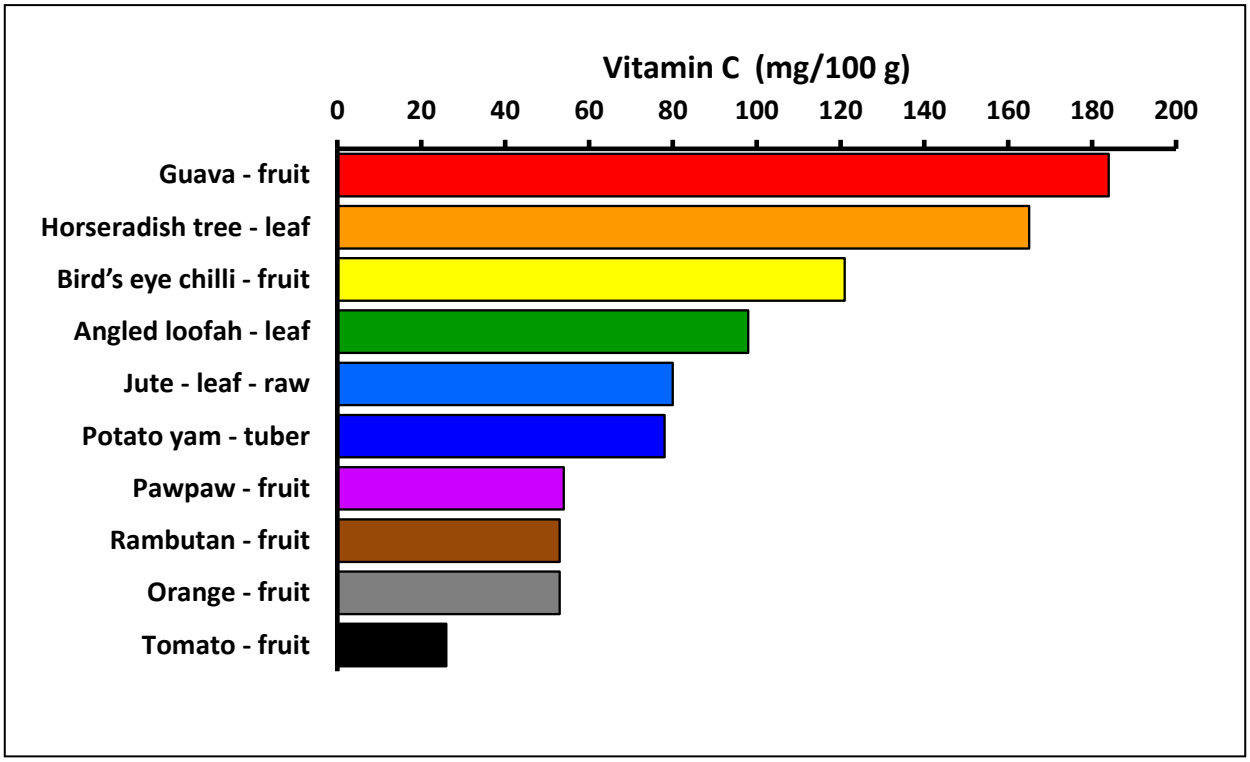
Diseases

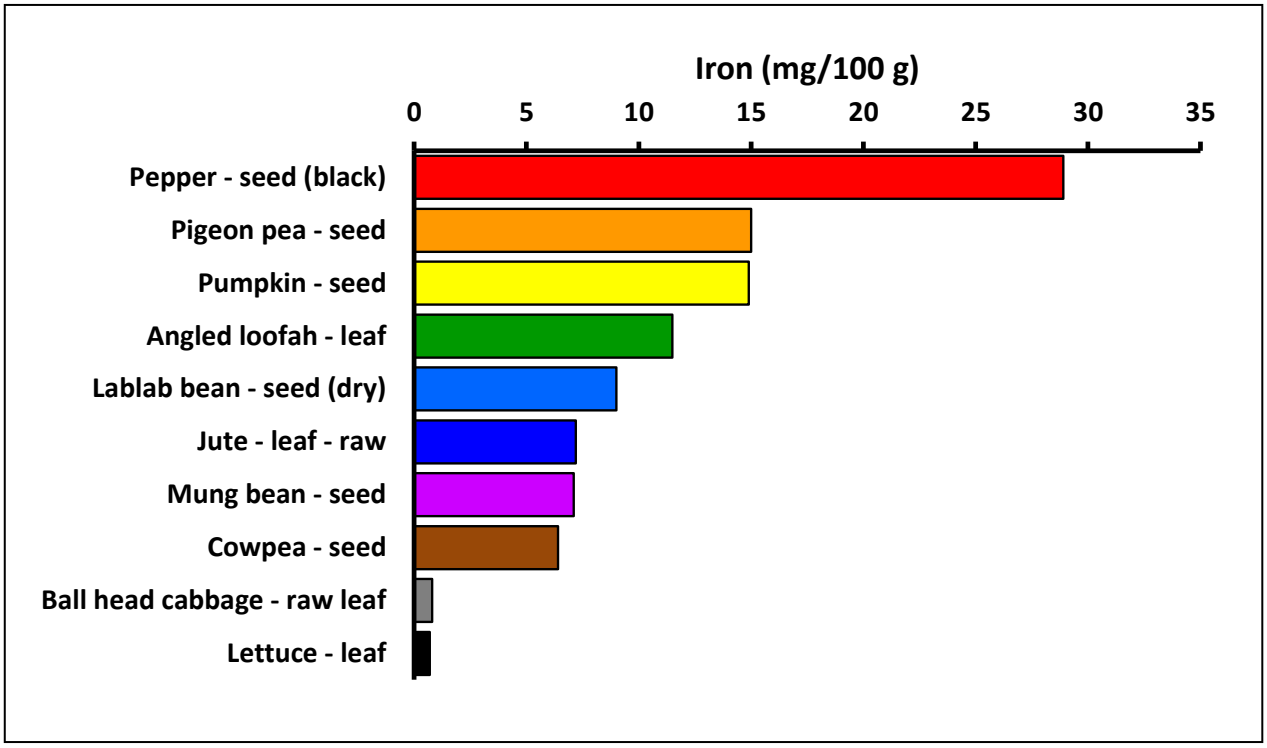
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct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

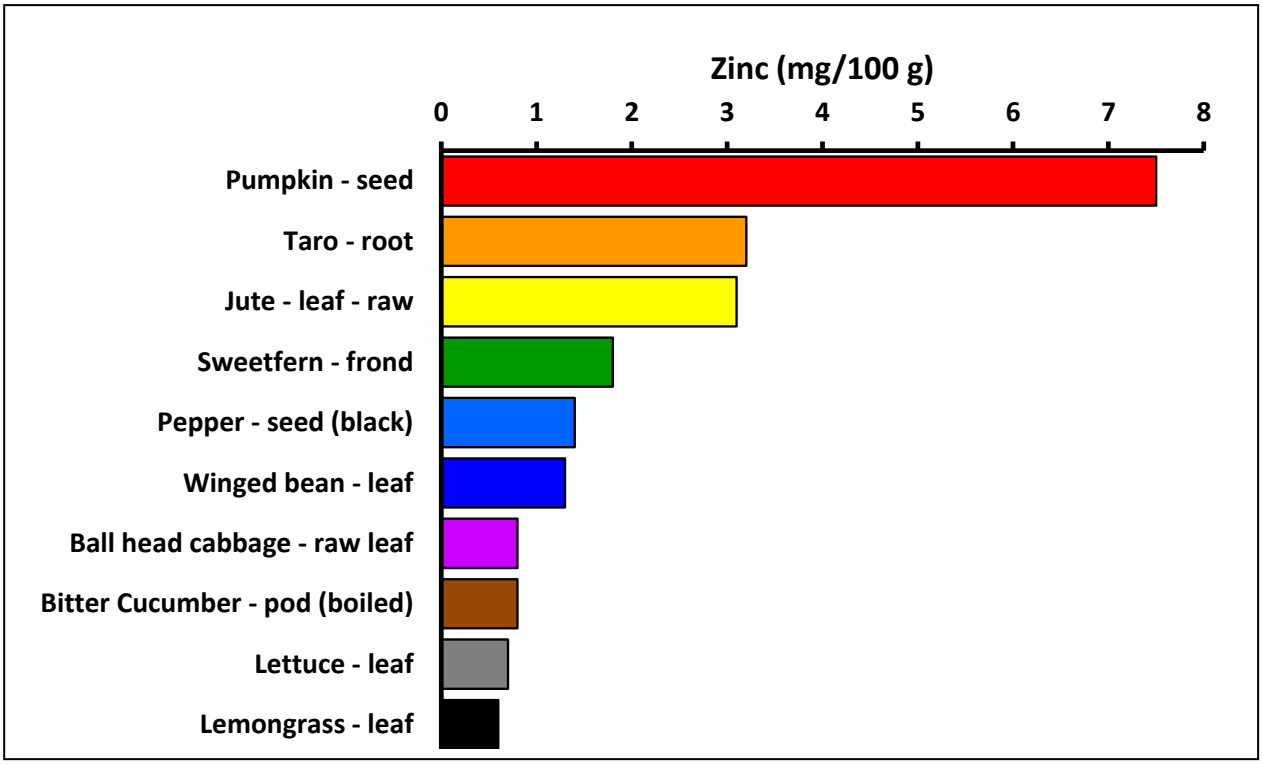
Food value charts for a selection of plants from the Philippines






Vitamin C (mg/100 g)
0
20
40
60
80
100
120
140
160
180
200
Guava - fruit
Horseradish tree - leaf
Bird's eye chilli - fruit
Angled loofah - leaf
Jute - leaf - raw
Potato yam - tuber
Pawpaw - fruit
Rambutan - fruit
Orange - fruit
Tomato - fruit


Iron (mg/100 g)
0
5
10
15
20
25
30
35
Pepper - seed (black)
Pigeon pea - seed
Pumpkin - seed
Angled loofah - leaf
Lablab bean - seed (dry)
Jute - leaf - raw
Mung bean - seed
Cowpea - seed
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. corn). This does not mean that they are not useful, but merely reflects a desire for the Food Plant Solutions project to concentrate on plants that are less well known and/or underutilised.

Starchy staples

English: Potato yam
Local: Ube

Scientific name: *Dioscorea bulbifera*
Plant family: DIOSCOREACEAE

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

Distribution: An annual tropical plant. It will grow from the coast up to about 1700 m altitude in equatorial zones. It is common near the edge of grassland and forest at mid altitudes. Both wild and cultivated forms occur. It is common near secondary forest at low and medium altitudes.

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Sweet potato
Local: Kamote

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.

Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivars can be selected for increased production under mild shade but not heavy shade. The survival of cuttings at planting is also reduced under shaded conditions. Under shaded conditions plant become more climbing and with fewer 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. Cultivars 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. In well drained or high organic matter soils digging or mounding is not as essential. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage plants need to be hilled or have the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Cassava
Local: Kamoteng Kahoy

Scientific name: *Manihot esculenta*
Plant family: EUPHORBIACEAE

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

Distribution: A tropical plant. Plants grow from sea level up to about 1,650 m. They can grow in poor soil and can survive drought. It 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 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: Rice
Local: Bigas or Mais

Scientific name: *Oryza sativa*
Plant family: POACEAE

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

Distribution: A tropical plant. It grows in tropical and subtropical countries. Plants are grown in both flooded and dryland sites. It will grow over a range of conditions but is normally between sea level and 900 m altitude in the tropics. Occasionally it is grown up to 1,600 m. It needs a frost free period of over 130 days.

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: Taro
Local: Gabi

Scientific name: *Colocasia esculenta*
Plant family: ARACEAE

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

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

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

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

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

For dryland taro, the soil is prepared by digging, unless a fresh bush fallow is used where the natural friability of the soil allows plants to be put into the undug soil in a small hole that is prepared. Plants

are put into a hole 5 - 7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth in beneficial. Setts from corms normally give higher yield than that from cormels. The greater leaf area and root production may be responsible for this. Setts of about 150 g are optimum.

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

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Starchy staples

English: West Indian Arrowroot
Local: Uraro

Scientific name: *Maranta arundinacea*
Plant family: MARANTACEAE

Description: A perennial plant with an erect stem growing to 2 m tall with large fleshy underground rhizomes. There are 4 - 8 large leaves on long stalks near the base and 1 - 8 leaves on the stem. These stalks can be 3.5 - 20 cm long. The leaf blade is 12 cm long and the leaf stalk clasps the stem. Flowers are small and white. There can be several on each leafy shoot and they occur on the ends of branches. There are 1 - 2 bracts under each 2 - 3 flowers. The rhizomes can be 20 cm long and about 3 cm across. They are covered with fleshy scales. The fruit are capsules which are green and tinged red-brown. They are oval and 7 - 8 mm long by 4 - 5 mm wide. The seeds are brown.

Distribution: It is a tropical plant that grows well in hot humid climates. A temperature of 20 - 30°C is best. Plants grow from the coast up to 900 m altitude in the tropics. It needs an annual rainfall of 1,500 – 2,000 mm. It suits plant hardiness zones 10 - 12. .

Use: The rhizomes are used in soups or sauces. They can be just scraped and boiled. They can be used for making flour. It is an easily digested starchy flour and is a good thickener in sauces. The fresh rhizomes can be stored for 7 - 8 days. **Caution:** It is important to peel off the skin scales or they give a bitter taste to the starch.

Cultivation: Plants are grown from pieces of rhizome or sometimes suckers. A spacing of 1 m x 0.5 m, or closer, is suitable. 3,000 – 3,500 kg of planting material are required for one hectare. The pieces are planted 6 - 8 cm deep. It needs a deep, well drained, fertile and slightly acid soil. Flowers are normally removed to allow as much starch storage as possible in the rhizomes.

Production: Rhizomes are ready for harvest after about 11 months. Successive crops are grown in the same site for 5 - 7 years. Yields of 12.5 t per hectare are average. These produce 8 - 16% starch.

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 - starch	12.2	1515	0.4	-	-	1.2	-
root - raw	80.8	272	4.2	2	1.9	2.2	0.6

Legumes

English: Snake bean
Local: Sitaw

Scientific name: *Vigna unguiculata* subsp. *sesquipedalis*
Plant family: FABACEAE

Description: A climbing bean with long pods. The vines can be 3 m long. They normally twine around stakes. Dwarf kinds also occur. Leaves have 3 leaflets. The leaflets are oval and side leaflets are at an angle. Leaflets can be 2 - 16 cm long by 1 - 12 cm wide. The centre leaflet can have lobes near the base and the side leaflets can have lobes on the outer edge. The leaf stalks can be 2 - 13 cm long. The flowering stalks are in the axils of leaves. There can be few or several flowers. The flowers can be white, yellow or blue. Flowers are 1 - 3 cm long by 1 - 3 cm wide. Pods are long (up to 90 cm) and flexible. The seeds can vary between white to dark brown. They are oblong or kidney-shaped. Seeds are 4 - 12 mm long by 2 - 6 mm wide.

Distribution: Plants grow in coastal areas in the tropics from sea level up to about 300 m in equatorial regions. Seeds shoot in moist soil over 22°C. For growth, day temperatures between 25 - 35°C and night temperatures not below 15°C are required. It suits wet areas and cannot tolerate drought. It is a day-length neutral plant that performs best under full sunlight, but can tolerate some shade. It has a high water requirement when fully grown (6 - 8 mm/day). It can tolerate a wide range of soils with pH of 5.5 - 7.5. Seeds show no dormancy or inavtivity. This is a very important bean for the hot, humid tropics.

Use: The young pods and leaves are eaten. The ripe seeds can also be eaten.

Cultivation: Plants are grown from seed. Seeds germinate quickly (2 - 3 days) and plants grow rapidly. Flowering occurs after 5 weeks and harvesting of young pods can start 2 weeks later. Plants die after about 3 - 4 months. A spacing of 60 cm is suitable. Plants need sticks to climb up. Sticks about 2 - 2.5 m long are suitable. Often 5 -r 6 seeds are sown around the one stick. Plants are often topped when growing too vigorously. It only grows as an annual bean, so seeds need to be replanted each year. The pods need to be harvested every 2 - 3 days. It suffers more from diseases if the bean does not have sticks to climb. Damage by bean pod borer is less if snake beans are grown intercropped with maize.

Production:

Food Value: Per 100 g edible portion

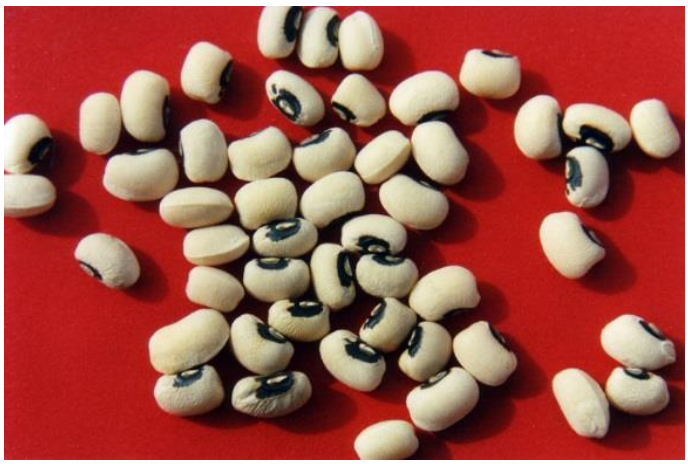
Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
pod (fresh)		197	2.8	43	18.8	0.47	0.37
seed (boiled)	87.5	197	2.5	20	16.2	0.98	0.36
seed (dry, raw)	8.43	1453	24.33	0.16	1.6	8.61	3.5

Food values obtained from: U.S. Department of Agriculture, Agricultural Research Service. 2011. USDA National Nutrient Database for Standard Reference, Release 24. Nutrient Data Laboratory Home Page, http://www.ars.usda.gov/ba/bhnrc/ndl

Legumes

English: Cowpea
Local: Balatong

Scientific name: *Vigna unguiculata subsp. unguiculata*
Plant family: FABACEAE



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

Distribution: It grows in tropical and subtropical climates. It grows from sea level to 1800 metres altitude in the tropics. Plants can stand high temperatures. Some kinds can tolerate drought. They are sensitive to cold and killed by frost. Plants germinate with a temperature between 11.5 - 15.5°C. The best growth occurs between 20 - 35°C. They can grow on a range of soils providing they are well drained. They are a short day plant. They do well in the semiarid tropics. It will not tolerate acid or alkaline soils. It grows in areas with an annual rainfall between 280 - 410 mm. It can grow in arid places.

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Winged bean
Local: Sigarilyas

Scientific name: *Psophocarpus tetragonolobus*
Plant family: FABACEAE

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

Distribution: A tropical plant that grows from sea level up to about 1850 m altitude in the tropics. It normally only produces tubers at 1200 - 1850 m altitude. Winged bean is a short day plant and needs a daylength less than 12 hours. Because of the effect of daylength, it will not produce flowers or pods at places far removed from the equator. The main areas of production occur between 20°N and 10°S latitudes. It is ideally suited to the tropics including the hot humid lowlands. For maximum seed production, winged beans need temperatures of 23 - 27°C and for tubers the temperatures should be 18 - 22°C. Winged beans can grow on a wide variety of soils and have been grown on soils with pH from 3.6 - 8.0. Soils which are very acid have soluble aluminium to which winged beans are sensitive. Soils should not be waterlogged.

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

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

Production: The first green pods are ready about 10 weeks after sowing. Tubers are ready after 4 - 8 months. Seed yields of 1.2 tons/ha and tuber yields of 4 tons/ha are possible. A single plant can produce up to 75 pods. Dry bean yields of 45 - 330 g per plant can be produced depending on variety. Tuber yields of 5500 - 12000 kg per hectare have been produced. Seeds can contain a trypsin inhibitor which reduces protein digestibility. This inhibitor is destroyed by soaking seeds then boiling them well. Tubers can also contain this chemical and need to be well cooked.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.5	1764	41.9	-	-	15.0	4.5
pod - fresh	92.0	105	2.1	-	-	-	-
leaf	95.0	197	5.0	809	30	6.2	1.3
seed - young	87.0	205	7.0	13.0	18.3	1.5	0.4
root	57.4	619	11.6	0	0	2.0	1.4

Legumes

English: Pigeon pea
Local: Kadyos

Scientific name: *Cajanus cajan*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Legumes

English: Lima bean
Local: Patani

Scientific name: *Phaseolus lunatis*
Plant family: FABACEAE

Description: A perennial, tall, vigorously climbing bean which can keep growing for some years. The leaves are slightly rounded at the base and pointed at the tip. The flower is white or yellow. The keel of the flower is twisted which helps tell the difference between this bean and Lablab bean. The pods are long (10 cm), flattened and curved and have 3 - 4 seeds which are very variable in colour. The seeds are large. The seeds have a short round hilum where the seed is attached to the pod. The seeds also have lines going out from this point across the bean seed.

Distribution: It suits warm and subtropical areas. In the tropics it is common between 500 and 2100 m altitude but grows to the limit of cultivation (2700 m). For germination it must have a soil temperature above 15.5°C and cannot withstand frost. In very hot weather seeds often do not set. It does best in a temperature range of 14 - 21°C. It is sensitive to a pH less than 6. It can grow in arid places.

Use: The leaves, young pods and seeds are all eaten. The seeds are eaten fresh or after drying. They are also fried in oil. Dried beans are boiled or baked. They can be used in soups and stews. The seeds are sometimes grown as bean sprouts then cooked and eaten. **Caution:** Some kinds have poison (hydrocyanic acid). This is destroyed by thorough cooking. The beans contain a protein inhibitor which is destroyed by cooking.

Cultivation: It is grown from seed. Coloured seeds are often hard to get to grow but white seeded kinds start growing easily. Sow 3 - 4 seeds in a hill and put a stick 2 - 3 m tall in the middle. Hills should be about 1 m apart. Seeds should be 2 - 4 cm deep.

Production: Harvesting can begin after about 100 days. Dried beans can be stored for several months. Yields of 0.12 kg of seeds per square metre have been obtained. The yield of pods can be 1 kg per square metre.

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	12.0	1407	19.8	-	-	5.6	-
seed – young, cooked	67.2	515	6.8	37	10.1	2.5	0.8
seed – young, raw	70.2	473	6.8	30	23.4	3.1	3.1

Legumes

English: Common bean
Local: Baguio beans/Abitsuelas

Scientific name: *Phaseolus vulgaris*
Plant family: FABACEAE

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

Distribution: It is a temperate plant that grows in many temperate and subtropical countries. It mostly grows from 700 - 2,000 m altitude in the tropics. It suffers from pest and disease damage in the lowlands, but can be grown to sea level. It is not suited to the wet tropics. It is shallow-rooted and damaged by excess moisture near the roots. A crop lifecycle needs about 350 mm of water. It is sensitive to frost and high temperatures. Flowers will not form below 9.5°C. Night temperatures above 37°C cause flowers to drop. The best temperature range is 15 - 21°C. It does not suit very acid soils. It suits hardiness zones 8 - 11.

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

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

Production:

Food Value: Per 100 g edible portion

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

Legumes

English: Lablab bean
Local: Bataw

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	-	1.0	2.4	-

Legumes

English: Mung bean
Local: Monggo

Scientific name: *Vigna radiata*
Plant family: FABACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Leafy greens

English: Kangkong
Local: Kangkong

Scientific name: *Ipomoea aquatica*
Plant family: CONVOLVULACEAE

Description: Kangkong is a creeping sweet potato like plant. It has hollow stems and can float on water. The leaves are green and are normally not divided like some sweet potato leaves, but the shape and size varies a little between different kinds. The trumpet shaped flower looks like a sweet potato flower and is normally white. The runners develop roots at the nodes and also branch. This branching increases when tips are picked off. Some variation in leaf shape can be observed. Leaf shape is less variable than in the related sweet potato, but narrow and broad leafed kinds occur. White and green stemmed kinds occur. Green stemmed kinds have more cold tolerance than white stemmed.

Distribution: A tropical plant which grows best in short day and stable high temperature, moist conditions. Temperatures need to be above 25°C for satisfactory growth. In the equatorial region plants probably grow up to 1000 m altitude. Below 23°C the growth rate is too slow for economic production, so production is mainly in the lowland tropics. Optimum soil pH is 5.3 - 6.0. It suits damp places and can grow as a partly floating plant in swamps and lagoons behind the beach.

Use: The young tips are cooked and eaten. They can be boiled, steamed, stir-fried, or added to soups, stews or curries. The young stems can be used in pickles. The young tips can be eaten raw in salads. The roots are occasionally cooked and eaten. The harvested leaves can be stored for 4 - 5 days.

Cultivation: Dryland kangkong is normally grown from seed. Sometimes seed are pre-soaked for 12 - 24 hours prior to sowing. Plants can also be grown from cuttings and establishment is rapid. Top cuttings 25 - 40 cm long can be planted beside a pond.

Production: Young tips can be taken 30 days after planting, and subsequent harvests every 7 - 10 days. Production of new shoots probably declines at flowering. Yields of up to 60,000 kg/ha have been recorded in other countries.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	90.3	126	3.9	40	60	4.5	-
leaf – boiled	92.9	84	2.1	520	16.0	1.3	0.2

Leafy greens

English: Pe Tsai, Chinese Cabbage, Bok Choy
Local: Pechay

Scientific name: *Brassica rapa pekinensis*
Plant family: BRASSICACEAE

Description: A cabbage family herb. It is a robust leafy plant. The leaves are toothed. It usually forms an oblong head. The leaves are densely packed and pale yellowish-green. Wong bok varieties have narrow leaf stalks and do not form heads.

Distribution: It is a subtropical plant.

Use: The leaves are stir-fried, boiled, pickled or braised. They are also fermented into a spicy, sauerkraut-like vegetable. The seeds can be sprouted and eaten in salads and sandwiches.

Cultivation: Plants are grown from seed. They are usually sown directly.

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 (raw)	94.4	67	1.2	120	27	0.3	0.2

Leafy greens

English: Sweetfern / Vegetable Fern
Local: Pako

Scientific name: *Diplazium esculentum*
Plant family: ATHYRIACEAE

Description: A large fern with an upright stem. It forms tufts. It can be 1 m high and 1 m wide. It usually grows as a large clump. It spreads by underground runners. It has feather-like fronds that are 50 - 80 cm long and divided 2 or 3 times. The leaf stalks are black near the bottom. The secondary leaflets are pointed at the tip and about 8 cm long and 1 cm wide. The leaflets have teeth and are about 2 - 5 cm long.

Distribution: It grows in Asia and the Pacific including Solomon Islands. It grows in moist tropical places and mostly occurs in coastal areas. It is common in wet areas. It also occurs in Malaysia, Indonesia, Philippines and Fiji where it is used as food. It is widely distributed in the Philippines on areas of gravel and the banks of streams. It is frost sensitive. It is an important vegetable fern throughout Asia and the Pacific.

Use: The fronds are cooked and eaten as a vegetable. They are also used in stews.

Cultivation: Plants can be grown from spores. They need to be in a well-drained potting medium and kept in a high humidity environment. The spores need a temperature of 21°C to grow and should be sown as soon as ripe. Plants should be transplanted into a moist, well-drained soil with partial shade. Plants can also be grown by separating the underground runners.

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
frond	94	81	2.4	211	2.0	2.4	1.8

Leafy greens

English: Leaf mustard
Local: Mustasa

Scientific name: *Brassica integrifolia*
Plant family: BRASSICACEAE

Description: A cabbage family herb that is grown as an annual. It grows 1.2 m high. The leaves have lobes along the stalk. The flowers are yellow. They are in groups on long stalks at the top of the plant. The fruit is a long capsule.

Distribution: A tropical plant that can tolerate frost. It grows in areas with an annual rainfall of 600 - 1,600 mm. It can grow in dry and salty soils but does best in fertile soil. It can grow in arid places.

Use: The seeds are used in pickles and the oil in prepared foods. Mustard sauce is made from the seeds.

Cultivation: Plants are grown from seeds.

Production: Seeds can be harvested after 90 - 100 days. The yield can be 200 - 500 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	8.5	2261	20	-	-	17.9	-
leaf (boiled)	94.5	63	2.3	303	25.3	0.7	0.1

Image sourced from: http://organica.vn/organic-brassica-integrifolia

Leafy greens

English: Jute / Bush Okra
Local: Saluyot

Scientific name: *Corchorus olitorius*
Plant family: MALVACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf - raw	80.4	244	4.5	278	37	7.2	-
leaf - cooked	87.2	155	3.4	156	33.0	3.1	3.1

Fruit

English: Banana
Local: Saging

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

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Fruit

English: Guava
Local: Bayabas

Scientific name: *Psidium guajava*
Plant family: MYRTACEAE

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

Distribution: A tropical plant. Guavas thrive in both humid and dry tropical climates. They do best in sunny positions. They grow wild and are also cultivated. They fruit better where there is a cooler season. Temperatures near 30°C give best production. They can become weedy under some conditions. They produce better in soils with good organic matter. They prefer a well drained soil but can stand some water-logging. Trees cannot tolerate salty conditions. It can grow in arid places.

Use: The young leaves are eaten raw or cooked. The fruit are eaten raw. Fruit can be used to make jelly. Half ripe fruit are added to help the jelly set. The liquid from boiled guava seeds is used to flavour cheese. The seeds are the source of an edible oil.

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.1	238	1.1	31	184	1.4	0.2

Fruit

English: Pawpaw / Papaya
Local: Papaya

Scientific name: *Carica papaya*
Plant family: CARICACEAE

Description: Pawpaw is a very well-known fruit of the tropics. The straight, soft-stemmed plant grows 3 - 5 metres tall and only occasionally has branches. The stem has scars from fallen leaves. The leaves are large (50 cm wide), deeply-lobed and on stalks 90 cm long. There is a crown of leaves at the top of the trunk. Trees can be male, female or bisexual. The male flowers are small and white on long stalks. Female and bisexual flowers are on short stalks. These have no fruit, round fruit and long fruit, respectively. There are three forms of long fruit. The seeds are black.

Distribution: It is a tropical plant grown in most tropical and some subtropical countries. Pawpaw grows up to about 1700 m altitude in the equatorial tropics. In cooler regions, it has to be planted, but in the humid tropics, is often self-sown. Sunlight allows germination when forest is cleared. It cannot tolerate frost and needs night temperatures above 12°C. It cannot tolerate flooding and dies after 48 hours in standing water. It needs a pH of 5 – 8 and suits hardiness zones 11 - 12.

Use: Fruit can be eaten ripe and raw. Green fruit can be cooked as a vegetable. The young leaves can be eaten cooked, but are bitter. The flowers and the middle of the stem can be eaten. Papaya contains papain which is a meat tenderiser. It is a common and popular fruit.

Cultivation: Pawpaw seeds grow easily and plants grow quickly. Fresh seeds can be used, but dry seeds should be soaked before planting. They need a reasonably fertile soil to produce well. Seeds can be sown directly or grown in a nursery and the seedlings transplanted. Seeds in a nursery should be sown about 1 - 2 cm deep. Seedlings can be transplanted when they are about 20 cm high. Plants should be about 3 m apart.

Production: Continuous fruit production depends on fertility, temperature and moisture being adequate to maintain active growth. The fruit is produced year-round, but the growth and development rate decreases with temperature. The size and quality of fruit declines at lower temperatures. Pollination is by wind and insects. Normally, cross and self-pollination both occur. Pollination is not normally limiting. Seeds are widely dispersed by birds, bats and people. Seeds remain viable for a few months and also germinate freely. Seeds emerge in 2 - 3 weeks. Vegetative growth before flowering is 4 - 8 months. Fruit is produced as one or more per leaf axil, about every 1 - 2 weeks under good growing conditions. With good growth, 100 fruit can be produced from one plant in a year. Fruit development from pollination to maturity is about 2 - 3 months. On the coast in tropical equatorial regions, pawpaws start producing fruit after about 4 - 5 months, but in the highlands this may not start for 12 - 18 months. The first fruit are ripe 6 - 11 months from planting. Practical tree life is about 2 - 3 years, although trees may live for 10 - 12 years.

Food Value: Per 100 g edible portion

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

Fruit

English: Jackfruit
Local: Langka

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	-
immature fruit + seed	85.8	-	1.6	-	13	0.1	-

Fruit

English: Pomelo
Local: Suha

Scientific name: *Citrus maxima*
Plant family: RUTACEAE

Description: A dome-shaped, spreading, spiny tree that grows up to 15 m tall. The glossy, oval leaves are very large. And are downy underneath. The leaf stalks have broad wings. Young shoots and stems have fine hairs on them. Flowers are large (2 cm) and creamy white. The flowers are produced in bunches from woody shoots. The flowers have a sweet scent. The fruit are oval or pear shaped. The fruit is very large (20 cm) with a thick skin. The skin is dotted with oil glands. The fruit are green but become yellow when ripe. They contain 11 - 14 segments. The flesh can be pale yellow or pink. Each segment of the fruit is covered by a strong membrane. Some kinds have many seeds, while others are almost seedless. There are several named cultivated varieties.

Distribution: A tropical plant that thrives in warm lowland areas. It can grow from sea level up to 900 m. It is tolerant of brackish and salty conditions. It suits humid climates in tropical and subtropical locations.

Use: The fruit can be eaten fresh. It is used for desserts, jams and marmalades. The fruit pulp can be dried and candied. The skin can be eaten as a vegetable. The leaves are used to flavour meat and fish during cooking.

Cultivation: It is mostly grown from seed, and does not breed true. The seed only produce one seedling unlike many citrus. Trees are often produced by aerial layering, but budding or grafting can be used. Air-layered trees give sweeter fruit. Trees start producing after about 9 years. Trees need to be about 9 m apart. Trees grown away from other trees often produce almost seedless fruit.

Production: Fruit is produced almost all the year round. The time from flowering to ripe fruit is about 6 months. Fruit can be stored quite well.

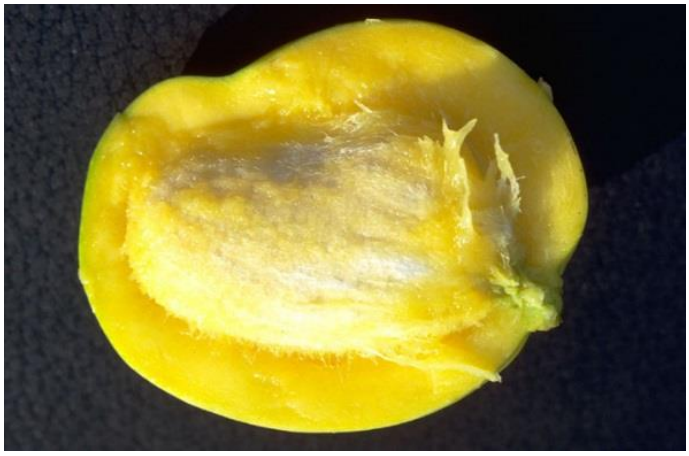
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit - raw	90.3	175	0.6	20	37	0.4	-

Fruit

English: Mango
Local: Manga

Scientific name: *Mangifera indica*
Plant family: ANACARDIACEAE



Description: An erect, branched evergreen tree. It can grow to 10 - 40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10 - 30 cm long and 2 - 10 cm wide. They are arranged in spirals. The leaf stalk is 1 - 10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10 - 50 cm long and branching. Up to 6,000 flowers can occur on a stalk. Most of these are male and 1 - 35 % have both male and female flower parts. Fruit are green, yellow or red and 2.5 - 30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.

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

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

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

vary and can be different from the parent tree. Plants can be propagated by budding, or by grafting using in-arching. This is not easy and care is required. In wetter places, flowers need to be protected with fungicides to enable fruit to form. If organic manure is used this should not be directly in the planting hole or immediately against the new plant. Young transplanted seedlings need regular watering. A spacing of 6 - 12 m between plants is used. Wind protection is advisable to prevent fruit rubbing and getting damaged. Trees should only ever be lightly pruned as fruit develop on new growth and heavy pruning can reduce flowering. Flowering can be brought about by foliar sprays of potassium nitrate.

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

Food Value: Per 100 g edible portion

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

Fruit

English: Mangosteen
Local: Mangosteen

Scientific name: *Garcinia mangostana*
Plant family: CLUSIACEAE

Description: A medium sized tree 10 - 20 m high with bright, glossy, leathery leaves 15 - 25 cm long that are kept all year. Male and female flowers are on separate trees. Commercial trees only have female flowers. Male trees are rare. Female flowers have 4 cream petals and 4 sepals, and a round ovary with a thick stigma of 4 - 8 lobes. No pollination is required as fruit develops without fertilisation. The dark blue fruit has 4 - 8 white juicy segments inside a thick skin. Each segment is enclosed in fine pinkish veins. It is 8 cm across and has flower sepals attached to the stalk end. It leaks yellow sap from wounds. Fruit is produced on side branches near the tips of the main branches. It often has no seeds or up to 2. These are not true seeds but they will grow.

Distribution: It is a tropical plant that needs a hot humid climate (25 - 35°C), being killed below 5°C and slowing in growth below 20°C. It grows from sea level up to 1000 m in the equatorial tropics but very slowly at this altitude. It can stand light shade. It needs protection from wind, often not doing well in sea breezes. It cannot tolerate drought and needs fertile soil. Good fertility enables earlier bearing. It suits high rainfall areas over 2500 mm per year. It cannot tolerate alkaline soils.

Use: Fruit is best eaten fresh. It is the arillus or layer around the seeds which is eaten. It is also cooked for desserts. The boiled or roasted seeds are eaten, and can be ground to produce vegetable butter.

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

Production: Trees are slow growing and begin to bear after 8 - 20 years. Fruit is produced on shoots which are more than two years old, so pruning is unnecessary. Fruiting is seasonal once or twice a year. Often more fruit are produced every second year. The main fruiting season is November to March. Fruit need to be harvested when mature and ripe. Fruit can only be transported with difficulty. They can be stored under refrigeration (10°C for up to eight weeks). Between 500 and 1500 fruit are produced per tree. Fruit are best opened by cutting the skin around the middle to prevent tannins from the skin spoiling the flavour. Fruit can be stored for 3 weeks if undamaged.

Food Value: Per 100 g edible portion

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

Fruit

English: Soursop
Local: Guyabano

Scientific name: *Annona muricata*
Plant family: ANNONACEAE

Description: A low, bushy tree growing 8 - 10 m tall. The leaves are long (14 cm), narrow (4 cm) and thick and slightly shiny on top. The flowers are large (2 - 3 cm), rounded and produced on short stems on the branches. They occur singly or in groups of three. The flowers have two layers of thick, fleshy petals. The fruit are 10 - 30 cm long and spiny. The flesh is juicy. Many black seeds are embedded in the white flesh. Fruit are often mis-shapened, due to only some of the ovules, or young undeveloped seeds, being fertilised. Beetles are normally thought to do the pollinating. This means fruit end up heart-shaped when unevenly pollinated. Several types occur with different sweetness, shape and juiciness.

Distribution: A tropical plant that has been taken to most tropical countries and grows in tropical lowland areas below 1,200 m altitude. It can tolerate poor soils and a humid climate. It cannot tolerate frost. The trees can withstand temperatures down to freezing (0°C) for a short time but salt-laden winds from the sea can kill the trees. It needs a well-drained soil and cannot tolerate waterlogging. Trees continue to grow and produce satisfactorily in fairly poor, compacted soil, but improving the fertility increases the amount of fruit. It can grow well in hot humid areas, but a fungus disease called Blossom blight can cause flowers to fall off. It suits hardiness zones 10 - 12.

Use: Fruit can be eaten fresh, or used in ice-cream and for drinks. Young fruit can be cooked as a vegetable. Leaves are edible when cooked. The trees are fairly common, but the fruit may not be widely used. **Caution:** The seeds are toxic, so should be removed before processing.

Cultivation: Trees are grown either as seedling trees or grafted plants. They can be grown from cuttings or air-layering (part of the plant cut and wrapped in dirt so it produces new shoots). Trees are easy to grow and maintain. Plants can easily be grown from seeds. Seeds can be planted fresh or stored. Seeds grow in about 15 - 20 days. Trees grown from seeds vary in the quality of the fruit. Seedlings are transferred to plastic bags when 15 cm tall. Trees can also be grown from cuttings or by grafting. This allows better trees to be selected and produced. Seedlings are suitable for grafting after 6 months. Trees need to be about 5 m apart. Flowers are pollinated by insects. Hand-pollination of flowers can increase the number of fruit that are produced. Fruit are soft and fleshy, and difficult to transport.

Production: Trees grow quickly and commence bearing by the third year. It bears fruit almost continually throughout the year, but there is normally one season when more fruit are getting ripe. A tree can produce 12 - 24 fruit in a year, weighing 4 - 5 kg each and with 11 - 14% sugars.

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	82.4	294	0.88		16	0.3	0.1

Fruit

English: Rambutan
Local: Rambutan

Scientific name: *Nephelium lappaceum*
Plant family: SAPINDACEAE

Description: A medium sized tree 12 - 25 m tall. It keeps its leaves throughout the year. Trees spread to 6 m wide. The leaves are alternate with leaflets opposite along the stalk. There are 5 - 7 pairs of leaflets. Each leaflet can be 20 cm long by 8 cm wide. The leaflet stalks are short and the leaflets are pointed at the tip and rounded at the base. The flowers are very numerous on compound flower arrangements. Seedling trees can produce only female or only male trees. Some kinds have both male and female flowers or both flower parts in the one flower. The dark red fruit has many prominent projections united at the base. The colour can vary between yellow, green, orange and bright red. Some trees are separately male and female, and sometimes seedless fruit is set. Male and female flowers are often separate on the same tree. The fruit is up to 5 cm long in loose clusters of 10 - 12. It normally contains one large seed. There are several named cultivated varieties.

Distribution: A tropical plant that suits the humid tropical lowlands mostly within 12° of the equator. It grows from sea level up to about 500 m in equatorial zones and will grow about 17° from the equator. It does best where the temperature is constant around 28°C or ranges from 22 - 30°C with a rainfall of 2,000 – 5,000 mm per year. Low humidity can cause leaf scorch. Excessive rainfall before flower formation reduces flowering. A dry period of about one month assists flower initiation and areas with two seasonal dry periods can get double crops. A well drained soil is needed.

Use: The fruit are eaten fresh. Sour fruit are eaten stewed. The seeds are sometimes roasted and eaten, and can be used for oil.

Cultivation: Trees can be grown from fresh seeds. The short lived seeds need to be planted fresh, after washing. Germination takes place in 7 - 10 days. Seedlings are not easy to transplant. Roots are sensitive to drying out. Selected trees can be propagated by budding or air-layering. Seedling tree quality varies considerably due to cross pollination. Trees are planted 10 m apart at densities of 80 - 120 per ha. About 1% male flowers are sufficient if enough pollinating insects are present. A mixture of varieties might be needed to get good fruit set. Organic manure is often used twice yearly.

Production: Seedling trees can bear after 6 years and vegetative trees after 4 years. Flowering occurs during the dry season. The main fruit season is November to March. Fruit mature about 110 days after flowering. Where trees with only female flowers occur, male pollinator trees are needed. Fruit can weigh 20 - 40 g and need to be harvested when ripe. A well maintained tree can produce 150 kg.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit – raw	82.0	271	1.0	0	53	1.9	0.1

Vegetables

English: Okra
Local: Okra

Scientific name: *Abelmoschus esculentus*
Plant family: MALVACEAE

Description: A tropical annual herb. It grows erect, often with hairy stems. It mostly grows about 1 m tall but can be 3.5 m tall. It becomes woody at the base. The leaves have long stalks up to 30 cm long. Leaves are roughly heart shaped with lobes and teeth along the edge. Upper leaves are more deeply divided than lower ones. The flowers are yellow with red hearts. The fruit are green, 7.5 - 15 cm long and have 5 - 7 ribs. The round, dark green seeds are 4 - 5 mm across.

Distribution: A tropical plant. It suits the hot humid tropical lowlands but is unsuited to the highlands. It cannot tolerate drought. It is very sensitive to frost. It can grow in salty soils. They grow best where temperatures are between 20 - 36°C. It can grow well in dry climates with irrigation. It suits plant hardiness zones 8 - 12.

Use: Pods are eaten cooked. They are slimy, but less so if fried. They are also less sticky if a little lemon is added. Dried powdered seeds can be used in soups. It thickens the soup. They can also be pickled. Young leaves can be eaten cooked. They can be dried and stored. Flowers can also be eaten. The seeds are roasted and used as a coffee substitute.

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

Production: Plants keep producing if the fruits are harvested regularly. Pods develop 5 - 10 days after flowering. Plants are ready to harvest 8 - 10 weeks after sowing. Young pods can be harvested 2 - 4 months from sowing. Pod harvests can continue for 1 - 2 months. Leaving pods on the plants stops new pods developing.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.2	1721	23.7	-	-	-	-
leaf	81.0	235	4.4	116	59	0.7	-
pod - fresh	88.0	151	2.1	185	47	1.2	-
fruit - cooked	90.0	134	1.9	14	16.3	0.3	0.4
fruit - raw	90.0	71	2.0	36	25	1.0	-0.5

Vegetables

English: Eggplant
Local: Talong

Scientific name: *Solanum melongena*
Plant family: SOLANACEAE

Description: A perennial shrubby herb up to 1 m tall. It is often grown as an annual. It has a deep taproot and branched side roots. The stem is thick and covered with many woolly hairs. The plant has many branches. Often the plant is spiny. Leaves can be 20 cm long and wavy along the edge. Leaves are covered with hairs. Flowers are bluish red and 5 cm across. They are either solitary or in small groups opposite the leaves. They have 5 large woolly lobes which continue to surround the base of the fruit. Fruit are white, blue, green or purple. The fruit colour and shape vary. Sometimes the fruit is spiny. Often the fruit are 10 - 20 cm long and 5 - 8 cm wide. Numerous kidney shaped seeds are in the flesh of the berry. There are many cultivated varieties.

Distribution: A tropical plant. Plants grow from sea level up to 2,200 m altitude in the tropics. It suits wet climates but does well in dry climates with irrigation. It needs a long warm growing period. A daily mean temperature of 20 - 30°C is most suitable. They are frost tender. They need a rich, friable, well tilled soil. In the sub-tropics they can be grown as a summer crop.

Use: Fruit are mostly fried then eaten. They can also be grilled, baked, stuffed and stewed. They are used in curries. The fruit are also dried and stored. The leaves, although edible, are hairy and not good flavor.

Cultivation: Plants are grown from seeds. Seeds germinate slowly. At the best temperature, they germinate in 8 - 12 days. Seed are sown in nursery beds. Seedlings can be transplanted when about 8 cm tall or 4 - 6 weeks old. Plants need to be about 60 - 100 cm apart. Because some cross pollination can occur, seed crops need to have varieties planted 400 m apart.

Production: Fruit are ready for harvest after 3 months. They continue to yield for 3 - 4 months.

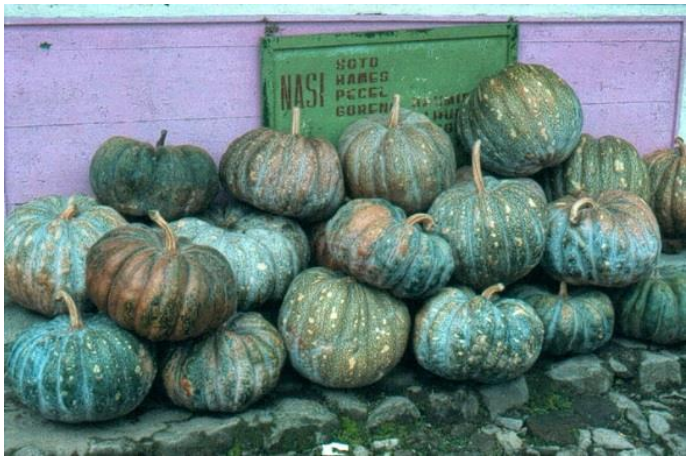
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	91.8	117	0.8	6	1.3	0.4	0.2
fruit (fresh)	93.4	62	0.7	50	5	0.4	0.3

Vegetables

English: Pumpkin / Winter squash
Local: Kalabasa

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: Choko
Local: Sayote

Scientific name: *Sechium edule*
Plant family: CUCURBITACEAE

Description: A vigorously growing climber that can last for several years. It has strong tendrils which can attach to fences and trees so that the plant can climb well. The choko leaves are about 15 - 20 cm across and have a rough feel. The stems have furrows along them. The fleshy fruit contain one large seed. The choko fruit is produced in the angle where the leaf joins the vines. Fruit can be up to 20 cm long and they are rough or irregular shaped on the outside. There are white and green fruited varieties. The flowers are separate. Male flowers are in clusters and female flowers are on their own. A choko plant produces a large thickened root tuber and the plant can re-grow from this tuber and go on growing year after year.

Distribution: A tropical and subtropical plant. Choko requires relative humidity of 80 - 85%, annual rainfall of at least 1,500 - 2,000 mm and average temperatures of 20 - 25°C with limits of 12 - 28°C. In equatorial tropical regions, chokos will grow from sea level to about 2,200 m altitude. In the lowlands it grows best in shade. Chokos need a reasonably well drained soil. It can grow in arid places. It suits hardiness zones 9 - 12.

Use: The fruit are edible cooked. They can be pickled, baked, steamed, or made into fritters and puddings. The young leaf tips are eaten. The seeds can be eaten cooked. They are often deep fried. The fleshy root can be eaten cooked. They can be boiled, baked or fried. Starch can be extracted from the fruit.

Cultivation: The entire fruit is planted as the seed cannot withstand drying out. It is planted flat and thinly covered with soil. Often chokos start to develop shoots and roots while they are still attached to the original plant. These eventually fall off and continue growing if they fall on soft moist soil. A spacing 2 m apart along a fence is suitable. Trellis support is required. A well drained, fertile soil is needed. Cuttings can be used for planting. Plants do not breed true.

Production: Fruit can be picked starting 3 - 5 months after planting and continued for many months. The fruit can be stored for several weeks. Tips can be picked regularly. Tubers of 5 kg weight have been recorded. These are normally produced during the second year of growth and after a time of arrested development such as a dry season.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	80	331	2.0	-	19	0.8	-
leaf	91.0	105	4.0	75	24	1.4	-
fruit (boiled)	93.4	100	0.6	5	8	0.2	0.3
fruit (raw)	94.0	80	0.7	15	14	0.4	0.7

Vegetables

English: Bitter cucumber
Local: Ampalaya

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: Angled loofah
Local: Patola

Scientific name: *Luffa acutangula*
Plant family: CUCURBITACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Horseradish tree
Local: Malunggay

Scientific name: *Moringa oleifera*
Plant family: MORINGACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Bird's eye chillies
Local: Sili

Scientific name: *Capsicum frutescens*
Plant family: SOLANACEAE

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

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

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

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

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

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	74.0	395	4.1	7140	121	2.9	-

Nuts, seeds, herbs and other foods

English: Pepper
Local: Paminta

Scientific name: *Piper nigrum*
Plant family: PIPERACEAE

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

Distribution: It is a tropical plant. It grows from sea level up to at least 1,100 m altitude in equatorial places. It suits areas with a temperature between 24 - 26°C. It cannot tolerate frost. It likes high humidity and shade. It does best with an annual rainfall of 1,200 - 2,500 mm. It originally came from the tropics of India. It suits hardiness zones 10 - 12.

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Avocado
Local: Abokado

Scientific name: *Persea americana*
Plant family: LAURACEAE

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

Distribution: A subtropical plant that grows from sea level up to 2,250m in the tropics. It cannot stand water-logging. Branches are easily damaged by wind. It needs a frost free location or where frosts are rare. West Indian varieties thrive in humid, tropical climates, freeze at or near 0°C and can stand some salinity. Mexican types come from dry subtropical plateaus and thrive in a Mediterranean climate. They are hardy to -7° C. They are salt sensitive, have the smallest fruits and the thinnest skin. The best daytime temperature is 25 - 33°C. Guatemalan types come from cool, high-altitude tropics and are hardy to -3° C. It does best with neutral or slightly acid and well aerated soil. Growth is disrupted when soil temperature is below 13°C. It needs high humidity at flowering and fruit set. It can grow in arid places.

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

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

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

Food Value: Per 100 g edible portion

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

Nuts, seeds, herbs and other foods

English: Coconut
Local: Niyog

Scientific name: *Cocos nucifera*
Plant family: ARECACEAE

Description: Coconuts are produced on palm trees that grow to about 25 m tall. The unbranched trunk has ring-like leaf scars along it. It is swollen and surrounded by a mass of roots at the base. Dwarf varieties have been produced. The fronds are 2 - 6 m long and are divided along the stalk into strap shaped leaflets. The leaflets are 60 - 90 cm long and are narrow. Clusters of large fruit develop beneath the fronds. Male and female flowers are separate on the one stalk. Female flowers are near the base. Flowers are cream and covered by boat shaped bracts. Fruit are up to 25 cm diam. and are fibrous on the outside. The hard shell inside is filled with coconut milk and the white copra layer.

Distribution: Coconuts grow mainly in tropical coastal areas (occasionally up to 1,000 m altitude). Temperatures of 27 - 32°C are best with a daily range of 5 - 7°C. They need a minimum temperature of over 18°C to bear fruit. They require over 1,000 mm of rain/year and preferably 1,500 mm. Soils need to be well drained. Plants require full sunlight. Coconuts are salt tolerant and can tolerate soils with pH of 5 - 8.

Use: The liquid of fresh nuts can be drunk. The flesh can be eaten, as can the "apple" in sprouting nuts. The flesh is usually grated and used in cooking as "coconut" milk. The young shoots at the top of the palm (palm hearts) can be eaten, although this kills the palm. The sap from the flower stalk can be tapped for the sugary juice and oil can be extracted from the kernel.

Cultivation: Seeds of coconuts should be selected from regular bearing palms that produce more than 80 nuts per year. Selected nuts should be sprouted in a nursery. Seeds that have not germinated within 3 months are usually rejected. Seedlings are ready for transplanting when they have 3 - 4 leaves (about 1 year). The nut should be planted in a hole 0.6 x 0.6 m. A spacing of about 7 - 8 m is suitable.

Production: Early germinating nuts give early production in the field. They can commence production after 6 - 8 years, although best production occurs from 12 - 60 years. Trees can live for 100 years. Palms can produce 15 - 100 nuts per year. Fruit take about 1 year to be mature. Tapping the flower stalk can give 1 kg sap/day for 6 months. For palm heart production, plants are put at a close spacing of about 2 m and are ready to harvest in 2 years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
flesh (dry)	12.2	2429	6.6	0	-	-	-
milk	84.9	1004	3.7	-	8	1.3	0.4
apple	84	310	1.3	-	5.0	0.7	-
flesh (fresh)	80.9	119	1.1	-	-	0.2	0.2

Nuts, seeds, herbs and other foods

English: Lemon grass
Local: Tanglad

Scientific name: *Cymbopogon citratus*
Plant family: POACEAE

Description: A coarse clumpy grass about 1 m tall. It forms dense tufts and clumps. The stems are hollow and cane like. The leaves have a rough edge and are about 1 m long by 1 cm wide. They curve over and are pale blue-green. It very rarely produces flowers. When flowers are produced, they are in a loose branched panicle. These are 5 cm long. It has a lemon smell when crushed.

Distribution: It is a tropical and subtropical plant. It occurs in coastal areas up to at least 1,400 m altitude. It is a good plant for borders and erosion control. They are frost tender. It needs a temperature above 10°C to grow. It needs good drainage. In Argentina it grows from sea level to 2,700 m above sea level. It suits hardiness zones 9 – 11.

Use: It is mostly used as a flavouring in lemon grass tea and stews. The leaves can be dried and stored for use in tea. The very young fleshy white bases of the shoots are used in Asian cooking. The outer layers are peeled off.

Cultivation: It is grown from portions of the clump. A spacing of about 1 m between clumps is needed. Plants can be easily grown by putting the stem end of a shoot in water until roots form then planting out.

Production: It can be cut 4 - 8 months after planting and then every 3 - 4 months. Harvesting can continue to 3 - 4 years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	70.3	490	1.4	3	1.8	2.8	0.6

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
ANACARDIACEAE	*Mangifera indica*	Mango	fruit	83.0	253	0.5	54	30	0.5	0.04	39
ANNONACEAE	*Annona muricata*	Soursop	fruit	82.4	294	0.88		16	0.3	0.1	42
ARACEAE	*Colocasia esculenta*	Taro	root	66.8	1231	1.96	3	5	0.68	3.2	16
ARECACEAE	*Cocos nucifera*	Coconut	flesh (fresh)	80.9	119	1.1	-	-	0.2	0.2	54
ATHYRIACEAE	*Diplazium esculentum*	Sweetfern	frond	94	81	2.4	211	2.0	2.4	1.8	29
BRASSICACEAE	*Brassica integrifolia*	Mustard greens	leaf (boiled)	94.5	63	2.3	303	25.3	0.7	0.1	30
BRASSICACEAE	*Brassica rapa pekinensis*	Chinese cabage (Bok Choy)	Leaf (raw)	94.4	67	1.2	120	27	0.3	0.2	28
CARICACEAE	*Carica papaya*	Pawpaw	fruit	88.0	163	0.5	290	54	0.4	0.18	34
CLUSIACEAE	*Garcinia mangostana*	Mangosteen	fruit	81.3	299	0.6	-	2.7	0.4	-	41
CONVOLVULACEAE	*Ipomoea aquatica*	Kangkong	leaf - boiled	92.9	84	2.1	520	16.0	1.3	0.2	27
CONVOLVULACEAE	*Ipomoea batatas*	Sweet potato	tuber - baked	72.9	431	1.7	961	24.6	0.5	0.3	11
CUCURBITACEAE	*Cucurbita maxima*	Pumpkin	seed	6.9	2264	24.5	38	1.9	14.9	7.5	46
CUCURBITACEAE	*Momordica Charantia*	Bitter Cucumber	pod (boiled)	94.0	79	0.8	11	33	0.4	0.8	48
CUCURBITACEAE	*Sechium edule*	Choko	fruit (boiled)	93.4	100	0.6	5	8	0.2	0.3	47
CUCURBITACEAE	*Luffa acutangula*	Angled loofah	leaf	89.0	-	5.1	-	98	11.5	-	49
DIOSCOREACEAE	*Dioscorea bulbifera*	Potato yam	tuber	70.8	357	2.7	-	78	3.1	0.4	10
EUPHORBIACEAE	*Manihot esculenta*	Cassava	tuber	62.8	625	1.4	30	15	0.23	0.48	13
FABACEAE	*Cajanus cajan*	Pigeon pea	seed	10.0	1449	19.5	55	-	15.0	-	22
FABACEAE	*Lablab purpureus*	Lablab bean	seed (dry)	10.0	1428	22.8	-	-	9.0	-	25
FABACEAE	*Phaseolus lunatus*	Lima bean	seed	12.0	1407	19.8	-	-	5.6	-	23
FABACEAE	*Psophocarpus tetragonolobus*	Winged bean	leaf	95.0	197	5.0	809	30	6.2	1.3	21
FABACEAE	*Vicia unguiculata subsp. Sesquipedalis*	Snake bean	pod (fresh)	-	197	2.8	43	18.8	0.47	0.37	19
FABACEAE	*Vigna radiata*	Mung bean	seed	11.0	1432	22.9	55	4	7.1	-	26
FABACEAE	*Phaseolus vulgaris*	Common bean	pod	88.0	151	2.5	750	27	1.4	0.2	24
FABACEAE	*Vigna unguiculata subsp. unguiculata*	Cowpea	seed	11.2	1189	23.5	-	1.5	6.4	-	20
LAURACEAE	*Persea americana*	Avocado	fruit	74.4	805	1.8	480	11	0.7	0.4	53
MALVACEAE	*Abelmoschus esculentus*	Okra	pod - fresh	88.0	151	2.1	185	47	1.2	-	44
MALVACEAE	*Corchorus olitorius*	Jute	leaf - raw	80.4	244	4.5	278	80	7.2	3.1	31
MARANTACEAE	*Maranta arundinacea*	West Indian arrowroot	root - starch	12.2	1515	0.4	-	-	1.2	-	18

MORACEAE	*Artocarpus heterophyllus*	Jackfruit	fruit - raw	74.5	395	1.5	30	6.7	0.6	0.4	36
MORINGACEAE	*Moringa oleifera*	Horseradish tree	leaf	76.4	302	5.0	197	165	3.6	-	50
MUSACEAE	*Musa sp (A &/or B genome) cv.*	Banana	fruit - sweet	75.7	365	1.7	-	2	0.9	0.4	32
MYRTACEAE	*Psidium guajava*	Guava	fruit	77.1	238	1.1	3.1	184	1.4	0.2	33
PIPERACEAE	*Piper Nigrum*	Pepper	seed (black)	10.5	1067	11.0	19	21.0	28.9	1.4	52
POACEAE	*Cymbopogon Citratus*	Lemongrass	leaf	70.3	490	1.4	3	1.8	2.8	0.6	55
POACEAE	*Oryza sativa*	Rice	seed (brown)	13.5	1480	7.6	-	-	2.8	-	15
RUTACEAE	*Citrus maxima*	Pomelo	fruit - raw	90.3	175	0.6	20	37	0.4	-	38
SAPINDACEAE	*Nephelium lappaceum*	Rambutan	fruit	81.3	271	1.0	-	53	1.9	-	43
SOLANACEAE	*Capsicum Frutescens*	Bird’s eye chilli	fruit	74.0	395	4.1	7140	121	2.9	-	51
SOLANECEAE	*Solanum Melongena*	Eggplant	fruit (fresh)	93.4	62	0.7	50	5	0.4	0.3	45

Solutions to Malnutrition

and Food Security

FOOD PLANT SOLUTIONS

ROTARIAN ACTION GROUP

www.foodplantsolutions.org