Rotary | FOOD PLANT SOLUTIONS ROTARY ACTION GROUP
Solutions to Malnutrition and Food Security

Food Plant Solutions Brief Guide to Food Plant Gardens in Amed, Bali

Our bodies need nutrients to be healthy and strong - nutritious food provides these:

Starch: Starch provides sustained energy for the body.

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

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

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

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

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

Starting a garden

PLAN:
Identify a suitable location for the garden. Factors to consider include:
A site that receives 6-8 hours a day of sunlight and is not shaded by buildings or trees.
Easy access – a garden that is difficult to get to will not be maintained.
Protection from predators like native animals. If this is an issue, consider what can be used as a barrier and install it before planting.
Adequate and easily accessed water, whether it be a garden hose or a watering can.

TOOLS AND EQUIPMENT:
What do you need to turn over the soil, to plant seeds and seedlings (e.g. shovel, hand trowel, hoe) and how will soil be moved to cover seeds (e.g. rake). Can you borrow tools to reduce your start-up costs?

SIZE:
Gardens can be all different sizes. Plan the size of your garden – what space is available and how much time do you have? Start small and increase the size as you become more confident. If space is limited, remember plants can be successfully grown in containers or pots.

BUILD: Clear the area, removing any existing plants and large weeds (turn the soil – dig, lift and turn it over onto itself).Once the soil has been loosened, spread compost and work it into the soil. Avoid stepping on freshly turned soil, as this will compact the soil and undo your hard work. Once the digging is complete, smooth the surface with a rake and water thoroughly. Allow the bed to rest for several days before planting. Use a good quality potting medium if using pots and containers.

PLANT:
Seeds and seedlings can be purchased from nurseries, garden centres and most hardware stores. A packet of seeds will grow a lot of seedlings, but take longer to mature than seedlings directly transplanted. Plant seeds and seedlings in accordance with their specific directions and apply sufficient water to ensure the soil around the seeds and/or seedling roots is moist. Consider how tall and wide each plant will grow when planning the space between plants. Information on seed packets or seedling labels will indicate the appropriate distance between neighbouring plants. Add a thick layer of mulch around seedlings to help keep the soil moist. Make small signs to stick in the ground to show what you have planted.

MAINTAIN:
Plants need regular watering, which ideally should occur either early in the morning, or late in the day. Weeds will compete with the plants for nutrients and water, so it is important to keep them to a minimum. Hand weeding and adding mulch around seedlings will help keep weeds under control.

Starchy Staples provide energy and dietary fibre				
Common Name	**Scientific Name**	**Cultivation:**	**Use:**	**Nutrients:**
Taro	*Colocasia esculenta*	Taro can be planted from cormels or from the top of the central corm. Taro can be grown under flooded conditions, but root rots develop if the water becomes stagnant. For dryland taro, the soil is prepared by digging the soil and plant into a hole 5-7cm deep.	The corms, petioles and leaves are all edible after cooking. The leaves are also dried and stored. The flowers are also cooked as a vegetable.	Root: Energy, Zinc Energy, Protein. Leaves (cooked): Protein, ProvitA, VitC.
Sweet potato	*Ipomoea batatas*	Vine cuttings are used for planting. Cuttings are planted on mounds. It needs a sunny position. Tubers will not form if the ground is waterlogged when tubers start to develop. Sweet potato are not tolerant to shading.	Tubers are boiled or baked. They can be steamed, fried, mashed, or dried. The young leaves are edible.	Tuber: Energy, ProvitA. Leaf: Protein, VitC, Iron.

Cassava	*Manihot esculenta*	Cassava is planted from sections of the stalk. Sections about 15-20cm 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. Roots form and leaves start to sprout from the stalk. It 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. Once established it can survive for several months without rain.	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.	Tuber: Energy, Zinc. Leaf: Protein, ProvitA, VitC, Iron.

Legumes provide protein for growth				
Common Name	**Scientific Name**	**Cultivation:**	**Use:**	**Nutrients:**
Pigeon pea	*Cajanus cajan*	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 1.5m x 1.5m is suitable. Plants can be cut back and allowed to re-grow or grown from cuttings.	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.	Seed: Energy, Protein, ProvitA, Iron.
Common bean	*Phaseolus vulgaris*	Plants are grown from seed. Climbing types need stakes. Bush types can be spaced at 25 cm by 25 cm. Or they can be put closer together in rows wider apart to make weeding and harvesting easier.	The young pods, leaves and mature seeds are edible. The pods are eaten raw in salads and boiled, steamed, marinated, and pickled. The young seeds are boiled and served as a vegetable.	Seed: Energy, Protein, Iron and Zinc. Fresh pods: ProvitA, VitC .

Cowpea	*Vigna unguiculata*	It is grown from seeds. Seed collection is easy. Seeds remain viable for several years if carefully stored. A seeding rate of about 20kg per ha is suitable and seed are sometimes broadcast then thinned.	Young leaves, young pods and ripe seeds are all eaten. They can be steamed, boiled & stir-fried. The leaves can be dried and stored. Dried seeds are used in soups or stews and ground into flour or fermented. Seeds are used for bean sprouts. Roasted seeds are used as a coffee substitute.	Seed: Energy, Protein, Iron. Leaf: ProvitA, VitC, Iron. Pods: VitC.

Leafy greens are a source of iron

Common Name	**Scientific Name**	**Cultivation:**	**Use:**	**Nutrients:**
Amaranth Greens	*Amaranthus hybridus*	Plants are grown from seeds.	The leaves and young shoots are cooked and eaten. They are also dried. The leaves and stems are chopped and added to salads or fried with eggs.	Leaf: Protein, VitC, Iron.
Bok/pak choi	*Brassica rapa subsp. chinensis*	They are grown from seed and often transplanted. Seeds are sown direct, 1cm deep. They germinate in about 7 days with soil temperature of 21°C. Plants are thinned 20cm between plants.	The leaves are cooked and eaten. The stems are cooked.	Leaf: ProvitA, VitC, Iron, Zinc.

Kangkong	*Ipomoea aquatica*	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 2-4 cm long can be planted beside a pond.	The young tips are cooked and eaten, they can be boiled, steamed, stir-fried, 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. The fruit are fried and eaten.	Leaf: Energy, ProvitA, VitC, Iron.

Fruit are an important source of vitamins and dietary fibre				
Common Name	**Scientific Name**	**Cultivation:**	**Use:**	**Nutrients:**
Pineapple	*Ananas comosus*	The suckers and slips and top of the fruit can be used for planting. Therefore, use suckers that grow from the stem near the ground, for earliest yield. Other suckers or the top of the fruit can be used. They can grow well under shade.	The fruit is eaten fresh or used for juice. It can also be sliced and cooked with ham, or used in ice cream, jams, and juices. The young heart leaves can be eaten, cooked in curry dishes. Unripe fruit are also cooked and eaten. The flower spikes are peeled and sliced and steamed as a vegetable.	Fruit: Energy, ProvitA, VitC.

Papaya	*Carica papaya*	Pawpaw seeds grow easily, and plants grow quickly. Fresh seeds can be used, or if dry seeds are used, they should be soaked before planting. Seeds should be planted with a temperature of 24-30°C. To produce well they need a reasonably fertile soil. Seeds can be sown directly, or the seeds can be put in a nursery and the seedlings transplanted. Seeds in a nursery should be about 1-2cm deep. Seedlings can be transplanted when they are about 20cm high. Plants should be about 3m apart.	Fruit can be eaten ripe and raw. Green fruit can be cooked as a vegetable. The young leaves can be eaten cooked but are bitter. The flowers and the middle of the stem can be eaten. Papayas contain papain which is a meat tenderiser.	Fruit: ProvitA, Zinc. Leaf: Energy, Protein, VitC, Iron.

Passionfruit	*Passiflora edulis*	Plants are grown by seeds or cuttings. Seeds germinate in 15-45 days. Seedlings can be grafted. When the end shoots of the mother plant are the same thickness as the seedling stem, shoot tips 8cm long can be used. The leaves should be removed from the cutting being used in the graft. An even light and high humidity allow these grafted plants to be ready in a few weeks. Plants are put in a hole 30cm deep and which has had organic matter added. A spacing of 3-4m apart is suitable. Plants need a trellis to climb over. Often a trellis 2m high is used.	The fleshy portion of the fruit is eaten raw. Passionfruit are also used for flavouring in juices, and with other foods. It is used in sherbets, custards, cakes, sauces, pies, fruit soups, candies, and ice cream. The seeds are edible. They also yield an edible oil. The tender shoots are boiled and eaten. They are added to meat curry.	Fruit including seeds: ProvitA, VitC, Iron.

Vegetables are an important source of vitamins and dietary fibre				
Common Name	**Scientific Name**	**Cultivation:**	**Use:**	**Nutrients:**
Okra, Lady's fingers	*Abelmoschus esculentus*	They are grown from seeds, which are easy to collect. They need high temperatures for germination (over 20°C) and a sunny position. Often seeds are soaked for 24 hours before sowing to give quick germination. Seeds are sown 1.5-2.5cm 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 30cm high encourages branching. A spacing of about 90 x 45cm is suitable.	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 to thicken. They can also be pickled. Young leaves can be eaten cooked. They can be dried and stored. Flowers can also be eaten.	Pods: Energy, Protein, ProvitA, VitC, Iron. Leaf: ProvitA, VitC.

Beetroot	*Beta vulgaris*	Plants are grown from seed. Normally the plants are planted in the final site because transplanting is difficult. When the small clump of seeds or seed ball are planted more than one seedling will result.	The red tubers are eaten after cooking. The root is also dried and powdered, and the flour mixed with barley or wheat. They can be pickled or fermented, or boiled, sliced, and served with vinegar. Tops of leaves are edible. They are cooked in soups and stews.	Root: Energy. Leaf (raw): ProvitA, VitC, Iron.
Choko, Chayote	*Sechium edule*	The entire fruit is planted as the seed cannot withstand drying out. It is planted flat and thinly covered with soil. These eventually fall off and continue growing if they fall on soft moist dirt. A spacing 2m 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 and a large variability of fruit types can occur.	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, often deep fried. The fleshy root can be eaten cooked. They can be boiled, baked, or fried. Starch can be extracted from it.	Leaf: Protein, ProvitA, VitC, Iron. Root: Energy, Protein, Iron.

Acknowledgements:

This guide is based on information from the Food Plants International (FPI) database, "Edible Plants of the World", developed by Tasmanian agricultural scientist Bruce French AO.

"Food Plant Solutions Brief Guide to Food Plant Gardens in "Amed, Bali" is a limited selection of food plants, which is intended as a **Draft Guide only,** to identify some local food plants that have high levels of nutrients that are important to human nutrition. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants in Amed, Bali. It is not a comprehensive guide of food plants for Amed, Bali. Other important nutritious plants may be equally useful. Please contact Food Plant Solutions if you would like further information about these, or more detailed information about the ones selected.

Food Plant Solutions Rotary Action Group 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, which are 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 or email info@foodplantsolutions.org

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Always be sure you have the correct plant, and undertake proper preparation methods.