



Can I Grow a Complete Diet?

Designing a Tropical Subsistence Garden

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Human Nutrition

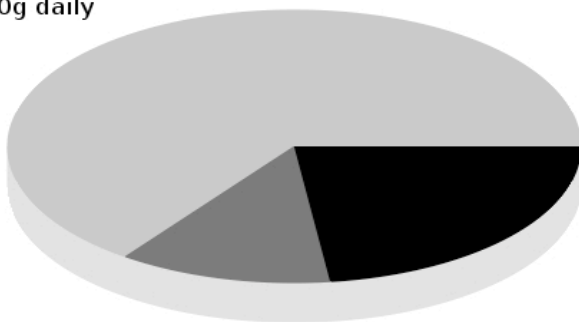
Good nutrition is essential to human health, yet the complex details of human nutrition need not be fully understood in order to grow the foods you need to create a balanced diet.

When we consume food our bodies derive energy and essential nutrients from carbohydrates, proteins, and fats. **Carbohydrates** provide energy through sugars and starches, **proteins** are necessary for growth and repair of the body, and **fats** provide a very concentrated source of energy. Additionally we benefit from **vitamins**, trace amounts of **minerals**, and an assortment of plant-derived molecules called **antioxidants** that help protect our bodies from disease and damage. The precise quantities required from each group are continually debated, however, as a general guideline the following numbers can help you to understand and plant for your nutritional need.

Nutritional Need Groups

Foods that Provide Energy: Carbohydrates

55-75% of calories from carbohydrate
200-260g daily



Foods that Protect: Vitamins, Minerals, Fatty Acids, Antioxidants, etc...

15-30% of calories from fats, 27-60g daily
Remaining calories from a variety of
fruits and vegetables, 400g daily

Foods that Support Growth: Protein

10-15% of calories from protein sources
45-65g daily

Martin, Franklin, and Scott Sherman. "A Beginner's Guide to Nutrition on the Small Scale Farm." ECHO Technical Note, 1992.

World Health Organization Site. WHO. 19 March, 2009 <http://www.who.int/nutrition/topics/5_population_nutrient/en/index.html>.

Diet Diversity

Growing and eating a diverse assortment of foods is essential to a nutritionally complete diet. By consuming many different sources of the necessary calories, you can assure you are getting an overlapping and complementary supply of micronutrients and complete proteins.

Select a diverse array of plant species and a variety of cultivars within species. In this way you increase your food security and seasonal food selections. Diversity is key both in your garden and on your plate!

Tropical Crops for Nutrition

Yes, you can grow and enjoy a complete diet! Choose a wide variety of crops for each nutritional group to fulfill your energy, growth, and micro-nutrient needs.

Throughout the tropics, and the Pacific islands in particular, a tuber-based diet has sustained populations for many generations. The complementary consumption of tuber leaves and stems fill out many of the nutritional elements lacking in the tuber. Additionally the ease and abundance of growing fruit and nut trees, as well as

perennial crops makes tropical subsistence both nutritionally complete and practical. The inclusion of multiple tree crops increases yield from a given area through the use of vertical growing space, and through the temporal distribution of fruiting times.

The potential for a nutritionally complete garden exists by planting a large variety of crops from each nutritional need group outlined below.

Energy Crops (Carbohydrates)

- Every diet is based around energy rich foods. These staples are eaten regularly and constitute the major portion of dietary calories providing for the majority of energy needs.
- Many staple crops are highly adapted to the region where grown and relied upon, handling fluctuations in moisture and temperature better than other crops.
- Staple crops lend resilience to a home garden. When availability to other crops degrades, these crops remain staples supplying energy and basic nutrient needs.
- Root crops are excellent sources of carbohydrates, calcium, and vitamin C, but are low in protein and micronutrient content.
- Staple crops include: **Taro, Sweet Potato, Yam, Cassava, Breadfruit, Bananas**, etc.

Growth Crops (Protein)

- Adequate dietary protein is essential for the maintenance and growth of the body.
- While animal protein is a good source, it is possible to meet protein needs from plant sources alone.
- Legumes, seeds, and nuts are excellent sources of protein. A diverse mixture of leafy greens will also supply overlapping amino acids to create a complete protein.
- Protein crops include: **Winged Bean, Cowpea, Pigeon Pea, Chaya, Sissoo Spinach, Tuber Leaves (Taro, Sweet Potato, and Cassava), Macadamia Nuts, Sunflower Seeds, Pumpkin Seeds**, etc.

Protective Crops (Vitamins and Minerals)

- In addition to carbohydrates, fats, and protein, the body requires a variety of nutrients in very small quantities to maintain proper health and protection from disease.
- The inclusion of a wide variety of fruits and vegetables of many different colors will provide for vitamin and mineral needs.
- Protective crops include: **Coconut, Papaya, Mango, Orange, Avocado, Ethiopian Kale, Okra, Tomatoes**, etc.

From Garden to Plate

A well designed tropical home garden rich with tuber crops, fruit trees, and a variety of annual and perennial vegetables will supply abundantly throughout the year. By following traditional Pacific island dietary patterns you can eat delicious and nutritionally complete meals from your tropical garden. For many, personal food choices are already guided by these cultural traditions. However, for others, a significant transition in diet should be considered in order to thrive from the bounty of a tropical subsistence garden. Browsing traditional Pacific island recipes and cookbooks may help in the selection of crops that will suit your palate.

Food Security

While initially you may wish to supplement your diet heavily through store purchased items or farmer's market produce, growing edibles around your home provides the potential for food self-reliance. Since many tropical plants are propagated vegetatively through cuttings it is of vital importance to have a wide selection of plant materials in your garden to multiply your plantings in the future. The delights of having fresh, homegrown fruits and vegetables are immediate, regardless of the possible necessity down the road.

Begin your garden now by selecting tropical crops suitable to your climatic zone. The following table outlines the nutritional values for a model nutritionally complete garden suitable for mid-elevation tropical locations receiving between 60-100 inches of rain per year. Many of these crops are early producing, most within a year (some within a couple of months), and in the right conditions will provide abundantly.

Tropical Crop Nutritional Composition

All values given per 100 grams of edible portion.

Common Name	Scientific Name	Calories (Kcal)	Carbs (g)	Protein (g)	Fat (g)	Vit. A (mg)	Vit. C (mg)	Calcium (mg)	Iron (mg)	Zinc (mg)
Staple Crops										
Roots										
Cassava, tuber baked	<i>Manihot esculenta</i>	177.0	41.5	2.0	0.3	T	53.0	35.0	2.2	0.4
Sweet Potato, tuber baked	<i>Ipomoea batatas</i>	100.0	30.1	1.4	0.2	5	25.0	28.0	0.5	0.3
Taro, tuber baked	<i>Colocasia esculenta</i>	122.0	27.5	1.1	0.4	T	8.0	19.0	0.6	1.2
Yam, tuber baked	<i>Dioscorea batatas</i>	101.0	22.1	2.5	0.1	10.0	22.5	9.0	0.8	0.5
Trees										
Banana (cooking), baked	<i>Musa spp.</i>	180.0	42.4	2.4	0.2	17.0	25.0	3.0	1.7	0.2
Banana (dessert)	<i>Musa spp.</i>	103.0	23.6	1.3	0.4	4.0	17.3	11.0	0.6	0.2
Breadfruit, baked	<i>Artocarpus atilis</i>	103.0	22.1	1.3	0.6	2.0	22.0	18.0	0.3	0.1
Protein Crops										
Legumes										
Cowpea ^a	<i>Vigna sinensis</i>	116.0	20.8	7.7	0.5	1.0	0.4	24.0	2.5	1.3
Pigeon Pea ^a	<i>Cajanus cajan</i>	121.0	23.3	6.8	0.4	T	0.0	43.0	1.1	0.9
Peas, edible pod, boiled	<i>Pisum sativum</i>	41.0	5.2	3.3	0.2	15.0	32.0	24.0	0.9	0.6
Winged Bean, mature baked	<i>Psophocarpus tetragonolobus</i>	133.0	11.6	8.1	5.4	0.0	0.0	127.0	4.0	1.3
Yard Long Beans, cooked	<i>Vigna unguiculata</i>	29.0	4.3	2.0	0.1	18.0	10.0	50.0	1.4	0.4
Perennial Greens										
Chaya, raw ^b	<i>Cnidoscolus chayamansa</i>	NA	4.2	5.7	0.4	NA	164.7	199.4	11.4	NA
Chayote, shoots/leaves raw	<i>Sechium edule</i>	22.0	T	4.4	0.3	6.0	40.0	71.0	7.3	0.4
Edible Hibiscus, leaves boiled	<i>Abelmoschus manihot</i>	29.0	0.3	3.4	0.8	731.0	7.0	216.0	1.5	1.2
Okinawa Spinach, leaves boiled	<i>Gynura crepidioides</i>	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sissoo Spinach, leaves boiled	<i>Alternanthera sissoo</i>	NA	NA	NA	NA	NA	NA	NA	NA	NA
Secondary Leaves										
Cassava Leaves, boiled	<i>Manihot esculenta</i>	47.0	3.3	3.9	1.1	477.0	64.0	106.0	1.9	1.7
Papaya Shoots, boiled	<i>Carica papaya</i>	61.0	8.0	5.5	0.4	300.0	61.0	284.0	6.3	0.3
Pumpkin Leaves, boiled	<i>Cucurbita maxima</i>	26.0	1.5	2.7	0.2	248.0	4.0	335.0	1.5	0.4
Sweet Potato Leaves, boiled	<i>Ipomoea batatas</i>	23.0	0.8	1.9	0.7	59.0	3.0	125.0	1.2	0.1
Taro Leaves, boiled	<i>Colocasia esculenta</i>	28.0	0.7	3.8	0.6	414.0	20.0	214.0	1.7	0.3
Winged Bean Leaves, boiled	<i>Psophocarpus tetragonolobus</i>	31.0	T	3.4	1.1	397.0	22.0	43.0	2.7	0.7
Nuts/Seeds										

Common Name	Scientific Name	Calories (Kcal)	Carbs (g)	Protein (g)	Fat (g)	Vit. A (mg)	Vit. C (mg)	Calcium (mg)	Iron (mg)	Zinc (mg)
Jackfruit Seeds, boiled	<i>Artocarpus heterophyllus</i>	155.0	32.8	5.0	0.2	0.0	8.0	37.0	0.7	NA
Macadamia Nut, raw	<i>Macadamia spp.</i>	734.0	4.5	7.6	76.2	0.0	1.0	48.0	1.8	1.2
Pili Nut, dried	<i>Canarium ovatum</i>	591.0	18.5	12.1	51.8	2.0	0.0	115.0	2.5	2.8
Pumpkin Seed, raw	<i>Cucurbita maxima</i>	565.0	19.8	29.4	40.4	19.0	0.0	39.0	10.0	6.6
Sunflower Seed, dried	<i>Helianthus annuus</i>	584.0	20.0	20.8	51.5	3.0	1.4	78.0	5.3	5.0
Vitamin and Mineral Crops										
Avocado, fresh	<i>Persea americana</i>	212.0	0.4	1.9	22.6	24.0	9.0	20.0	0.7	0.5
Chayote, fruit boiled	<i>Sechium edule</i>	23.0	4.0	0.6	0.2	4.0	11.0	16.0	0.3	0.2
Citrus, orange, fresh	<i>Citrus sinensis</i>	46.0	10.0	0.6	0.3	11.0	30.0	21.0	0.3	0.2
Coconut, flesh mature	<i>Cocos nucifera</i>	398.0	3.5	4.0	40.0	0.0	7.0	14.0	2.2	0.5
Corn (sweet), boiled	<i>Zea mays</i>	116.0	21.4	3.3	1.3	25.0	6.2	2.0	0.6	0.5
Fig, fresh	<i>Ficus carica</i>	45.0	8.1	1.4	0.3	13.0	3.0	38.0	0.3	0.3
Eggplant, boiled	<i>Solanum melongena</i>	24.0	2.9	1.2	0.3	2.0	2.0	22.0	0.2	0.1
Ethiopian Kale	<i>Brassica carinata</i>	30.0	3.4	3.1	0.1	155.0	130.0	90.0	4.9	0.3
Guava, fresh	<i>Psidium guajava</i>	31.0	3.5	0.7	0.5	36.0	240.0	10.0	0.2	0.1
Jack Fruit, fresh	<i>Artocarpus heterophyllus</i>	55.0	7.4	1.6	0.2	9.0	7.9	37.0	1.7	0.5
Lilikoi, fresh	<i>Passiflora edulis</i>	110.0	18.9	2.4	2.2	39.0	17.0	11.0	1.2	0.8
Mango, fresh	<i>Mangifera indica</i>	68.0	14.1	1.3	0.7	51.0	39.0	20.0	0.3	0.4
Okra, boiled	<i>Abelmoschus esculentus</i>	30.0	1.6	3.4	0.2	9.0	27.0	78.0	1.0	0.8
Papaya, fresh	<i>Carica papaya</i>	51.0	11.8	0.5	0.1	59.0	73.0	24.0	0.7	0.1
Peppers Sweet, raw	<i>Capsicum spp.</i>	47.0	6.0	2.0	0.8	15.0	140.0	29.0	2.6	0.2
Poha Berry, fresh ^a	<i>Physalis peruviana</i>	53.0	11.2	1.9	0.7	36.0	11.0	0.0	1.0	NA
Pineapple, fresh	<i>Ananas comosus</i>	53.0	11.6	0.7	0.3	3.0	22.0	17.0	0.5	0.2
Pumpkin, boiled	<i>Cucurbita maxima</i>	44.0	7.1	2.3	0.4	223.0	11.0	27.0	0.5	0.3
Starfruit, fresh	<i>Averrhoa carambola</i>	41.0	8.3	0.4	0.2	T	36.0	4.0	0.4	0.4
Tree Tomato, fresh	<i>Cyphomandra betacea</i>	49.0	9.1	1.5	0.3	38.0	17.0	13.0	0.8	0.2
Tomato Cherry, raw	<i>Lycopersicon esculentum</i>	15.0	2.2	0.5	0.1	41.0	28.0	11.0	0.5	0.2

Unless noted, all crops from [The Pacific Islands food composition tables](http://www.fao.org/docrep/007/y5432e/y5432e00.htm). FAO. 19 March 2009 <<http://www.fao.org/docrep/007/y5432e/y5432e00.htm>>

a. [USDA Food Composition Data](http://www.nal.usda.gov/fnic/foodcomp/search/). USDA. 19 March, 2009 <<http://www.nal.usda.gov/fnic/foodcomp/search/>>

b. [Potential Nutritional Health Benefits of Tree Spinach](http://www.hort.purdue.edu/newcrop/proceedings1996/V3-516.html). New Crop Resource Online: Purdue University. 19 March, 2009. <<http://www.hort.purdue.edu/newcrop/proceedings1996/V3-516.html>>

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