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ORGANIC GARDENING

Soil Fertility

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Many gardeners have chosen not to use pesticides and fertilizers manufactured in laboratories and factories but they would prefer to use those, produced by nature. Among the reasons cited for gardening organically are energy conservation, fear of poisons, the high cost of chemicals, environmental concerns or simply the idea "natural is better". Regardless of the reason, all gardeners have the right to choose the method they prefer. This factsheet is written to help those people who have chosen "the organic way".

Most practices and principles of organic gardeners are the same as non-organic gardeners. Both are involved with choosing varieties, seeding, transplanting, weeding, staking and harvesting. The few differences that do exist usually involve the controversial topic of concentrated chemicals in the environment. Most organic gardeners prefer to substitute fertilizers such as compost and manure for concentrated fertilizer such as 10-10-10. Although it is possible to supply plants with adequate nutrition without using concentrated fertilizers, a good understanding of soil fertility and a lot of hard work is required.

SOURCES OF NUTRIENTS

Most of the nutrients required by green plants are available in abundant quantity from the air, water and soil. A good garden soil that receives periodic additions of organic matter will contain all of the trace elements and most of the major elements required for growth. (See Gardeners Factsheet No. 16 for a discussion of essential elements.)

The elements of greatest concern are nitrogen, phosphorus and potassium. These elements can be supplied naturally by soil organic matter and soil minerals. However after several years of cropping, even virgin soils will be depleted of these nutrients. Soil organic matter and soil minerals release nutrients slowly over time, however not in great enough quantity to supply rapidly growing vegetables.

It is necessary to add supplemental nutrients each year in order to equal the elements extracted by fast growing vegetables. These supplements can be made by concentrated fertilizers such as potassium nitrate or by organic fertilizers such as dried blood (a by-product of beef slaughterhouses).

Nitrogen

Nitrogen is required by plants for maximum leaf production. When nitrogen is limiting, plants appear yellow (chlorotic) and grow slowly, often producing smaller than normal leaves. Although soil organic matter releases nitrogen continuously over time, the amount released cannot satisfy vegetables during their

period of maximum growth. Most vegetables produce a major portion of their growth from three weeks through eight to ten weeks after seeding. In order to produce good quality vegetables they must receive adequate nutrition and water during this period.

Additional nitrogen must be supplied from a fertilizer such as manure, dried blood, fish emulsion or cottonseed meal. Each of these sources can supply enough nitrogen if used in adequate quantity (Table One). Since organic fertilizers do not release nitrogen immediately, they should be applied at planting time in order to be available during the peak nitrogen demand.

TABLE ONE. Amount of Organic Fertilizer Required per 100 sq. ft. to Supply Adequate Nitrogen

Fertilizer	Amount
Fresh Manure (except poultry)	4 bushels
Poultry Manure	1 bushel
Dried Blood	5 lbs.
Fish Meal	10 lbs.
Cottonseed Meal	10 lbs.

Animal manure is one of our oldest fertilizers and is still used today throughout the world. Although the amount of nitrogen in manure varies according to its source, most fresh manures other than poultry will contain 1/2 of one percent nitrogen. This is 1/20th the nitrogen as in an equal amount of 10-10-10 fertilizer. Therefore, about 20 times more manure is needed than 10-10-10 to supply the same amount of nitrogen. Most of the available nitrogen is in the urine, so it is best to apply fresh manure to the soil. Since tender seedlings may be injured by concentrated urine, wait at least 2-3 weeks before planting. Although you may plant immediately following an application of decomposed manure, it will contain little available nitrogen.

Poultry manure often contains 3-4 times more nitrogen than cow manure. It is also drier and more concentrated, though not quite as concentrated as 10-10-10 fertilizer. Less poultry manure is used than cow manure to avoid burning plants with too much nitrogen. Allow poultry manure to dry before applying to the garden.

Dried blood is a by-product of slaughter-houses. As blood is drained from recently killed animals, it is dried and ground into a fine powder. Although blood is relatively expensive, it is a good source of quickly available nitrogen.

Fish meal or fish wastes contain some nitrogen which will become available to plants. However it is slowly available and plant growth may suffer. Fish emulsion is a different product that contains up to 5% nitrogen that is readily available. However it can be quite expensive to supply plants with adequate nitrogen solely from fish emulsion.

Cottonseed meal is a by-product of the cotton industry which contains some nitrogen. It is not rapidly available and should not be relied upon as the sole source of nitrogen for vegetables. It also can be quite expensive.

Phosphorus

Most Virgin Islands soils contain some native phosphorus. However the amount may be inadequate to support quick growing vegetables. Also, phosphorus is rapidly tied up in an insoluble form when the soil pH is above 7.5 (alkaline soils). Soils that contain caliche (limestone) will require additions of phosphorus.

The concentrated fertilizer superphosphate is made from rock phosphate treated with sulfuric acid in factories. This can be done to some extent in the soil by adding elemental sulfur to organic sources of phosphorus. The sulfur will lower the pH of the soil immediately near the phosphorus and make it more available.

TABLE TWO. Amount of Organic Fertilizer and Sulfur Required per 100 sq. ft. to Supply Adequate Phosphorus

Fertilizer	Amount Sulfur	Amount of
Steamed Bone Meal	5 lbs.	1 lb.
Finely Ground Rock Phosphate	50 lbs.	10 lbs.
Fresh Manure (except poultry)	8 bushels	-
Poultry Manure	1 bushel	-

Steamed Bone Meal is a by-product of slaughter houses. It is a relatively good source of phosphorus, however it can be expensive.

Rock phosphate is ground rock that releases phosphorus very slowly. Although laboratory tests indicate that rock phosphate contains as much as 30% phosphorus, it is simply not in an available form. Additions of rock phosphate will do little good, especially in alkaline soils.

Potassium

Potassium is found in abundant supply in many Virgin Islands soils. It is usually found in the same soils as caliche, although it is not a direct result of caliche deposits. Before carrying large quantities of organic potassium to your garden, have the soil tested. If potassium levels are above 300 lbs/acre, no additional potassium is necessary. If it is below 300 lbs/acre add one of the organic potassium sources listed in Table Three.

TABLE THREE. Amount of Organic Fertilizer Required per 100 sq. ft. to Supply Adequate Potassium

Fertilizer	Amount/100 sq. ft.
Finely Ground Granite Dust	50 lbs.
Greensand	50 lbs.
Wood Ash	10 lbs.
Fresh Manure (except poultry)	4 bushels
Poultry Manure	1 bushel

Granite Dust contains about 5% potassium, little of which will be available during this century. Finely ground rocks simply will not supply elements rapidly enough for vegetables.

Greensand is mined from sedimentary deposits of rock containing about 6% potassium. It is very slowly available.

Wood ash is an excellent source of potassium which has been used for many years. It is rapidly available, yet is not likely to burn plants. Do not use charcoal ash as it may contain toxic amounts of sulfur.

Trace Elements

Trace elements are those elements required in very small amounts. (See Gardeners Factsheet No. 16 for a discussion of trace elements). Soils which contain adequate organic matter and have pH range from 6-7 will provide all the trace elements required by vegetables. Since many soils in the Virgin Islands are quite alkaline (pH above 7), vegetables may appear yellow due to deficiencies of iron, manganese or zinc.

Additions of elemental sulfur can lower the pH to below 7 and release many trace elements as well as phosphorus. Since sulfur is either mined from the ground or produced as a by-product, it is usually accepted by organic gardeners. The amount of sulfur required to lower the soil pH to 6.5 depends on the initial pH and the soil type. Table Four shows how much sulfur is required per 100 sq. ft. of garden to lower the pH to 6.5.

TABLE FOUR. Sulfur Required per 100 sq. ft. to Adjust pH to 6.5

Initial pH	Soil Type		
	Sandy	Loamy	Clay
8.5	4.5 lbs.	5.5 lbs.	7.0 lbs.
8.0	2.5 lbs.	3.5 lbs.	4.5 lbs.
7.5	1.0 lbs.	2.0 lbs.	2.5 lbs.

Soil Building

Organic fertilizers will substitute for concentrated fertilizers such as 10-10-10 but will not alleviate poor soil building practices. All gardeners should supply generous amounts of compost to maintain soil organic matter at a level that promotes good plant growth. Organic matter improves the tilth and friability of soil. It increases the drainage in heavy soils and helps sandy soils hold more water. Organic matter is truly the gardeners best friend.

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