GROW BIOINTENSIVE® SUSTAINABLE MINI-FARMING: SUSTAINABLE APPLICATION OF COMPOSTED VEGETABLE MATTER, COMPOSTED COW MANURE AND ORGANIC FERTILIZERS

GROW BIOINTENSIVE® Sustainable Mini-Farming

The goal of a GROW BIOINTENSIVE sustainable mini-farm[1] is *to produce essentially all of the soil's fertility sustainably and to eventually need no outside inputs.* This is possible once the soil nutrients are balanced through competent soil analysis followed by the application of the appropriate quantities of organic fertilizers. Sustainability can be achieved by accomplishing two goals: a) growing "compost crops" to generate *sufficient* cured compost; and b) returning all of the soil nutrients contained in the crops to the soil through *sufficient* compost and the proper, safe and legal recycling of human waste. If these two goals are accomplished, both humus and nutrient levels of the soil can be replenished in a way that is sustainable. That is, the fertility of the soil can be maintained virtually indefinitely, since these practices do not rely on nonrenewable resources directly (as in the use of chemical fertilizers which are produced from petroleum) or indirectly. Examples of practices that use nonrenewable resources are: a) the use of organic fertilizers which come from other soils, and b) the bringing in of organic matter from *other* soils—therefore, depleting those soils.

To ensure that a farm produces enough compost to maintain the organic matter level of its soil, as well as enough food and income for the farmer and his or her family, *approximately* ***60 percent*** *of the growing area of the farm on the average is used to grow* ***carbon-and-calorie crops*** *on a rotation basis.* Carbon-and-calorie crops (such as grain crops) yield high amounts of carbonaceous residues that produce more cured compost and humus when they are composted than do materials high in nitrogen and water (such as clover, vetch and other crops grown for green manure). These carbon-and-calorie crops also provide food for people.

Thirty percent *of the growing area of the farm should be used for* ***special root crops*** that produce large amounts of calories per unit of area, such as potatoes, parsnips and garlic. (The total area required to produce sufficient calories, therefore, is 90% [60% + 30%].)

The remaining ***10 percent*** of the area is for vegetables to provide the additional dietary vitamins and minerals not raised in the other 90 percent of the area, and for income crops. GROW BIOINTENSIVE Mini-Farming is excellent for nutrition intervention: as little as 2.5 percent of the mini-farm area is often needed to meet the daily vitamin and mineral requirements of the farmer and his or her family. In other words, one person's additional daily vitamin and mineral requirements may be met by GROW BIOINTENSIVE-ly growing as little as 100 square feet of

[1] Generally, the *minimum* farm size for growing all of one person's soil fertility, human nutrition and income on a sustainable basis will be approximately 4,000 square feet of planted surface, assuming intermediate GROW BIOINTENSIVE yields.

vitamin- and mineral-rich crops during a four-month growing season. The remaining 7.5 percent of the area can be planted in crops for income or other crops a person needs.

Sustainable Application of Composted Vegetable Matter

Ecology Action has found that, in most situations, approximately 4 cubic feet of cured compost (that is 50% soil by volume), assuming *high* yields, or 2 cubic feet of cured compost (including 50% soil by volume), assuming *intermediate* yields, is probably the maximum that 100 square feet can produce on the average with optimal conditions and is perhaps the optimal amount of cured compost to add to 100 square feet of soil per four-month growing season. Only under very unusual circumstances (such as when one is improving a soil that has no topsoil or subsoil, only C- and R-horizon material) is more than 4 cubic feet of cured compost (that is 50% soil by volume) needed (see below).

An application of 4 cubic feet of cured compost (including 50% soil by volume) per 100 square feet per four-month growing season can produce *very good* sustainable yields. However, this application rate may not be required for the best yield under all situations. In a semi-arid, sub-tropical area under large-greenhouse conditions, Dr. Ed Glenn of the Environmental Research Laboratory at the University of Arizona found that an application rate of 1.4 cubic feet of cured *soil-less* compost per 100 square feet per year (approximately equivalent to 2.8 cubic feet including 50% soil) produced the highest crop yields, compared to application rates of 4 (equivalent to 8 cubic feet of cured compost that is 50% soil by volume), 8 and 18 cubic feet of cured soil-less compost per 100 square feet per year.[2]

After doing a number of experiments on the sustainability of GROW BIOINTENSIVE Mini-Farming at the Environmental Research Laboratory, Dr. Glenn stated, "Although funding was not available to continue these experiments for the number of years necessary to draw final conclusions, the results supported the hypothesis that sustainable food production with few or no outside inputs will not only continue to produce high yields but will improve rather than deplete the organic constituents in the soil."

It is most important that beginning GROW BIOINTENSIVE Mini-Farmers begin growing their own compost materials, apply the cured compost they have made, and strive to eventually produce enough cured compost to be able to apply up to 2 cubic feet (that is 50% soil by volume) per 100 square feet per four-month growing season—and more skilled Mini-Farmers up to 4 cubic feet in optimal soil and climate conditions. The soil's fertility then may be sustainable on an approximate "closed-system" basis that does not deplete other soils in the process.

[2] Dr. Ed Glenn, personal communication, December 12, 1989.

Unsustainable Application of Cured Compost

Using more than the sustainable amount of compost necessarily requires another soil to be depleted of its organic matter and minerals. How much soil will be depleted depends on the amount of cured compost that is applied. For example, let us assume that, instead of an application rate of 2 cubic feet of cured compost that is 50% soil by volume per 100 square feet of soil, 8 cubic feet of cured compost that is 50% soil by volume per 100 square feet of soil is applied. Approximately 400 square feet *(assuming **intermediate** yields)* may be needed to produce 8 cubic feet of cured compost (that is 50% soil by volume). If all 8 cubic feet of cured compost is added to only 100 square feet, 300 square feet of farm soil cannot receive cured compost and will lose its organic matter, minerals and fertility over time. Eventually, the 300 square feet will become so depleted that it will be unable to produce enough organic matter to maintain even the other 100 square feet of soil.

Unsustainable Application of Cow Manure

Often, a half-inch layer of animal manure *composted without soil* (equivalent to approximately 4 cubic feet per 100 square feet) is recommended to be applied to a growing area, However, this is likely to be an over-application of nitrogen which could lead to nitrate toxicity in the crops, nitrate in the groundwater, crop lodging, acidification of the soil, and possibly a loss of soil humus.

Even more important, adding this amount of *soil-less composted* manure is insustainable. Annual fodder production for the cow, using GROW BIOINTENSIVE Mini-Farming with zero-grazing techniques, requires *(at **intermediate** GROW BIOINTENSIVE yields)* approximately 7,500 square feet of soil (75, 100-sq-ft beds). The cow produces approximately 220 cubic feet of manure (dry) annually or approximately 110 cubic feet once the manure is decomposed. 110 cubic feet is enough *cured* manure (without soil) to apply to about 2,750 square feet (or 27.5, 100-sq-ft beds) of soil once per year at the rate described above. Therefore, 4,750 square feet (or 47.5, 100-sq-ft beds) will not receive compost, and the minerals, as well as humus, will not be replenished. This practice will eventually cause the 47.5 beds to lose organic matter, minerals, fertility and productivity.

Intermediate GROW BIOINTENSIVE Yields[3]

Area required to feed one cow = 7,500 sq ft
Area that will be fertilized with one cow's manure = 2,750 sq ft
Area that will begin to lose its fertility = 4,750 sq ft

Appropriate Use of Organic Fertilizers

Unless the soil is analyzed by a competent laboratory, or the farmer is able to tell by the presence and growth characteristics of certain plants which minerals are missing in the soil, organic fertilizers should not be applied, and only cured compost generated from residues

[3] The data for chickens and horses are being researched.

produced by the farm should be used. Indiscriminately added organic fertilizers can do more harm than good. Optimally, the minerals that the soil lacks will be identified through plant or chemical analysis and added in the form of organic fertilizers until the mineral levels are sufficient and balanced. Thereafter, if all the nutrients are properly recycled, no additions of organic fertilizers should be needed.

Compost Application Procedure

The 4 cubic feet (or less, if less is needed or if less is what is available) of cured compost (that is 50% soil by volume) should be applied and mixed into the upper 2 to 4 inches of soil only **after** the bed has been double-dug, not before the double-dig. Compost that is added before the double-dig tends to be buried too deep in the soil to be immediately accessible to and most effectively used by the soil microorganisms and the seedlings when they most need it.

One Exception to the Guidelines

If it is necessary to significantly amend a soil that has no topsoil and/or subsoil, or a soil with extremely low organic matter, a Complete Texturizing Double-Dig, with compost mixed in 24 inches deep during the double-dig, may help. (See the Soil Preparation Chapter in *How to Grow More Vegetables*.) Under such circumstances, no more than 8 cubic feet of cured compost (that is 50% soil by volume) should be added, and it should be added *on a one-time basis only*. The purpose of this exception is to produce a significantly greater amount of compost materials resulting in a more rapid increase in soil fertility, thereby contributing to long-term sustainability for the soil and farm.

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