A Farmer's Mini-Handbook:

GROW BIOINTENSIVE®

Sustainable Mini-Farming

By Margo Royer-Miller

An Ecology Action
Self-Teaching Publication

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Designed by Shannon Joyner/Raven Hill Enterprises

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The basic tools for creating your own GROW BIOINTENSIVE garden: D-Handled Shovel, Spading Fork, Trowels, Fork, and Dibber.

INTRODUCTION

Communities, families, and individuals all over the world are searching for ways to provide the necessary food and nutrition for sustenance and health. This handbook is a simple and instructive look at GROW BIOINTENSIVE® (GB) Sustainable Mini-Farming. It is a method of food-growing that helps revitalize our planet by building soil, using a smaller area to produce higher yields than conventional methods, and minimizing water, organic fertilizer, and biological pesticide use. It attends to the long-term sustainability of farmland, so that food can be produced generation after generation. GB may be part of the solution you, your family, and your community are pursuing.

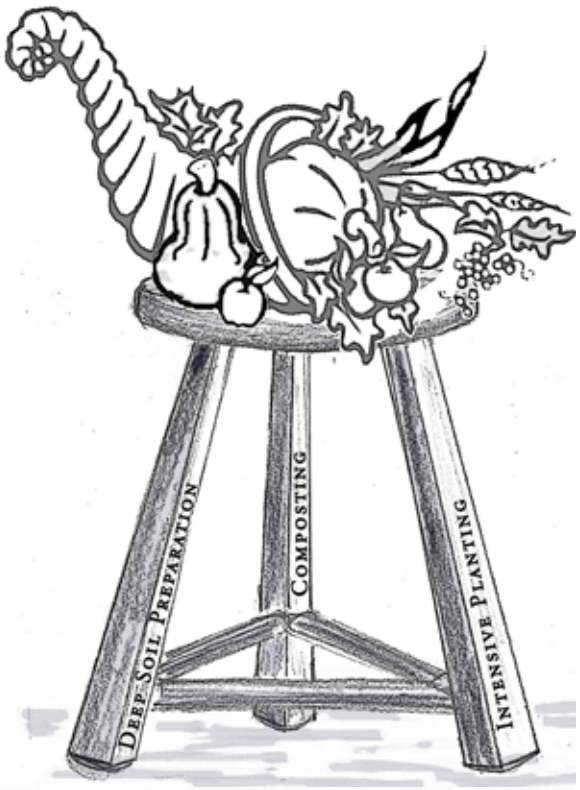
As you read this handbook and implement GB, please keep in mind these important basic ideas that under-gird and support this method:

1. GB works with the Earth's natural cycles to create balance and diversity in the growing space and surrounding areas.
2. GB involves observation, recognizing recurring patterns to learn how to improve the health and productivity of the growing system.
3. Local farmers are important resources.

As a farmer or gardener you are also important to your family, your community, and the world! Everyone relies on nourishing food to eat. You produce that food. All of our grandchildren will need healthy land so they can produce food, too. We must take care of the earth for future generations. The farmer faces the unique challenge of how to grow good food and care for the farmland *at the same time*.

Note: this handbook is written for all people who plant and grow food, whether you identify as farmer, gardener, or producer. For simplicity and consistency we have chosen to use the terms "farm" and "farmer" throughout, to acknowledge that all food-growers contribute to the feeding of humanity, no matter the scale of production.

GROW BIOINTENSIVE Sustainable Mini-Farming consists of eight principles to guide the farmer to simultaneously grow healthy food and care for the land. These principles are inspired by how plants grow in nature and are based on using natural processes to create a thriving and sustainable food-production system. A well-executed GB farm approaches sustainability as it becomes a closed system with no off-farm sourcing of inputs AND nurtures the soil and ecosystem to be self-sustaining. In the long run, a GB farm is a farm that will be vital and productive for generations, a monumental achievement!



The eight principles of GROW BIOINTENSIVE are:

1. Deep Soil Preparation
2. Composting
3. Intensive Planting
4. Companion Planting
5. Carbon Farming
6. Calorie Farming
7. Open-Pollinated Seeds
8. Whole System Method

Read on to see how you can make your farm the bountiful, healthy system you want it to be, for your family and your community today and in the future.

❀ PRINCIPLE 1: DEEP SOIL PREPARATION ❀

Goal: Build Soil and Soil Structure

Looking at GB as a three-legged stool, deep soil preparation is one of the legs. Deep soil preparation builds soil and soil structure by loosening the soil to a depth of 24 inches (60 cm).

Ideal soil structure has both pore space for air and water to move freely and soil particles that hold together nicely. Air supports plant roots and soil organisms that give life to the soil and enhance nutrient availability for the plants. Aerated soil holds water better than compacted soil, requiring less watering. It also facilitates root penetration, supporting healthy plants and minimizing erosion.

To prepare the soil on your farm, determine where your growing beds will be and where your paths will be. (Paths are necessary because stepping on the bed compacts the soil, reversing the process of digging.) Recommended bed dimensions are 4-5 feet (1-1.5 m) wide and 20-25 ft (6.5-10 m) long for a total of 100 ft^2 (10 m^2). This bed size works well for labor and space efficiency, and for water retention. Make your paths wide enough for you to work easily, but not so wide that you sacrifice growing space unnecessarily.

HINT:
When digging or planting, put a strong, wide digging board on the bed to distribute your weight and avoid compacting the soil.

To double-dig, stand on a digging board positioned 12 in (30 cm) from the end of the bed. Facing the end, use a flat digging spade with a D-handle (or the tools available to you) to remove soil to make the first trench, 12 in x 12 in x 5 ft (30 cm x 30 cm x 1.5m). Put the soil you dig out of the trench in a bucket, basket, wheelbarrow or pile to save for later. Some of this soil will go back into the bed to complete the double-dig, and some can be used for compost building and to start seeds. (More about the uses for bed soil later.)

HINT:
Make the work easier by allowing the soil to gently slide off the digging spade into the open trench, by letting your weight sink the fork into the lower trench, and by raking after every 5 trenches!

With a D-handled digging fork (or other locally available tool), gently loosen the lower level of the first trench 12 in (30 cm) deep. If you cannot penetrate 12 in (30 cm), simply loosen as deeply as you can. Each year the soil will improve from a combination of double-digging and the growing action of roots, until you are able to achieve a loose, healthy soil structure to the full 24 in (60 cm).

Next, move your board 12 in (30 cm) back from the first trench to expose more soil to begin the second trench. Using your digging tool again, move the soil from the top 12 in (30 cm) into the first trench. Now you have a new trench. Loosen the soil in the bottom of this second trench, as deeply as you can.

Repeat this pattern until you reach the other end of the bed. At the end you will have one last trench to fill. This soil comes from the soil you removed from the first trench. Fill the trench and rake your soil smooth, your bed is ready for compost. You have crafted the first leg of the stool.

Notes to Refine Deep Soil Preparation:

Soil of proper moisture level (like a wrung-out cloth) will be the easiest to work with. If the soil is too dry or too wet it is more difficult to dig and the soil structure can be damaged in the process. Make your job easier and take care of the soil by watering the bed or keeping it dry, as appropriate, in preparation for digging.

- Choose cool and comfortable times of day for digging. Working in the heat of the day exposes the soil organic matter to accelerated oxidation and more will be lost. The farmer uses less energy digging in the cool of the day, too!

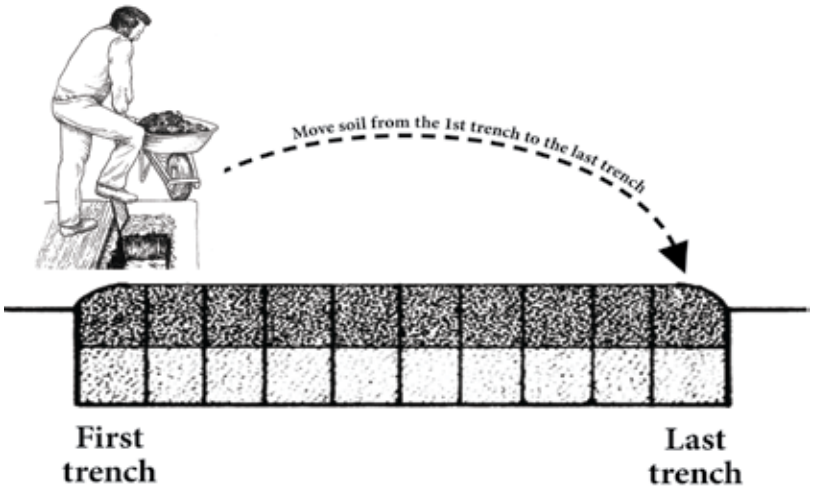
- If the soil is very compacted, it may not be possible to dig 24 in (60 cm). Simply dig as deeply as you can and let the plant roots help you. You can plant deep-rooting crops to accelerate this process. Remember this is part of building soil structure, over time the full depth will be achievable!

- Another important part of building soil structure is supporting the beneficial interactions between the organisms living in the soil, the roots, and the soil itself. The disruption of deep soil preparation is best limited to once every growing season, until good soil structure allows you to dig less often.

- If your soil is overly loose due to sand, double-digging is not helpful. Instead you will want to build soil structure by adding organic matter in the form of compost and keeping plants growing year-round so roots can support soil microbial life.

GB Farmer's Challenge:

Watch your soil grow and change. Remember the goal of deep soil preparation is to build soil and soil structure, not to double-dig. Before you dig, check the soil down to 24 in (60 cm), if it is loose all the way down you might only single-dig (gently loosening the top 12 in (30 cm) with a digging fork, like you do for the lower trench in the double-dig) or even just loosen the top surface of the soil 2-4 in (5-10 cm) so it is ready for compost and planting.



❁ PRINCIPLE 2: COMPOSTING ❁

Goal: Maximize compost quality and quantity
AND
maximize microbial diversity

Composting is the second leg of the three-legged stool. GB composting strives to produce the maximum amount of compost from the materials used. It also maximizes microbial biodiversity through a correctly built and "cured" compost pile using plant material from your farm, food scraps from your kitchen, and soil from the beds.

Healthy compost is broken down plant material that returns nutrients and carbon to the soil, so the soil regains fertility and waste is minimized. Quality compost in the soil provides sustained release of nutrients for plant roots and microorganisms. It provides more aeration for roots and microbes. Compost helps buffer challenging soil conditions, like high or low pH, or too much clay or sand. The organic matter in compost also helps increase water retention, so you need to water less. By using compost to support soil fertility you can be more self-sufficient and rely less on purchased organic fertilizer.

HINT:
Make the base of the pile at least 3 ft x 3 ft (1 m x 1 m) so the pile is big enough to retain moisture and heat for healthy decomposition.

To make GB compost, start by picking any space available to put your compost pile, maybe even on a growing bed. Next, gather your materials, collect them over time and/or use what you have on hand:

1. **Mature Material** — Did this plant grow to its old age and produce seed? If so, the plant is mature and made up of material that is complex and tougher to breakdown. Think of a corn stalk after it has borne fruit. It is structurally strong.

Adding mature material to a compost pile

2. **Immature Material** — Did this plant grow to its old age and produce seed? If not, the plant is immature and made of material that is less complex and easier to break down. Think of alfalfa plants or lettuce leaves that are very flexible. It can sometimes be hard to differentiate between mature and immature materials, so just do your best.

3. **Soil** — this comes from the first trench of soil you removed during the double dig. Keep a little around after double-digging for compost building.

4. **Roughage** -— This is plant material that is thick and tough and will take many compost piles before it decomposes. Think of branches from trees or stalks of cassava. Roughage is used once in each pile, so only a small amount is necessary.

Now you are ready to build:

Step 1 Gently loosen the soil where you will build down to 12 in (30 cm), so the pile can drain.

Step 2 Apply roughage about 4 in (10 cm) thick so the pile can drain and breathe.

Step 3 Apply a layer of mature material, about 2 in (5 cm) thick and water until evenly moist.

Step 4 Apply a layer of immature material, about 2 in (5 cm) thick and water until evenly moist.

Step 5 Apply a layer of soil about ¼ in (½-1 cm) thick and water. The soil plays an important role, helping to stabilize the moisture and temperature levels of the pile and inoculating it with microorganisms.

Step 6 Repeat steps 3 through 5 until you have used up your materials or the pile is tall enough for you to stop working on it, whichever comes first.

Notice that you are using equal volumes of mature and immature materials. This is an important component in producing healthy compost, as both the structural integrity of the mature material and the less-structural immature material contribute to the process of decomposition and the humus-formation that make compost so valuable.

GB Farmer's Challenge:

Get to know your compost pile. Watch it, smell it, and feel it as it changes. Even on the inside! Learn to know when it is healthy. Let it teach you how to make even better compost.

If your pile was short when materials ran out or it shrinks a lot, you may want to keep adding to the pile when you have more material, until you decide to call your compost pile finished. Finishing a pile within one month is a good guideline. When you are done building, an additional layer of soil on the top will help the pile to hold moisture. Your compost pile will begin to shrink after you build it.

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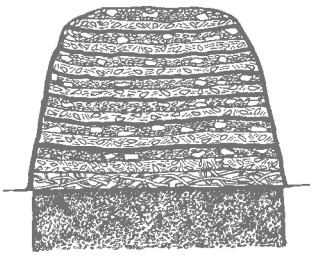

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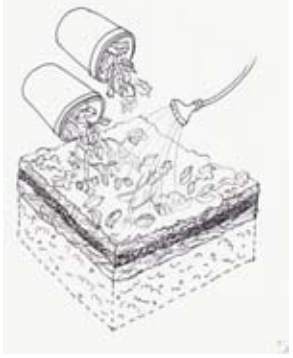

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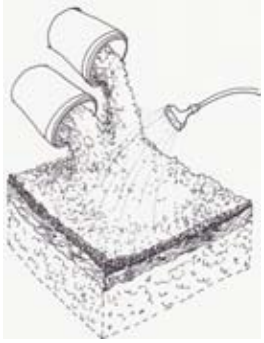

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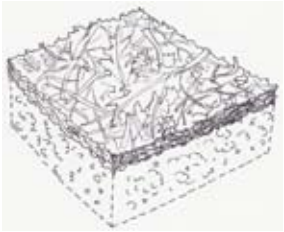

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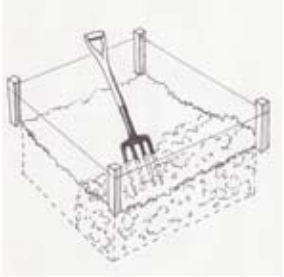


To maintain your compost pile:

Because compost is the result of decomposition, maintaining a compost pile is about creating the ideal conditions for this process. Decomposition is carried out by microorganisms in the presence of moisture and air; therefore, the pile must have enough moisture (like a wrung-out cloth) and enough air (too much moisture limits air). You have four strategies to create the moisture balance you want: a) You can loosen your pile, b) water your pile, c)cover your pile or d) do nothing. In some climates, it may be necessary to water the entire pile, or at least the edges daily, to retain moisture. Pile location can help with this too, as shaded piles will retain moisture better. If you notice a sour smell or white color, your compost pile may be anaerobic (not enough air, too much water); loosen it to add air. If the materials are not breaking down, your pile may be too dry; water it and/or cover it to hold the moisture. If all is going well, enjoy observing this miraculous process!

HINT:
Use many different kinds of plant material to support a variety of microorganisms. This maximizes microbial diversity, creating more vibrant, healthier decomposition and compost—plus natural antibiotics in the soil to encourage the maintenance of plant health.

One to two weeks after finishing your pile (adding material for the last time), you may choose to turn the pile. The best time to do this is after the temperature of the pile has peaked and dropped 20° F (11° C) (you can monitor the temperature of the pile using a thermometer). Turning will result in more uniform decomposition, but is not absolutely necessary. To turn a pile, choose a site close-by and complete steps 1 and 2 as outlined on the previous page. Move your pile with a pitchfork or locally available tool, by taking forkfuls off the top of the pile and putting them on top of the new roughage. Form the new pile by placing the less decomposed material towards the center of the new pile and the more decomposed material to the outer edges. Water after every layer you make, if needed, to establish good moisture (like a wrung out cloth). Turning will add air, restarting the decomposition process. Now maintain a healthy moisture level and let your pile cure.

The pile should smell musty, then earthy. The materials should become harder to recognize, ending up as a crumbly, brown-black, woodsy-smelling fertile material that feels rich to the touch. Your pile should take about 3-6 months to cure, depending on the climate. When you decide it is ready, put it onto already prepared beds, working it gently into the top 2-4 in (5-10 cm) of soil. The beds are now ready to plant. If you are not ready to use the compost, disassemble and dry the pile in a dry, airy and warm location, so it doesn't continue decomposing (over-decomposition reduces the nutrient value of the compost). Store compost dry; it will rehydrate when you use it.

Turned pile <------ Original pile

Notes to Refine Composting:

- If the material available has a lot of oils or readily available nutrients like coffee grounds, citrus peels, or manure, limit it to no more than 1/6th the volume of the completed pile.
- There are some things that are better to avoid putting into compost piles because they don't decompose well. They have strong components that inhibit the decomposition process, or they contain undesirable eggs or seeds that can survive the curing process. Examples include: magnolia and eucalyptus leaves, poisonous plants, ivy, insect or disease infested plants, etc.
- The more mature material in a compost pile, the cooler and slower the decomposition. The resulting compost has higher amounts of stable organic matter that will have positive long-term affects in the soil. "Cool" composting is also better at maximizing the quantity of cured compost created per unit of built compost, which is part of the composting goal.
- A yearly compost application for each growing bed is a general guideline.
- When applying compost, more is not always better. Remember to apply a quantity that can be sustainably produced by your farm.
- Because compost is a stable form of organic matter with long-term benefits for soil fertility and structure, it is preferable to put all crop material into a compost pile rather than turning crop matter directly into the soil.
- Compost supports soil fertility, but it may not contribute specific nutrients that a soil is lacking. For this reason, it is recommended to test your soil annually for basic and trace nutrients. If the soil is deficient, an annual addition of organic amendments as recommended by the soil test can help stabilize the soil nutrients.
- Caring for soil through composting and careful preparation will help hold onto these nutrients and over time you will find yourself needing to add fewer and fewer amendments.
- http://www.timberleafsoiltesting.com/ is a trusted resource.

A compost sifter helps remove un-decomposed roughage.

By composting your own materials, you are actively taking care of your land by returning fertility to the soil. You are building soil and contributing to the long-term health of your farm! Your three-legged stool has two strong legs.

❀ PRINCIPLE 3: INTENSIVE PLANTING ❀

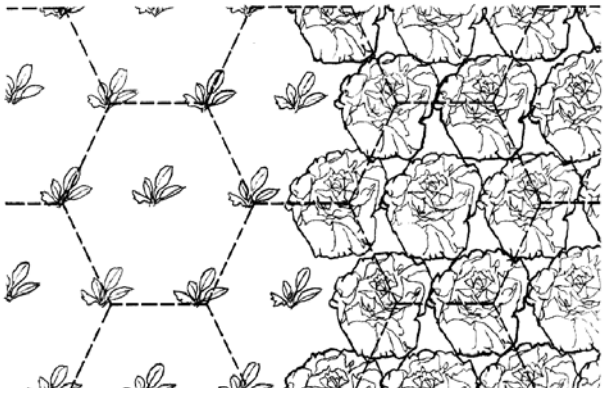
Goal: Create enhanced and uninterrupted root and plant growth

The third leg of the stool is intensive planting. It creates enhanced and uninterrupted plant and root growth by transplanting seedlings in a close, off-set spacing pattern so their leaves are barely touching at maturity, creating a living mulch over the soil!

The ***living mulch*** results in a mini-climate between the plants and the soil, retaining moisture and protecting soil from wind and water exposure that can lead to erosion. Intensive planting also maximizes root material, which increases the biological activity and the organic matter in the soil. (When the soil is healthy, roots can be healthy; when roots are healthy, plants can be healthy.)

Intensive planting limits weed growth, supporting the plants and saving labor. Additionally, the farmer benefits because the hexagonal pattern maximizes the number of plants in a given area, increasing yield.

From above, the pattern looks like this:



Each plant is the same distance from all the plants around it. In the center is the seedling and the circle around it is the area the plant covers when it is full-grown. From the side, the leaves should look like this:

GB Farmer's Challenge:

Experiment with the best spacing for your climate. For example, try lettuce 8, 10, 12, and 14 in (20, 25, 30, 35 cm) apart and measure your yields per unit of area to compare production, soil coverage, and plant health. Remember to try experiments 3 or more times to be confident in the conclusions!

Intensive planting is also utilized in the process of growing your own seedlings for transplanting. This farming practice contributes to the sustainability of the farm through supporting a closed system (not buying seedlings). Seedlings can be grown in flats, in any container that drains well and is deep enough for roots (at least 3 in/ 7.5 cm), or in a nursery bed. Propagate seedlings in a way that allows them enough room to grow, while creating a good mini-climate over the flat, container or bed. Use the off-set spacing pattern, putting most seeds on 1 or 2 in (2.5 or 5 cm) spacing. If the seeds are too small to handle, scatter them evenly. To have enough space for the seedlings to develop properly, it may be necessary to move these seedlings to another flat, container or area on off-set spacing once they have germinated. This process is called "pricking out." Most seedlings are pricked out on 1.5 or 2 in (3 or 5 cm) spacing.

HINT:
To attend to the closed system of the farm, make flat soil (soil used in flats or containers for seedling propagation) from equal amounts of compost and bed soil (saved from the double-dig). Once soil is available from used flats or containers, use equal parts of old flat soil, compost, and bed soil. If seedlings were diseased, use that old flat soil for compost where the microorganisms can transform it into healthy soil again.

HINT:
Some fast growing plants like radishes don't benefit from transplanting.

HINT:
If the plants look stressed, check the soil 2, 6, and 8 in (5, 10, 15 cm) deep, there may be a hidden moisture imbalance.

Your plants will be healthiest if you transplant the seedlings when their roots and leaves are thriving and in balance with one another. Roots are too big when they've hit the bottom of the flat or container. Remember to harden off seedlings for a few days before transplanting by bringing them from a protected temperature into the ambient temperature. Transplanting is best done in the cool of the day, followed by immediate watering to settle the roots into the soil. Transplanting is preferable to directly sowing seeds in the bed because you can:

- avoid empty spaces in the bed caused by poor seed germination,
- establish living mulch faster because seedlings are already large; therefore they cover the soil sooner and the soil requires less water,
- use the healthiest seedlings to maximize yield,
- produce warm-loving seedlings earlier (with some protection) that will be ready to plant when the weather allows, and
- bring the crop already in the bed to fuller maturity (producing more compost material and higher yields), while the seedlings are growing.

Another important part of attaining enhanced and uninterrupted plant and root growth is watering gently. If the rains aren't enough and you water your garden, make the water fall gently like raindrops instead of beating onto the plants or running over the soil. And remember if the soil is healthy, the plants will benefit, so when watering think about creating good soil moisture instead of focusing on the plants.

Using intensive planting, along with compost and deep soil preparation, is the foundation for a sustainable farm. These principles work together to create and support a healthy, vibrant soil, which can produce higher yields. A key in sustainable farming is to recognize that soil is the foundation of life! Farmers grow food that nurtures life; therefore, farmers must grow and honor the soil.

These first three principles of GROW BIOINTENSIVE take care of the soil; they are the three legs that are the solid foundation of a good stool. To strengthen the system and complete the stool, the GB farmer employs five more principles.

GB Farmer's Challenge:

Continue reading and implement these ideas on your farm. Watch carefully to see the patterns that are consistent between beds, crops, and seasons. Learn from these patterns and remember that things take time.

❁ PRINCIPLE 4: COMPANION PLANTING ❁

Goal: Focus on the whole garden to create a thriving mini-ecosystem with beneficial interrelationships

Companion planting strengthens the whole farm by crop and layout choices that support beneficial relationships between plants, insects, and the soil.

Companion planting includes **choosing crops that are good neighbors** and encourage each other's growth. Good companion plants can follow one another in the same area, grow next to one another at the same time, or be interplanted to cooperatively share the same space. Avoid putting plants in the same area or space that inhibit each other's growth. Observing patterns can teach you a lot about companion plants.

HINT:
Plant a deep- and thick-rooting grain like rye after a root crop to loosen the soil. Interplant beans with corn to help support soil nitrogen and efficiently use the above-soil area while covering the soil thoroughly. Plant basil near tomatoes to encourage both growth and flavor.

Companion planting **draws a diverse insect population** to the garden by using plants of many types and colors that flower all-season long. Additionally, a place for insects to drink water and to be protected at night can be helpful. These actions will support a balance of beneficial insects that prey on insect pests and pollinate the crops. Lastly, choosing strong-scented plants, like marigolds, will help repel unwanted insects.

Crop rotation is another way to use companion planting. Crop rotation means that crops of the same family are not planted in the same place within three years, creating diversity in the bed and over time AND minimizing disease pressure; therefore caring for the living soil and the whole garden.

Corn, squash and beans are traditional companion plants, known as "the three sisters"

❀ PRINCIPLE 5: CARBON FARMING ❀

Goal: Support closed-system sustainable soil fertility

"Carbon" refers to plant material, also called "biomass," that has a lot of complex cell structures and meets the criteria for mature material for compost building. Carbon farming promotes sustainable soil fertility by focusing on growing crops that produce a large amount of carbonaceous material (mature material) for composting. A farmer in tune with producing enough mature compost material will grow these crops in at least 60% of the cultivated area. By focusing on growing enough compost material through choosing carbon-producing crops, a farmer becomes more self-sufficient, relying on his/her own compost for soil fertility instead of buying resources from off of the farm.

Some crops of importance are: maize, sorghum, amaranth, quinoa, millet, rye, wheat, barley, rice, oats, and sunflowers. An important production goal for mature compost material is an average of 30 lb (13.5 kg) of air-dry material per 100 ft² (10 m²) bed. A sustainable farming system focuses on crops that have this potential.

In addition, carbon farming has a diet element. The important cereal crops mentioned above also produce an edible seed. Emphasizing crops that produce compost material AND a significant amount of calorie-rich food sustains the soil and the farmer!

HINT:
Mix legumes and grains for a diverse cover crop that fixes nitrogen and benefits the soil system with dense, soil-loosening roots.

Carbon farming can be enhanced by growing a small area of perennial crops like alfalfa that can produce large quantities of immature compost material. Growing cover crops in the off-season keeps the soil covered and supports sustainable soil fertility with more compost material. Keeping something growing in the soil at all times is an important farming practice for soil building and compost material, worth the extra planning it requires.

GB Farmer's Challenge:

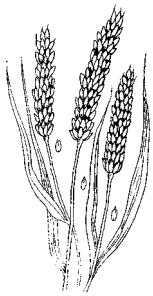
Learn which crops are the best producers of mature material and edible seeds in your area and focus on growing and eating these. Always plan to plant enough carbon crops for your compost needs.

Barley

Cereal Rye

Corn

Hull-less Oats



Wheat

PRINCIPLE 6: CALORIE FARMING

Goal: Grow a complete diet in the smallest area possible

"Calorie" refers to the energy that is found in food we eat. Calories are essential for human life and are in all food to some degree. Calorie farming produces a complete diet in the smallest space possible by focusing on special root crops that are calorie-dense and yield well in a small area. These specific crops are: potatoes, sweet potatoes, parsnips, leeks, garlic, Jerusalem artichoke, and salsify. A farm with 30% of its area in special root crops maximizes its area-efficient production of calories and can grow a complete diet in the smallest space possible.

After accounting for carbon crops and special root crops, the remaining 10% of area can grow vegetable crops for a nutritionally diverse diet and a modest income. Orange and dark green vegetables can help boost important vitamins and minerals in the diet, especially Vitamins A and C and iron.

With special root crops, nutritionally-rich vegetables, and the calorie-dense seeds from carbon crops, a complete diet can be sustainably grown in a small area.

HINT:
Everything sold from the farm contains organic matter and nutrients that are not returned to the soil. Consider choosing crops you will sell based on minimizing nutrient loss. Plan to reclaim those nutrients—maybe customers can bring kitchen scraps to contribute to your compost.

Remember that the purpose of the farm is to feed people! All farmers are calorie farmers, and smart farmers know which crops produce the most calories in the smallest area, which crops give valuable nutrients, and which carbon-crops produce calorie-dense seeds.

GB Farmer's Challenge:
Slowly work yourself toward growing your diet in the smallest area possible by adding more of these special root crops into both your diet and your garden.

Potatoes

Sweet Potatoes

Leeks

Garlic

❁ PRINCIPLE 7: OPEN-POLLINATED SEEDS ❁

Goal: Maximize seed production and quality and preserve genetic diversity

Using open-pollinated (OP) seeds allows the farmer to save seeds on the farm, providing for future crops through growing healthy, locally acclimatized, fresh seeds. This helps create a self-sufficient closed system by reducing dependence on large or small seed vendors, and by saving money. It is generally possible to grow all the seeds necessary for next year's garden in about 3% additional area.

Seed savers must start with OP seeds. This is because hybrid seeds have been crossed already, and do not have pure genes; seeds saved from hybrid plants will not produce offspring that are true to type (have appropriate characteristics for the variety). Only offspring from OP seeds will be true to type.

Saving seeds requires learning how specific crops reproduce. Some crops produce seed in one growing season (annuals), while others require two seasons for seed production (biennials). Some crops can self-pollinate while others require pollen from another plant to produce seed (cross-pollination). This information will help you learn how to grow the seed.

When growing seed in the garden, the farmer must pay attention to the purity of the seed. Pure seed will produce true to type offspring, keeping the variety strong and consistent. Seeds from some crops, like those that require cross-pollination, are naturally more likely to become impurely crossed (hybrids) with a different variety or crop. Some plants will even cross with wild relatives. To attend to seed purity it is wise to grow most crops for seed at a good distance from other varieties and other crops in the same family. For crops that cross readily, like corn, it may be advisable to grow only one variety each season—and that variety 2,000 ft (610 m) from other corn varieties. Another method of isolating seed from potential crossing is to grow varieties that mature at different times, so the pollen has no opportunity to cross.

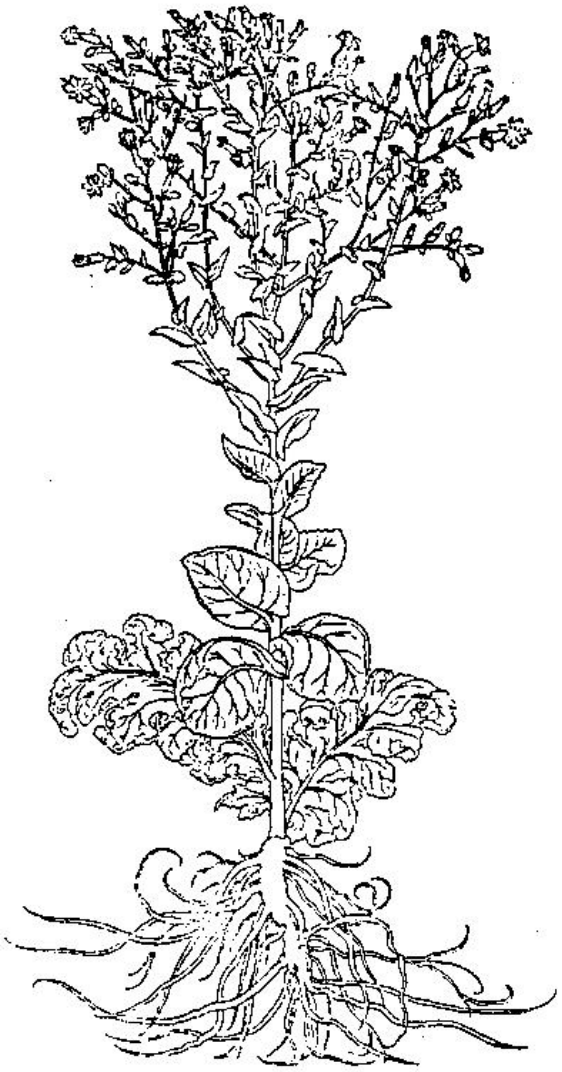
A pollinator at work

In addition to purity, genetic diversity is an important practice of good seed saving. Always save seed from a minimum of 5 plants, preferably more. (For corn at least 50 plants are needed.) You can never save seed from too many plants (of the same variety). In this way your seed harvest has a wider range of genes and traits. This will result in a healthy and diverse crop that will be better able to deal with various challenges of life, insects, climate, etc. Over time, seed saved consistently will be more acclimatized to local conditions and be more genetically adapted to the area, a benefit of careful seed saving.

Each type of seed generally has an average number of years it is able to germinate. A seed saver must attend to seed storage in such a way that the viability (ability to germinate) and vitality of the seed are supported. Conditions that are ideal for seed storage are the opposite of conditions that are good for germination. For example, seeds stored in airtight containers in cool and dark places are likely to remain viable longer than seeds stored in open containers in warm, sunny places.

GB Farmer's Challenge:
Start small and grow one crop out to seed the first season. Start with a simple crop like dry beans or lettuce. Add other crops over time to produce most of or all of your farm's seeds.

Using companion planting, farming for carbon and calories, and using open-pollinated seeds are like choosing the strongest material to make the three-legged stool, so it will truly last. They are actions of intention. They allow GB to produce enough compost and food to truly build and sustain the soil, to feed the farmer and help the farm approach sustainability.



Lactuca sativa (lettuce), in its seed-producing phase

❀ PRINCIPLE 8: WHOLE SYSTEM APPROACH ❀

Goal: Integrate all the principles into your garden to create balance

GB is a unified farming method, with *all eight principles* playing an important role in creating a thriving mini-ecosystem that sustains itself and its farmers. The closer you can come to a closed system, the more sustainable your farming methods will be.

If, instead of using all the principles on your farm, some principles are used and others are discarded, your soil may eventually be in worse condition than when you began. For example, deep soil cultivation partnered with intensive planting but *without* the benefits of compost may strip the soil of fertility and structure. Similarly, adding more than a sustainably produced amount of compost or extra biological fertilizer may improve crop yields for a few years, but lead to soil imbalances that could cause future insect and disease issues and a less-healthy soil. Not growing enough compost material on your own farm may be depleting your soil for lack of the compost needed to hold minerals in your soil. Buying materials to build compost may deplete someone else's land.

The benefits of patient and consistent work necessary to create the healthy soil and the crop diversity inherent in the GB method will be evident over time. Though crops may struggle during the first years in challenging soil, or insect pests may be an initial problem, careful attention to all eight principles will transform the farm into a vigorous ecosystem that grows healthy, high-yielding crops and can keep insect pests in balance.

GB requires farmers to act with thought and foresight, recognizing that the farm itself is part of a greater ecosystem that should be thriving. Keeping half of your land in the wild, if possible, nurtures the plant, insect, and animal diversity that surround the farm and provides a buffer that allows it to exist and thrive. In urban settings, perhaps an area for native flowers, shrubs, and trees can be a welcome space for visitors that also helps support a larger ecosystem.

This final principle is the essential top of the stool so that, when all other principles are considered, you can sit and rest with the satisfaction that the stool is well formed, strong and beautiful!

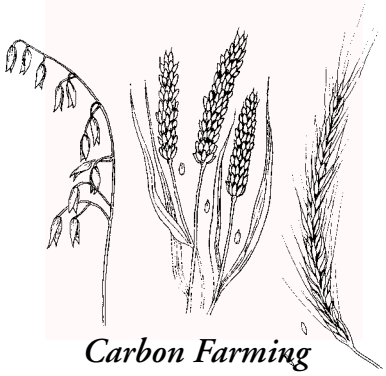
Ultimate GB Farmer's Challenge:

When considering any one aspect of the garden, always remember that all things are connected and that only a healthy soil will produce healthy crops. Only a healthy system can sustain a healthy soil. Challenge yourself and your neighbors to become aware of and to nurture the WHOLE ecosystem!

GROW BIOINTENSIVE Sustainable Mini-Farming is an exciting recognition that farmers are important people who care for other people and for the land. Be creative as you remember each of the goals and work toward creating a thriving mini-ecosystem on your farm. Ask yourself if your actions uphold the goal and move you toward sustainability. Be patient; knowledge and skill are things that are built by practice, dedication, and time—just like soil. Ultimately, start small, do the best with what you have, and learn from everything you do. As you master this, you hold a beautiful seed. As a farmer, this seed of knowledge will be in your hands to nurture and to share!

A Whole System Approach:

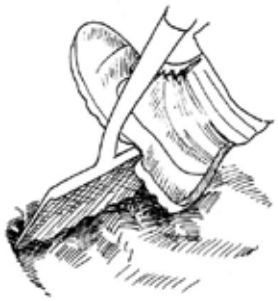
Calorie Farming



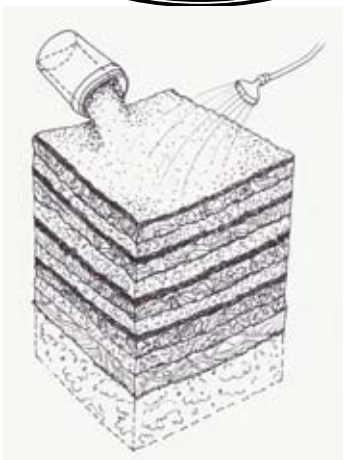
Carbon Farming

Open-Pollinated Seed

Companion Planting



Deep Soil Preparation



Composting

Intensive Planting

❁ NEXT STEPS ❁

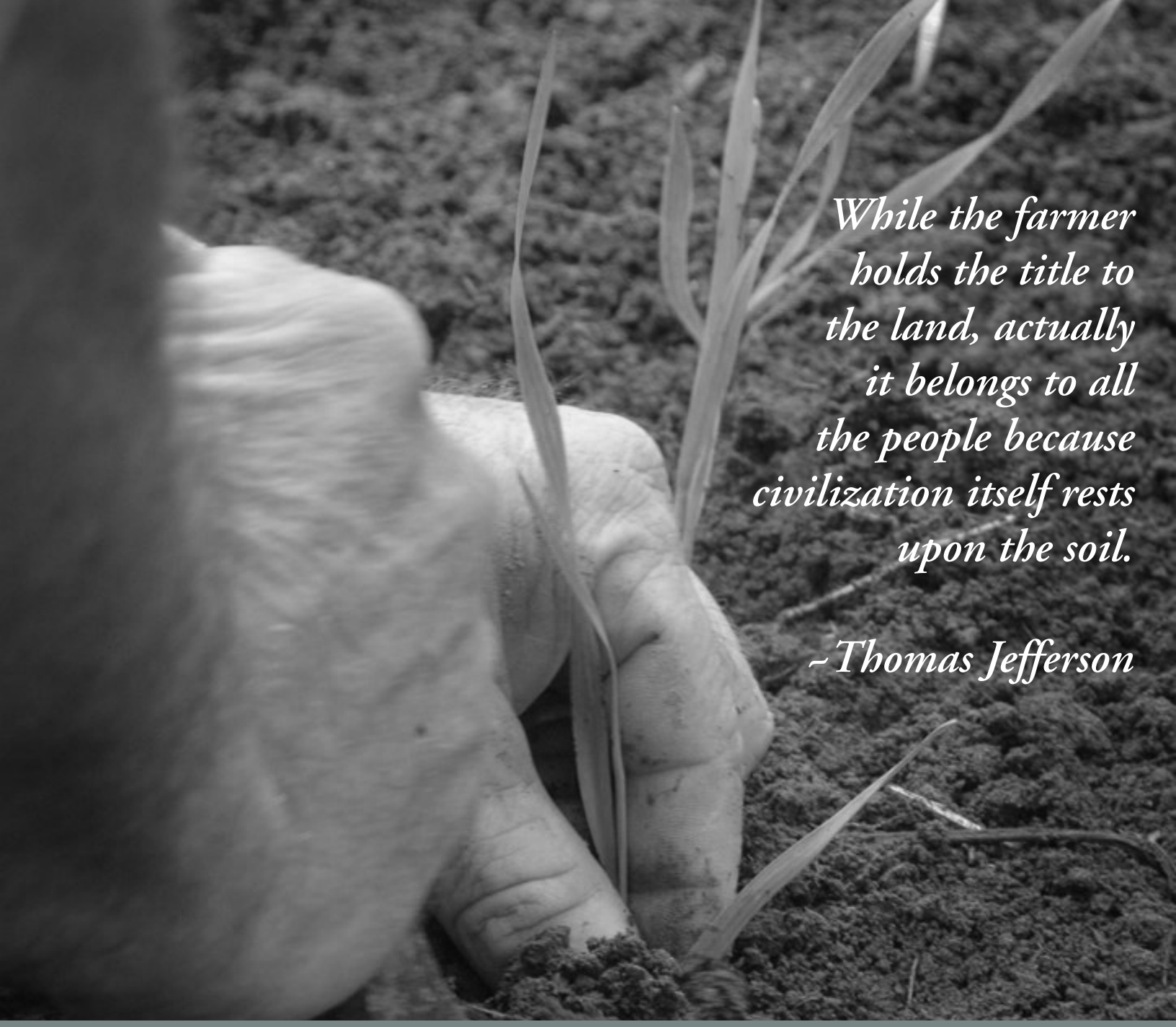
If you are ready to learn more, visit Bountiful Gardens (Ecology Action's International Mail Order Service) at www.bountifulgardens.org and consider getting ***How To Grow More Vegetables and Fruits, Nuts, Berries, Grains and Other Crops Than You Ever Thought Possible On Less Soil Than You Can Imagine,*** and/or ***The Sustainable Vegetable Garden.***

Also, for more information on events, tours,
workshops, tips, publications, videos and more, you may want to visit:
www.growbiointensive.org
www.commongroundinpaloalto.org
www.johnjeavons.info
www.renewallgardenproject.net

NOTES

ABOUT THE AUTHOR

Margo Royer-Miller was a Three-Year Ecology Action Apprentice, and afterwards acted as a GROW BIOINTENSIVE Field Coordinator at the Golden Rule Mini-Farm Garden. She now lives on her own mini-farm with her husband Dan and their son Alten Lee.



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