Soil is the connection to ourselves. From soil we come, and to soil we return. If we are disconnected from it, we area aliens adrift in a synthetic environment. It is soil that helps us to understand the self-limitation of life, its cycles of death and rebirth, and the interdependence of all species. To be at home with the soil is truly the only way to be at home with ourselves, and therefore the only way we can be at peace with the environment and all of the earth species that are part of it. It is, literally, the common ground on which we all stand.

-Fred Kirschenmann from "On Becoming Lover's of Soil"

Introduction

The use of composts and compost teas is a reliable method of applying organic matter to create and maintain fertility in cultivated soils. Sustainable, organic farms rely on this soil-enhancing technique to reduce dependence on off-farm inputs and ensure the growth of nutritious crops that are healthy and resistant to various pests and diseases. According to WSU soil scientist, John Reganold, "organic matter has a profound impact on the soil; it encourages mineral particles to clump together to form granules, improving the structure of the soil; it increases the amount of water the soil will hold and the supply of nutrients; and the organisms in the soil are more active. All in all, organic matter makes the soil more fertile and productive (1989, 51)". Therefore with ninety percent of US cropland being eroded each year due to conventional agricultural techniques (Jackson, 2002), it is important that conscientious farmers focus on growing soil, through the application of composts, before growing food.

S&S Homestead Farm operates as a small, integrated system, taking all members and components of the farm ecosystem into account when making management decisions. The ultimate goal for the farm is to achieve a closed symbiotic circle of the flora and fauna that make up the whole of the farm. To achieve this symbiosis various approaches are applied. From John Jeavon's technique of double digging to Elaine Ingham's biological approach to microbial soil health through the use of compost teas, S&S Homestead is always adapting new advancements in alternative soil procedures to place-specific needs on the farm. There is no attempt to subscribe to a single, specific methodology or qualify for organic or bio-dynamic certification. However, S&S Homestead Farm soil practices are consistently chemical-free and based on a holistic view of natural resource management.

A strategic use of compost and compost tea is needed to achieve the farm's goal of self-sufficiency. Previous interns have addressed this need through practical compost-related projects (Huntington 2000 and Hok 2002). Building on past intern reports and data, the present Soil Fertility and Fertilizer Management Plan is designed to consolidate existing information with present efforts into a cohesive outline of responsibilities for future interns to use during their stay at the farm. The hope is that this document will be a useful guide in maintaining productivity of farm soils and maximizing the use of on-farm inputs. As an educational enterprise, S&S Homestead Farm always welcomes new ideas and theories, and it is expected that the Soil Fertility and Fertilizer Management Plan will be continuously developed to keep pace with the farm's needs and individual intern goals.

Compost

Background

This is a general outline of the system we developed this year for making, curing and storing compost. It involves "active" or "hot" composting techniques, which will be described in one of the following sections. Bio-dynamic compost preparations are also being integrated into the farm's compost system and as the S&S Homestead develops it associative contract with the Josephine Porter Institute in Woolvine, VA, a systematic approach to Bio-dynamic inputs and applications will be established.

System Description

To begin, organic waste material is collected in the enclosed cement area bordering the north side of the Main Garden. Once enough material has been collected a pile can be made either in this locale or behind the pole barn. It is important to make sure there is enough material before beginning this process because *active* piles must be assembled at one time. In addition it is important to remember that fresh, green material can lose almost sixty percent of its nitrogen once it has been cut or mowed. Be sure to take this into account when planning to make a pile.

After construction, the temperature of the pile is monitored until it reaches the curing phase (see Summer 2003: Compost Report). Temperature is an indirect measurement of microbial activity since microorganisms radiate heat as they work (Hok, 2002). When temperature first falls below ninety degrees it is time to turn the pile in order to add oxygen and water which will re-stimulate microbial activity and further decomposition. After 2-3 weeks the pile should be ready for the "curing" area underneath the coniferous tree adjacent to the green house. After a good 3-4 weeks in this spot the compost should be done and is moved to the permanent storage area for the winter. The storage area (as recommended by Coleman in *The Four Season Harvest*) was constructed with hay bales as the perimeter and a heavy, rubber horse pad as a foundation. The compost is shredded finely and the pile is then covered with a tarp to prevent excess nutrient leaching throughout the winter.

How do I make a compost pile?

How to Grow More Vegetables by John Jeavons and *The New Organic Grower* by Eliot Coleman offer good instruction on how to make an *active* compost pile. Their methods are quite similar to each other and overall resemble Indore principles, as established by Sir Albert Howard, and general "hot composting" techniques. Although some *passive* compost piles exist on the farm (North Garden and Orchard) most compost piles are intensively managed in order to generate enough compost and to assure good, quality material.

When making compost we are basically trying to accomplish a 30:1 ratio of carbon to nitrogen and that can be done with a variety of material including, but not limited to, garden waste, kitchen scraps, manure, hay, and straw. With ample water and air the pile should immediately reach *thermophilic* temperatures (120-155 F) that will kill off harmful pathogens and weed seeds. Conditions hotter than this might facilitate excess nitrogen depletion and damage beneficial microbes at work decomposing the organic material. Chapter three of *The*

Humanure Handbook, entitled "Microhusbandry", offers an excellent description of the composting process.

How much is enough?

Between the Orchard, Main Garden, North Garden and Greenhouse there is approximately 15,000 square feet of bed space in use. Ideally, all of the Main Garden beds (2000 square feet) should receive an application of compost in early spring and fall and the orchard perennials (1000 square feet), such as the strawberries, need a similar amount sometime before and after fruiting. The North Garden (9,000 square feet) is being developed and the composting application needs in this area have not yet been determined. In addition, compost is used on the farm's flowerbeds, in potting soil mixtures, and in compost tea recipes which will be addressed in another section. In the future, it is also possible that compost will be used on the pasture and hay field as well.

Following are some calculations that helped me to assess compost needs:

Location	Bed Spare	C-Application	Depth	Sub-Total
Main Garden	2000 sq ft	2 times/year	½ inch	288,000 cubic inches
Orchard	1000 sq ft	2 times/year	½ inch	144,000 cubic inches
			TOTAL	432,000 cubic inches
			1 square foot=144 square inches	

Hok (2002) set up a good model for converting cubic inches to tons:

1 bucket of compost=35lbs
1bucket=5gallons=18.95liters
18.95 liters=18950 cubic centimeters=1155.95 cubic inches (cubic meters x .061=cubic inches)
→5 gallons=1155.95 cubic inches
Therefore the following calculations apply to our compost project:

432,000 cubic inches/1155.95=373.7 buckets of compost
373.7 buckets of compost x 35 lbs=13079.5lbs=**6.5 tons**

As you can see 10 tons is more than sufficient for garden and orchard bed needs, but this extra amount is needed for supplemental fertility needs mentioned above. Parnes (1989) explains that a typical, compost application rate is 5-10 tons per acre. Since the cultivated bed space on the farm is 1/3 acre (15,000 square feet) this figure also reveals that a goal of 10 tons will provide the farm with a secure source of fertility.

According to Johanna Hok's projections (2002), thirteen standard made last summer generated eighteen tons (17.88 exactly) of compost in one season. I have applied these calculations to the piles made this summer based on average initial size:

Piles 1-5
36"x48"x48"=82944x5=414720 cubic inches
Pile 6-11
48"x 48"x 60"=138,240x6=829440 cubic inches
Total =1,244,160 cubic inches /1,155.95 cubic inches=1,076.3 buckets of compost
1,076.3 buckets of compost x 35 lbs=37,670.8 lbs = **18 tons**

This may have been an overly generous calculation since most of the piles substantially shrunk from their original size. Also this year's compost supply (made in 2002) was exhausted by mid-season which is another sign of variation from this model. However we are keeping track of wheelbarrow loads of finished material (1 wheelbarrow=7 buckets=245lbs) and this is another way of keeping track of compost in storage. Currently there are 26 wheelbarrows x 245lbs/2000=**3 tons** of finished material.

Bio-Dynamic Inputs

In July we received the Pfeiffer BD Compost Starter and applied it to four of our ten compost piles. The Starter material was allowed to soak overnight in order to allow the bacteria and fungi to re-activate. After 12- 24 hours the Starter should be diluted with water in a 5-gallon bucket and applied with a whiskbroom to each layer of the pile. In the future the actual preparations (which are a component of the Pfeiffer mixture) will be added to the compost in the winter storage area and left to cure over the winter.

Compost Monitoring Report

To provide the farm with good, pathogen free compost and to maintain a record of compost production it is necessary for each intern to record compost temperature data. This is a useful way to learn about compost and it can be incorporated into a larger research project involving nutrient cycling. Compost monitoring information should be updated in each journal entry and this information can be compiled into a final report at the end of the summer for the farm's records. (See Compost and Compost Tea Report section)

Future Strategies

An idea I had was that this farm might want to start "growing" its own compost. Below I have provided a rough sketch of my idea that I may develop, if time permits, throughout the summer. This may end up being more compost than a farm this size might need, but it is a good exercise that allows me to apply my understanding of crop rotation and compost making:

- Stage One (Fall 2003)- Barley/Straw harvested from front field.
- Stage Two (Fall 2003)-Alfalfa (or some leguminous cover-crop more suitable to this area) is planted and allowed to over-winter. It may also be useful to look at a companion grass as well.
- Stage Three (Spring 2004)-Crop is cut (or possibly lacerated) and raked. Half goes to Hay, the other half is built into a large pile on the corner of the field. This pile can be turned once during the summer and will be ready as compost for the following spring.
- Stage Four (Spring 2004)-Barley replanted and harvested
- Stage Five (Fall 2004)-Field left fallow for a season (or possibly cover-cropped) and the rotation is continued on another field.

Eventually it will be important to think about the barley field after harvest and a cover crop might be a good alternative for the winter, even if it is not used in the manner described above.

Worm Composting

Background

Worms are great composters! Their castings are five times richer in nitrogen, two times richer in exchangeable calcium, seven times richer in available phosphorous, and eleven times richer in available potassium than the soil they inhabit (Jeavons, 1995). In addition to the compost system mentioned above, worm castings are a reliable source of fertility for the farm. The castings can be applied directly to the garden or they can be used as a tea. According to research, vermicomposts have significantly higher microbial activity than regular composts (Edwards, 1998). This makes sense since most compost is heated and thus favors only thermophilic bacteria. Vermicompost supports a wider range of bacteria and fungi since its temperature remains relatively low. However, the nutrient richness of vermicompost is always dependent on what goes into the worm bin and since thermophilic temperatures are not reached it is important to be careful not to import pathogen containing elements.

System Description

This year we constructed a worm bin (5'x10') using straw bales as a perimeter. The elevated temperature of typical compost piles is too hot for most types of worms, so they need special conditions in order to work efficiently and break down material. According to the ATTRA (Available Technology Transfers to Rural Areas) web page, optimal conditions for worm composting include temperatures of 60-70 degrees F, a pH level of 5-9, and moisture level of 80-90% (www.attra.org). There are many types of bins, ranging from small- to mid- to large-scale to accommodate the worms' needs.

The structures used to house worm populations can be separated into four major types: stacked bins, windrows, continuous flow reactors, and lateral movement bins. Stacked bins are generally small and used within the home. Windrows have become popular on dairy farms where there is a lot of raw material to process on a regular basis. Continuous flow reactor bins are permanent boxes that have a mesh or grated opening at the bottom to release fresh castings. This allows for the continuous addition of material without having to clean out old material. The lateral movement bins have a variety of forms and often mimic windrows in that they allow worms to migrate to fresh material, thus leaving the castings available for harvest.

The area we created is basically an "outlined windrow" that utilizes lateral flow as a management technique. The bin is located behind the barn in the shade of a coniferous tree. A two-inch layer of greenhouse soil was spread along the base and one bale of straw was added to the top as bedding. Three piles of rotted manure, located in the field behind the pole barn, had attracted copious amounts of red wigglers (*Eisenia foetida*). Four wheelbarrow loads of this material (worms included) were added to the bed along with various vegetable scraps. A thin layer of straw was then placed over the whole area to deter pests and odor. In addition, a framed wire door and tarp covered the facility to prevent bird (mostly chicken) predation and maintain a cool, moist microclimate.

After a month the amount of food in the box has declined substantially. In addition, it seems that there are more worms per square inch than before. Ideally, you want to start with 1 lb of worms to 1 lb of food and gauge the addition of food scraps by population growth and productivity. Since the worms were integrated in the rotted manure we did not weigh them beforehand. This would have been a long and time-consuming process. Instead we have monitored food decreases and will eventually encourage migration and allow space for casting harvest.

Compost Tea

Background

S&S Homestead is interested in a bio-spray regime that will replenish essential nutrients to plants throughout the growing season on a weekly basis. Although compost that is created on the farm offers a wealth of fertility, it is often necessary to supplement crops with another source of nutrition. In previous years fish emulsion, with an N-P-K ratio of 5-1-1, has been the main nutrient supplement for vegetable production throughout the summer and it is applied to each bed on a two-week rotation. In order to avoid this purchased input I have spent this season trying to figure out how to make compost teas, why they work, and if they can provide adequate nutrients to the plant in order to replace the fish emulsion. The fish emulsion is an organic alternative and it is a relatively local product, however compost tea could possibly be a more productive, sustainable and economical way of maintaining plant health in the garden.

The outcome of this research is a basic strategy for making and applying teas in the farm's Main Garden and Orchard during the growing season. The North Garden can easily be incorporated into this rotation once fertilization is required. The specified tea recipes can be used and application information can be recorded on the Compost Tea Application Chart (See Appendix D) which was developed this summer. I have also included a report on the observational data I collected while testing new tea recipes (See Compost and Compost Tea Reports) which might be interesting to future interns that would like to experiment with recipe ingredients.

What is compost tea?

For clarification, the process of creating an *active* compost tea versus one that is *passive* (example: extract, leachate) involves soaking compost in an aerated container of water. The input of oxygen prevents the teas from becoming anaerobic in the first 24-48 hours, which is the case in most *passive* methods. Anaerobic conditions can reduce the nutrient level and generate acids, such as butyric, proprionic and acetic, which are harmful to plant growth. In contrast, the *active* or aerated process can extract macro- and micro-nutrients and beneficial microbes, which are encouraged to grow and reproduce in this oxygen-rich environment.

Research on *active* teas has shown that they have the potential to improve soil and plant health (through enhanced microbial populations and nutrients), suppress disease, and improve nutrient cycling and retention (Ingham, 2001). However, according to Merrill and McKeon there can be three major sources for variation among compost teas: original feedstock, method of extraction, and time interval of extraction (2001, 9) and these discrepancies have been at the root of much debate and confusion over the benefit and effectiveness of compost teas.

For this farm I have been using the Soil Soup Blender™ and either a 5-gallon or 20-gallon container. Four pounds of compost are suspended in a mesh stocking for varying amounts of time. Using this method we are essentially creating an aerated tea that potentially could have both microbial life and nutrients, but without a lab analysis of the compost source and tea we are unable to describe our product definitively.

Some compost tea brewer manufacturers sell nutrient supplements. According to Vicki Bess, director of BCC laboratories, "When making a tea to supplement plant nutrients, many producers are fortifying the tea with supplements either during production or as a post-production addition" (Bess, 2000). This may be an option, however we should first work with what is produced on-farm.

In a review of current literature, Merrill and McKeon (2001) give a good general description of what may be possible to produce using varying compost sources:

> **Fresh Manure:** Macro: N, P, K, Ca, Mg, S and Micro: Fe, Zn, Mn, and Cu
>
> **Young or unstable compost:** available nutrients not yet fixed in microbial biomass, sugars, amino acids, micro-nutrients (same as above), and the organic chelating agents (humic and fulvic acid) that make them available to plants. Also produced are long chain carbon molecules that provide carbon and oxygen for soil microbes, including micorrhiza. The micorrhizal hyphae, in turn, greatly expand the root systems of plants, increasing their nutrient uptake, respiration, and weather tolerance.
>
> **Well-aged and suppressive composts:** organic chelators, populations of bio-fungicidal microbes that act as a natural fungicide by competing with and suppressing some plant pathogens.

In addition, the populations of microbes, such as mycoparasites, rhizosphere colonies, hyperparasitic fungi, epiphytic microbes, *Psuedomonas*, *Azotobacter*, *Trichoderma*, and *Gliocladium*, that can be extracted and maintained in an active tea, will improve soil structure by excreting organic gums and resins that together with fungal hyphae, bind soil particles into structural aggregates.

Therefore it seems that a tea is only as good as the compost used. A promising option for tea-making on this farm has involved the use of worm castings. Ann Lovejoy, a well-published garden expert living on Bainbridge Island, states that "worm compost differs from regular compost in being finer in texture, with a more complex nutrient base (2001, 1)." I have been using worm castings in compost tea and have found that the vermicompost is a reliable and convenient ingredient for the teas and I suggest that it be used as a staple source in compost tea production.

According to Elaine Ingham, compost teas can be applied as either a foliar spray or a soil drench depending on plant needs and environmental conditions (2001, 4). In general, foliar sprays have gained recognition for their ability to help plants fend off insect damage. However, "foliar feeding" is also an effective way of transporting nutrients directly to plants. Foliar feeding, according to the ATTRA web page, can be substantially more successful at transporting nutrients to a plant than soil applications where the plant absorbs nutrients through the rhizosphere and also shares the nutrients with microorganisms in the soil. In future seasons it would be interesting to see what effect foliar feeding versus soil drenches had a on plant nutrient response using teas made from on-farm inputs. Foliar feeding might be a more immediate way of treating the plant, whereas soil drenches help overall soil structure and nutrient cycling.

Compost Tea Recipes

Throughout the summer I have worked with three main tea recipes; casting tea, high bacteria compost tea, and nettle tea. These recipes have been derived from various sources and personal concoctions and they can serve as a basic outline for the tea-making procedure. The compost-based teas are all made in a similar fashion using the Soil Soup Blender™. The compost source is added to a mesh stocking and suspended in the 20-gallon container with the aerating machine. This equipment is kept behind the barn and the tea should run for only 2-3 days. Supplemental ingredients can be added during the first 24 hours.

High Bacteria Tea

4 lbs of compost
1oz of molasses
20 gallons water
½ gallon nettle soup

Sources: Elaine Ingham, Compost Tea Manual, Second Edition (2001).

Castings Tea

2-4 lbs of castings (remove worms while harvesting)
1 oz. of molasses
20 gallons of water

I recommend that worm casting be the staple in the farm's tea making operation. They are easily available and a more reliable source for nutrients than the general compost sources. It would be interesting to try cow manure as well, although this type of high-nutrient tea might burn the plant.

Nettle Tea

I have also been researching plant-based nutrient teas. I have found that a tea of nettle (*Urtica dioica*) can be an effective nutrient supplement and a deterrent of pests, especially on roses, currant bushes, and fruit trees (Thun, 1999). This tea is made by soaking 2 lbs of nettles (found all over the farm) in 5 gallons of water. After about a week this mixture can be strained and diluted with water (1:5 ratio) and either applied directly to the plants using the watering can or mixed in a compost-based tea. It will smell horrible, but it is effective as a mid-season nutrient supplement and a prophylactic spray against most fungal attacks. According to the journal, *Biodynamics*, it is especially useful on cucumbers in order to help them maintain their deep green foliage (March/April 1999).

Application Procedure

Once the tea is ready it can be transported in buckets and applied using a water can. Application is a judgement call, but Elaine Ingham recommends 0.25 gallons/ 3" of plant for foliar sprays and 5 gallon / acre for soil drenches (2001). The watering can is actually more effective and efficient at applying the tea than the sprayer, although the sprayer has a finer spray nozzle which might be more appropriate in some foliar applications. It is important to look at the size of the crop, the overall moisture level of the soil, and the damage done (if this is a pest issue) when deciding how much to apply.

When working with teas always be aware of what is planted and growing in the garden in order to maximize nutrient inputs. Vegetable crops should get a dousing of tea at least every two weeks and it is especially important to supplement plants during their development stages. In some cases, mature plants near harvest should be fertilized as well. The Compost Tea Application Map and Chart (Appendix D&E) offer a general framework for the compost tea system. On a week by week basis record where a tea was used on the chart, using the map as a guide, and keep a record of batch ingredients in a journal or notebook. On the chart specify which batch was used in the weekly slots (see example in Appendix D). This system will be helpful in maintaining the fertilization sequence throughout the summer. Also a good record of plant responses to certain tea types can be incorporated into journal entries and will serve to develop and refine this process.

Compost and Compost Tea Reports

Compost Monitoring Report

Our goal for the summer was to generate 10-15 tons of compost for the following season. This report will describe the activity of the first nine piles assembled over the summer. Six of these piles were made normally (Pile 1-6) while three were inoculated with Pfeiffier Biodynamic Compost Starter (Pile 7-9). Average temperature data was collected for Pile 1-3 (Appendix A) while data for Piles 4-9 shows the high/low temperature range (Appendix B).

At the beginning of the summer I tried to record and measure the amount of ingredients going into the piles. While it is important to maintain the carbon:nitrogen ratio of 30:1 , I think that a reasonable combination of green and brown materials in layers, and occasionally some blood meal and manure, will insure a well digested pile. Therefor I have not included the ingredient data in this report. Future interns may choose to do this and seek outside sources of carbon and nitrogen content information for organic waste material.

Pile 1 heated up very quickly and was therefore turned within a 24-hour period. I actually added soil at this point to cool the pile down and it stayed at a good thermophilic temperature (See Graph 1). At the second turning of this pile a bucket of grass clippings was added. Pile 2 turned out to be relatively small (3'x4'x3') so I turned it into the first after the temperature dropped to 90 F on Day 9 (See Graph 1). At this point the combined pile rose to 130 F in a 48-hour period. This data is not represented on the graph and the pile is currently in its "curing" phase by greenhouse.

Pile 3 was constructed on 5/20 with both grass clippings and sawdust and the pile heated up quickly, but dropped in temperature rather rapidly after this point (See Graph 2). Following this decline I added even more green material because there was still a lot of un-decomposed sawdust in the pile. The pile did not seem to respond to this addition so I rebuilt it and added a blend of bloodmeal, bonemeal, and greensand (N-P-K amendments, respectively) to help heat that pile. This change is indicated by 3-II on Graph 2. Pile 3 has now been moved the "curing" area.

Both piles (1&2combined and 3) were left in the cement enclosure to cure during the first two weeks in June while we scrambled to finish planting in the North Garden. After this period it became clear to me that the piles needed some attention and neither were at the curing stage quite yet. What I learned from this was that when constructing a hot pile a good balance of carbonaceous and nitrogenous materials needs to be present. Since I had been continuously adding material to both piles as I turned and monitored them, they were unfortunately still unfinished after a month's time. In addition, I had just been recording the average temperature for these piles.

For Piles 4-9, I began recording temperature ranges which gives a better picture of microbial activity throughout the whole pile. In many instances I noticed that some of the piles in the cement enclosure were only partially active. Good turning and watering practices can resolve this issue, but it also indicates that the layers were not evenly distributed. When pile 1, 2 and 3 were moved to the curing area I added a dusting of bloodmeal (15% Nitrogen) to each pile. This supplemental nitrogen helps to breakdown the semi-decomposed pieces of material that still exist.

Piles 4 and 5 were made in the beginning of July from a large amount of chicken bedding, kitchen scraps, and grass clippings that had accumulated in the corner of the compost area. Both piles shrunk substantially after they were built so I combined them into one pile. Pile 4/5 heated up immediately, but then proceeded to drop substantially in the first week (See Graph 3). Being late into the summer, the pastures are drying up and losing their nutritional content. Therefor the "green" material is actually quite low in nitrogen. I sprinkled multiple handfuls of blood meal onto the piles in order to balance the carbon:nitrogen ratios, and further the decomposition process. This pile is still curing in the cement-enclosed area.

Pile 6 consisted of straw and grass clippings from around the fences on the farm. It initially heated up to the thermophilic stage and then dropped slightly. At this point it was turned (Day 9) and heated up very well. It has been steadily declining in temperature, which is to be expected.

I built all three Biodynamic piles (7-9) in a similar fashion, using straw, garden waste, kitchen waste, cow manure, bloodmeal, and some grass clippings. For these piles I broke the sod underneath them in order to encourage interactions with the soil environment. All three piles rose in temperature slowly (See Graph 5-7), and never really heated beyond 130 F. This gradual temperature rise is apparent in all of the Biodynamic piles and it does not seem to be a problem in terms of pile activity. In fact it may be an indicator of a microbial population different than in the regular piles. In general I have found that the BD piles are more uniform in temperature than the two current piles in the cement compost area and they do not heat up as fast.

I am not sure whether the Pfeiffer Compost starter is causing this difference among the piles, or whether location offers more of an explanation. Being on a cement slab prevents aeration and contact with soil microbial life although it does prevent nutrients from leaching into the ground (Campbell, 93). It is interesting that both the BD piles have such consistent temperature from top to bottom, however they have not heated up as fast as the piles in the compost area. At this point I am not sure what these discrepancies will mean in relation to compost quality. I am assuming that there is different microbial life acting on the BD piles and that will make a major difference. However, it would be interesting to build a non-BD pile behind the pole barn in order to see if it maintained a more uniform temperature on bare soil.

Currently Piles 7-9 have been turned and combined and two more Biodynamic piles have been created as well as a compost pile of discarded cow innards. The location behind the pole barn has not offered these pile a lot of shade and they are presently quite dry and un-decomposed. A good turning with water and bloodmeal should do the trick, but in the future piles in this area might need a tarp covering and more frequent watering,

Compost Tea Monitoring Report

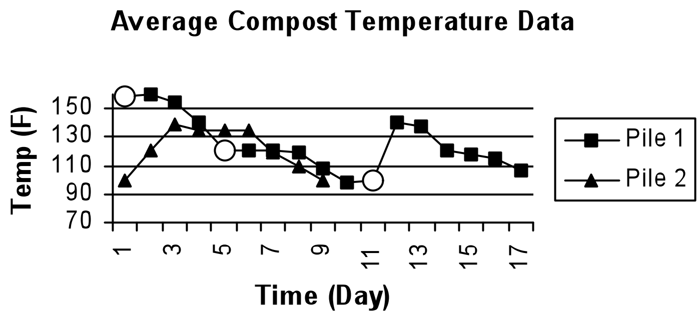
My initial project goal was to assess and compare the effect of compost tea applications on various organically grown crops in the Main Garden area. However, this was problematic since I did not have access to technical equipment in order to determine the content of the teas and it was difficult to find adequate room in the garden for control plots. Therefore the bulk of my methodology was qualitative, observational, and practical (See Compost Tea Trial Chart-Appendix C). I applied various recipes of compost tea to garden and orchard crops and monitored any physical or productivity changes that arose after the tea was employed. This information was then incorporated into the development of a specific system for supplying nutrients to garden and orchard crops throughout the season. The following report is a revue of the compost tea trail results I completed this summer.

Overall I did not see any dramatic changes in plant growth due to tea application. However, all of the plants that were given tea have grown deep, green foliage and produced a good harvest. The garden looked green. In two instances, smut on the onions and flea beetles on the kale, I applied tea to deter pathogens and pests, respectively. In both cases the tea did not seem to have a major effect and cultural practiced proved more effective.

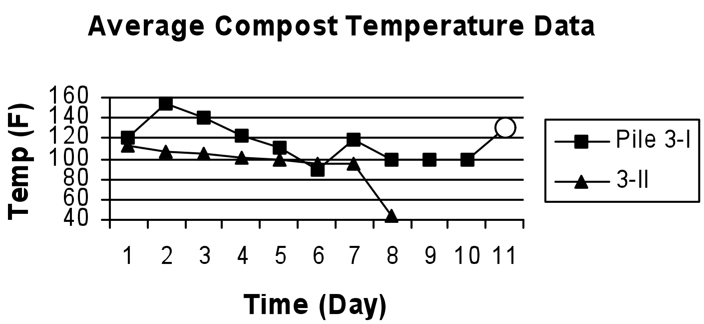
In general I found the worm castings tea, with a little molasses added, to be a reliable nutrient supplement. I usually brewed this batch for 2 days and applied it immediately. The cucumbers and beans have responded well to this type of tea, as well as the tomatoes in the orchard. I used the worm tea on the multiple rows of peas in the garden, but it was hard to tell if it affected them since they were near the end of their growing period.

The nettle tea seems to also be an effective alternative and I did not have any negative reactions to this type of tea. The melons died soon after I applied this tea, but I am pretty sure that was a result of poor seed stock and nursery maintenance. Nettles can be harvested from June to mid and late July.

Appendix A: Compost Data Graphs I



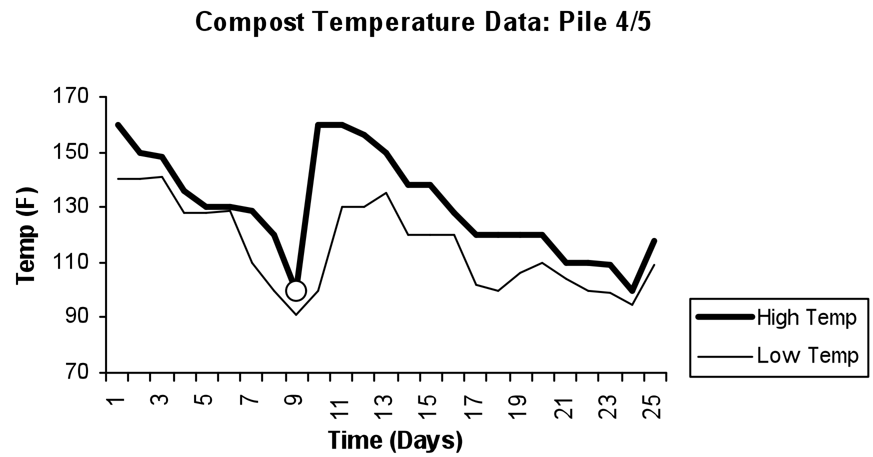
Graph 1. Average compost temperature of Pile 1 and 2 from S&S Homestead-Summer 2003.



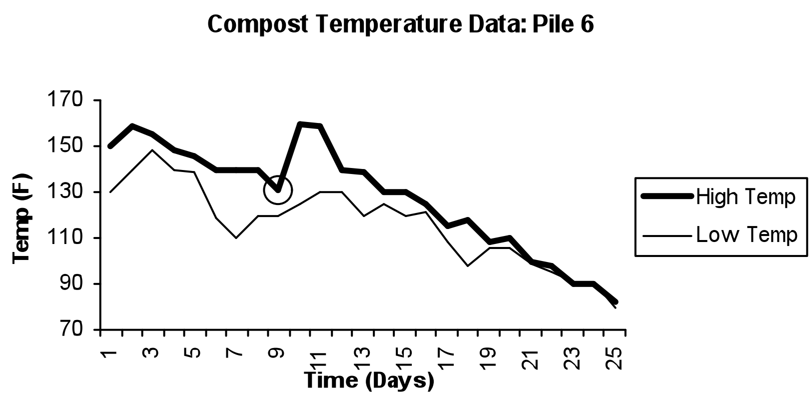
Graph 2. Average compost temperature of Pile 3-I and 3-II from S&S Homestead-Summer 2003

Note: Circle indicates when piles were turned

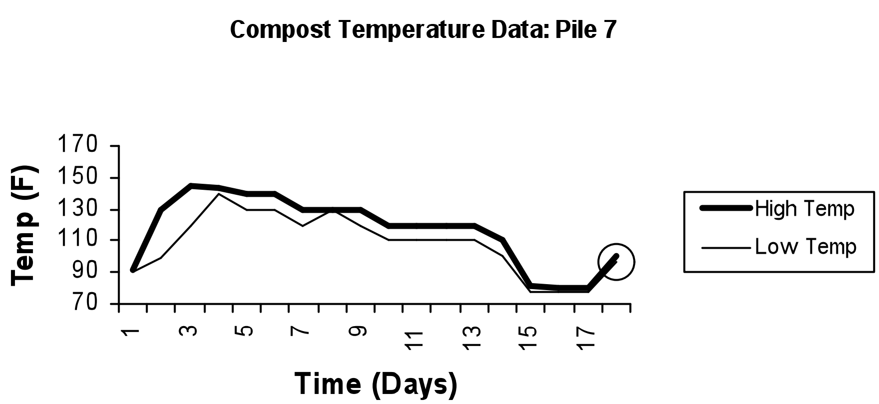
Appendix B: Compost Data Graphs II



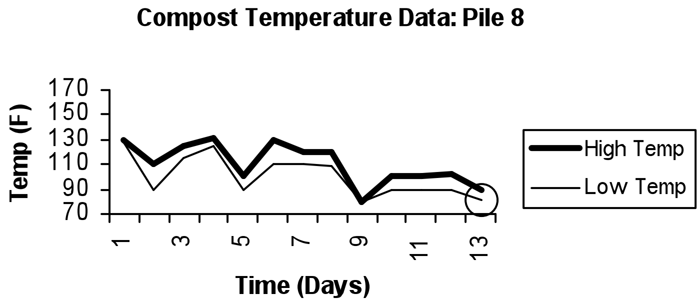
Graph 3. Compost temperature range for combined Pile 4/5 at S&S Homestead Farm-Summer 2003.



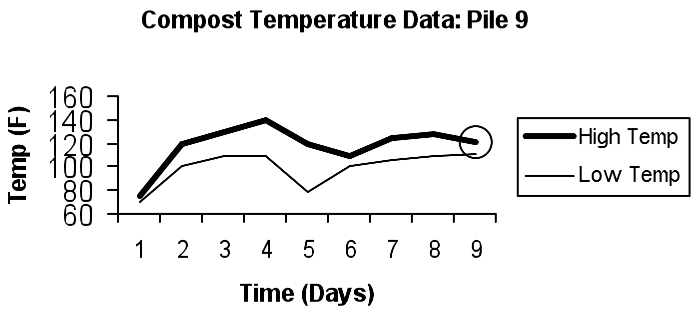
Graph 4. Compost temperature range for Pile 6 at S&S Homestead Farm-Summer 2003.



Graph 5. Compost temperature range for Pile 7 (Bio-dynamic) at S&S Homestead Farm-Summer 2003.



Graph 6. Compost temperature range for Pile 8 (Bio-dynamic) at S&S Homestead Farm-Summer 2003.



Graph 7. Compost temperature range for Pile 9 (Bio-dynamic) at S&S Homestead Farm-Summer 2003.

Note: Circle indicates when a piles were turned. Piles 7-9 combined into one pile after turning.

Appendix C: Compost Tea Trial Chart

Compost Tea Chart

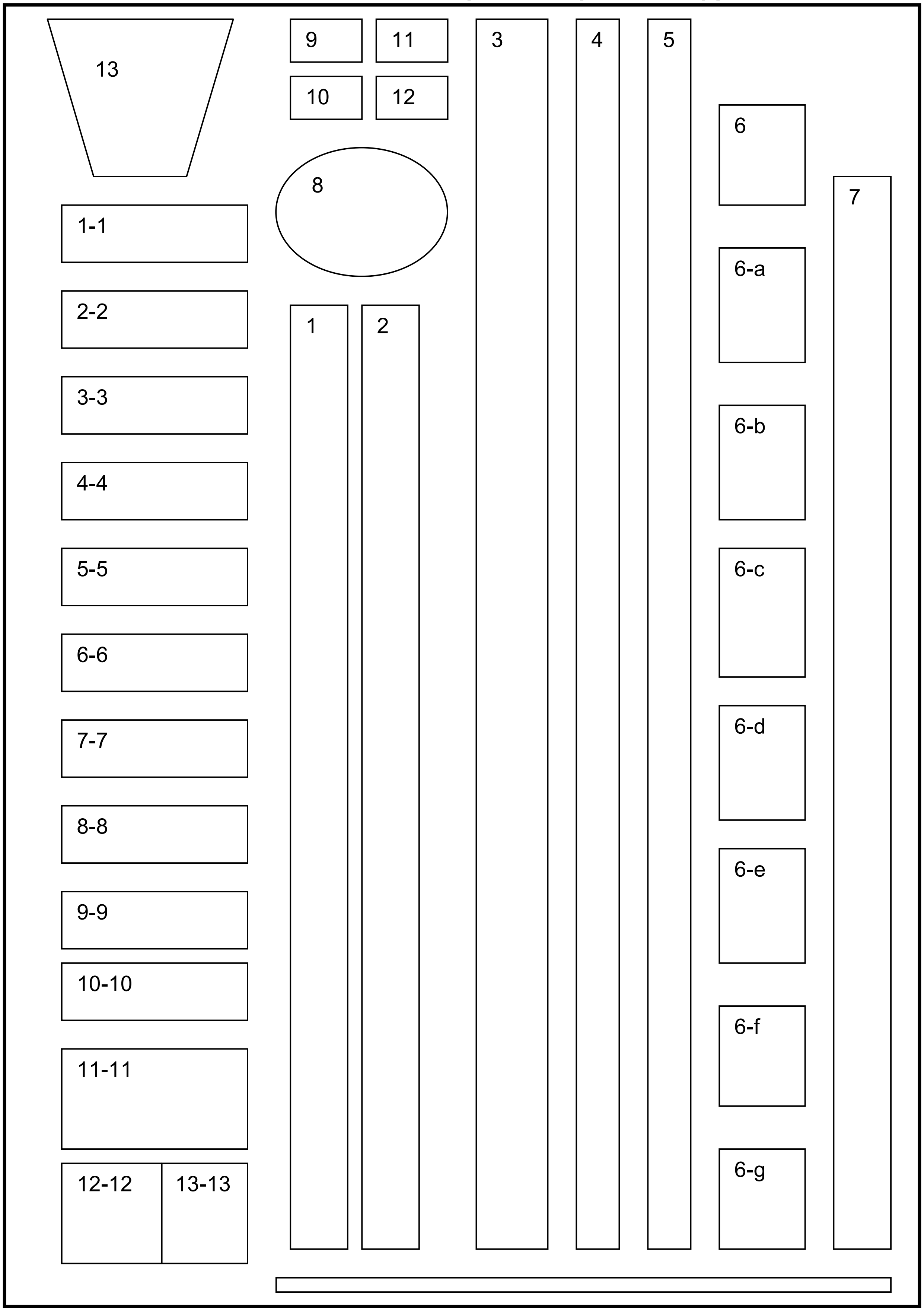
Tea #	**Date Made**	**Date Applied**	**Ingredients**				**Crops**	**Conclusions**
			Cpt	**H20**	**Ml**	**Nt**		
1	5-18	5-16	4lbs	20g	n	n	Cabbage/Broccoli	No significant change
2	6-1	6-16	4lbs	5g	1oz	1qt	Carrots	10% germination
3	6-16	6-18	4lbs	5g	n	n	Lovage, kohlrabi, peas	Peas grew substantially
4	6-22	6-24	4lbs	5g	n	n	Sweet peas, artichokes	No significant change
5	6-26	6-28	n	5g	n	2lbs	melons	Dead
6 worm	7-12	7-10	4c	20g	n	n	cucumbers, kale, onion, basil, pea row, pole beans	good, green growth pole beans and cucumbers are thriving, basil slow growth
7	7-14	7-24	n	5g	n	2lbs	cucumber (1/3)	No difference. All look healthy
8 worm	7-24	7-26	8c (3 lbs)	20g	1oz	n	beans, beets, cucumbers, peas	beans/cucumbers-rapid, green foliage
9 worm	7-28	7-30	8c	20g	1oz	n	tomatoes (orch), kale, kohlrabi, basil	Slow growth basil, tomatoes fruiting, kale-flea beetle
10 worm	8/5	8/7	8c	20g	1oz	n	kale, artichokes	Flea beetle still persisting
11 worm	8/7	8/9	8c	20g	1oz	n	Herb garden	good re-growth on rosemary, lovage

Cpt-Compost Ml: Molasses Nt: Nettle

Appendix D: Compost Application Chart

Bed Number	Week 1 Date:5/18	Week 2 Date:6/1	Week 3 Date:6/16-6/22	Week 4 Date:7/12-7/14	Week 5 Date: 7/24	Week 6 Date: 7/28	Week7 Date: 8/7	Week 8 Date: 8/10	Week 9 Date:8/16
1				Batch 6/7	Batch 8				Batch 13
2								Batch 12	
3		Batch 2							Batch 13
4			Batch 4						
5	Batch 1					Batch 9			
6	Batch 1								
6a			Batch 3	Batch 6		Batch 9			
6b			Batch 3	Batch 6		Batch 9			
6c									
6d									
6e					Batch 8				
6f					Batch 8				
6g									
7			Fish Em,		Fish Em.				
8			Batch 3				Batch 11		Batch 13
9									
10									
11									
12									
13									
1-1			Batch 3		Batch 8	Batch 9			
2-2			Batch 3		Batch 8	Batch 9			Batch 13
3-3			Batch 3		Batch 8				
4-4			Batch 3		Batch 8				
5-5									
6-6	Batch 1								
7-7					Batch 8				
8-8					Batch 8				
9-9	Batch 1								
10-10	Batch 1								
11-11									
12-12									
13-13				Batch 6					

Appendix E: S&S Homestead Garden Map for Compost Tea Application



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