1. FNE04-533
"Study of the Effects of Cover Crop and Composting Schedules",
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2. Goals
Our key question is: ***How much can we increase our production by spreading our autumn compost onto a cover crop vs open ground?***

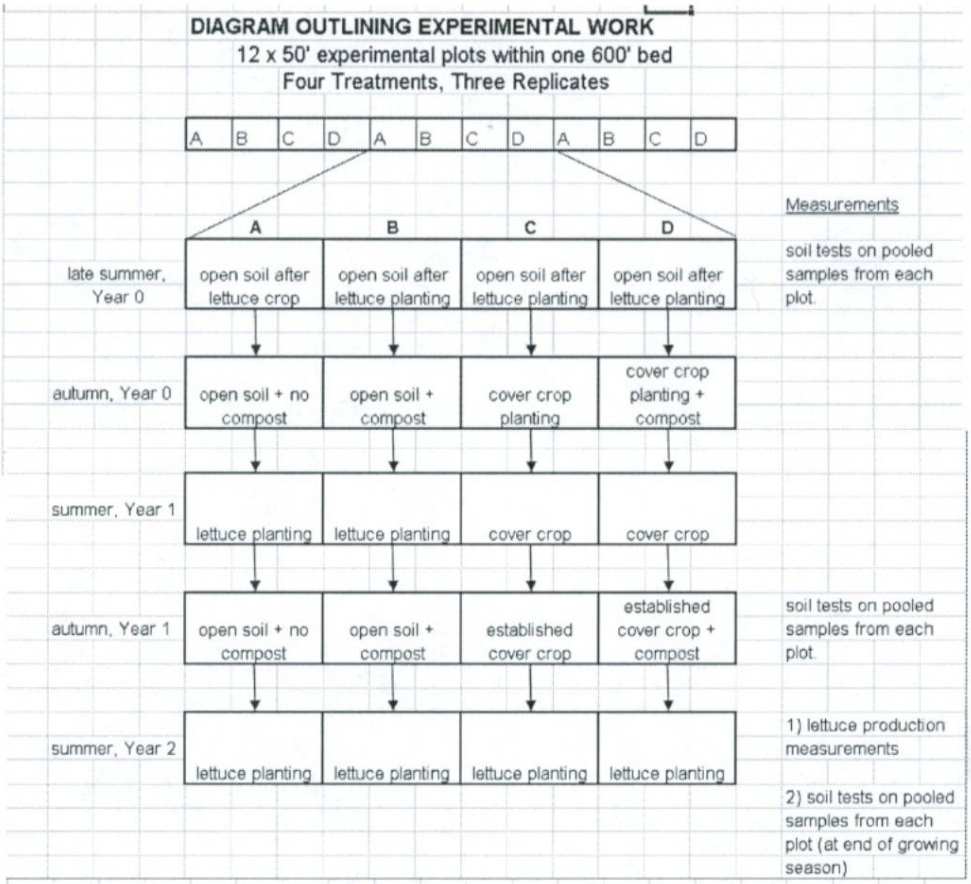
We are exploring this question by testing the effects of autumn composting on bare and cover-cropped soil. The New Organic Standards mean that we must apply our manure/compost in the autumn, accomplishing cover-cropping at the same time can sometimes be a stretch and so we are trying to evaluate the relative importance of making sure the manure goes onto a cover-cropped area.

We raise mixed vegetables, and will use lettuce growth in our different experimental plots as our primary measure of effect; we will supplement this with soil chemistry measurements.

3. Farm Profile
[repeated from application, there hasn't been appreciable change]
Hawthorne Valley Farm is a diversified, 400 acre farm that has been in operation since 1976. We are located in Columbia County in eastern NY. We produce garden vegetables for a 250 member CSA and for sale in our store and at the New York City Green Market. We have a dairy herd of about 60 head which are milked twice daily. We sell whole milk and produce yogurt, quark and a variety of cheeses. The yogurt and quark are sold both regionally and nationally. Our cheeses are sold locally and through the Green Market. We also maintain 5-15 pigs for pork and are beginning to build a beef cattle herd. In addition to the 400 acres of the farm-owned land, we lease an additional 300 or so acres for haying and pasture. The farm has four full time farmers, 2-6 farm apprentices and several part-time helpers. The Farm is part of the Hawthorne Valley Association, an educational non-profit; the farm's commercial viability is important to the overall success of the Association. The Association also includes a School and Visiting Students Program, and up to 500 kids/year get the chance to see how a true working farm operates.

4. Participants
Primarily, this is an on-farm project and collaborators include myself (as a researcher), the head farmer (Steffen Schneider) and the vegetable farmer (Katy Lince). Steffen, Katy and I share duties of planting and measuring. I also serve as coordinator. In addition, we have consulted on soils with Quirine Ketterings of Cornell.

5. Project Activities
[the below diagram comes from the original application]



"Soil Tests" - We will create a pooled soil sample for each of the 12 study plots. Soil will be collected from six samples taken the top 5 inches of soil in each plot. These will be sent to Cornell Plant and Soils Lab for analyses. Solvita soil resperation tests, earthworm counts, and soil stability tests (as described in USDA's Soil Quality Test Kit Guide) will be conducted in each plot along with an examination of soil physical structure.

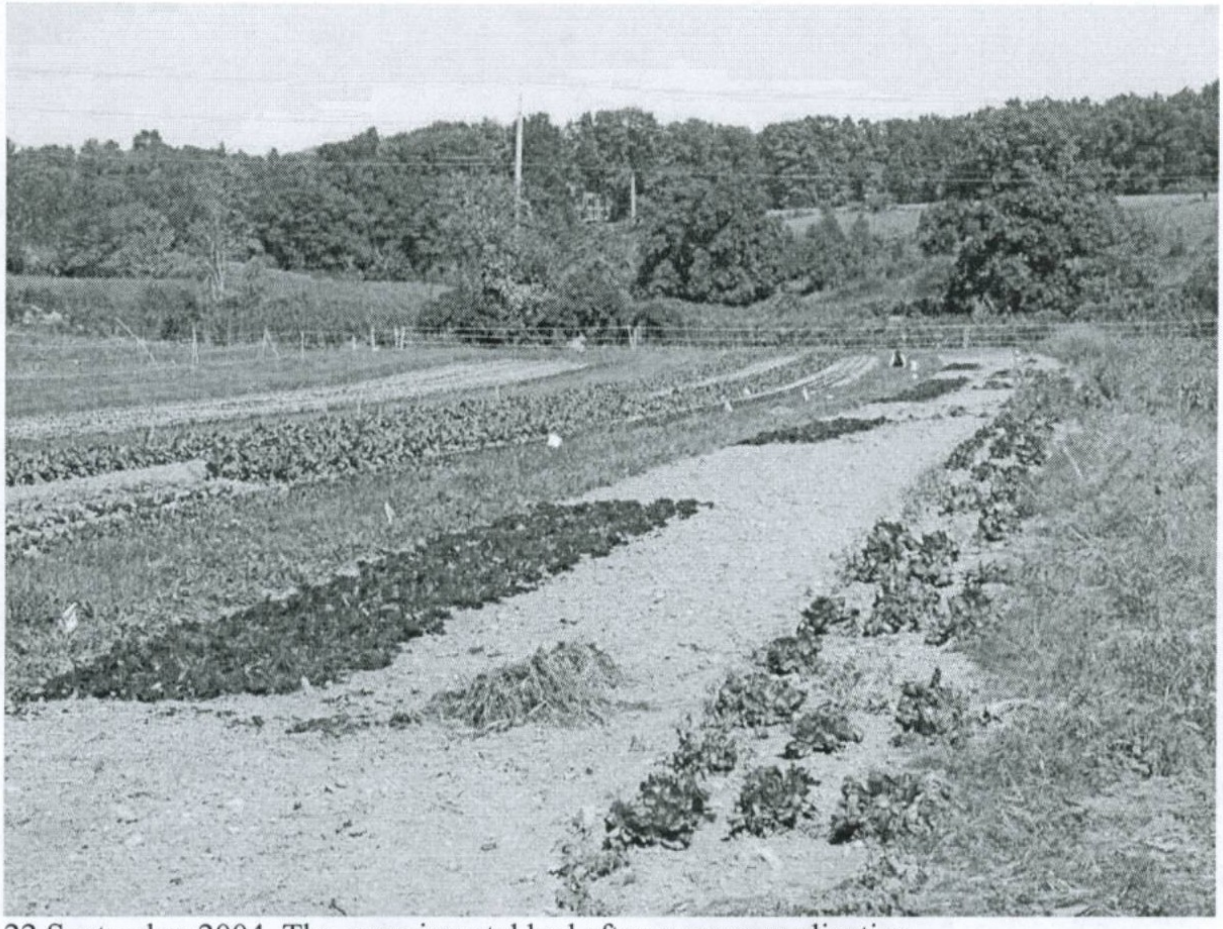
"Lettuce Production Measurements" - Plant growth rate and dimensions (height & diameter) will be measured along with dated notes on head formation and bolting.

"Lettuce Planting" - plots will be planted with on of our most popular lettuce types, we will use our standard methods for commercial plantings.

"Cover Crop" - a standard planting of our rye grass-red clover-vetch cover crop.

We have completed our schedule through the step marked "autumn, year 1". The experimental bed was selected; actual size restrictions reduced plot lengths to about 41 feet each (12 plots at 5' x 41'). Initial pooled soil samples were taken from each plot, dried and analyzed for soil nutrients and microbial activity. Treatments were then established for each plot and, where appropriate, compost and/or cover crops were provided. During the growing season of 2005, plots with cover crops were in rye, vetch, and red clover; plots without cover crop were in lettuce. The planting of lettuce on open plots was included in our treatments because it simulates actual garden management – ground is never left bare during normal garden rotations. In autumn of 2005, soil samples were taken again and similar analyses repeated. A comparison of our initial values and those from the second autumn give us preliminary information on treatment effects (see results below).

Measuring manure application rates. We wanted to simulate rate of application generated by our manure spreader. So we measured its application rate several times by driving the spreader over a plastic of known dimensions and then weighing the manure found on the plastic. From those took what seemed most typical to Steffen and applied that amount by hand (in order to insure all plots received an equal amount). Was 359 lbs per plot of manure.



22 September 2004. The experimental bed after manure application.

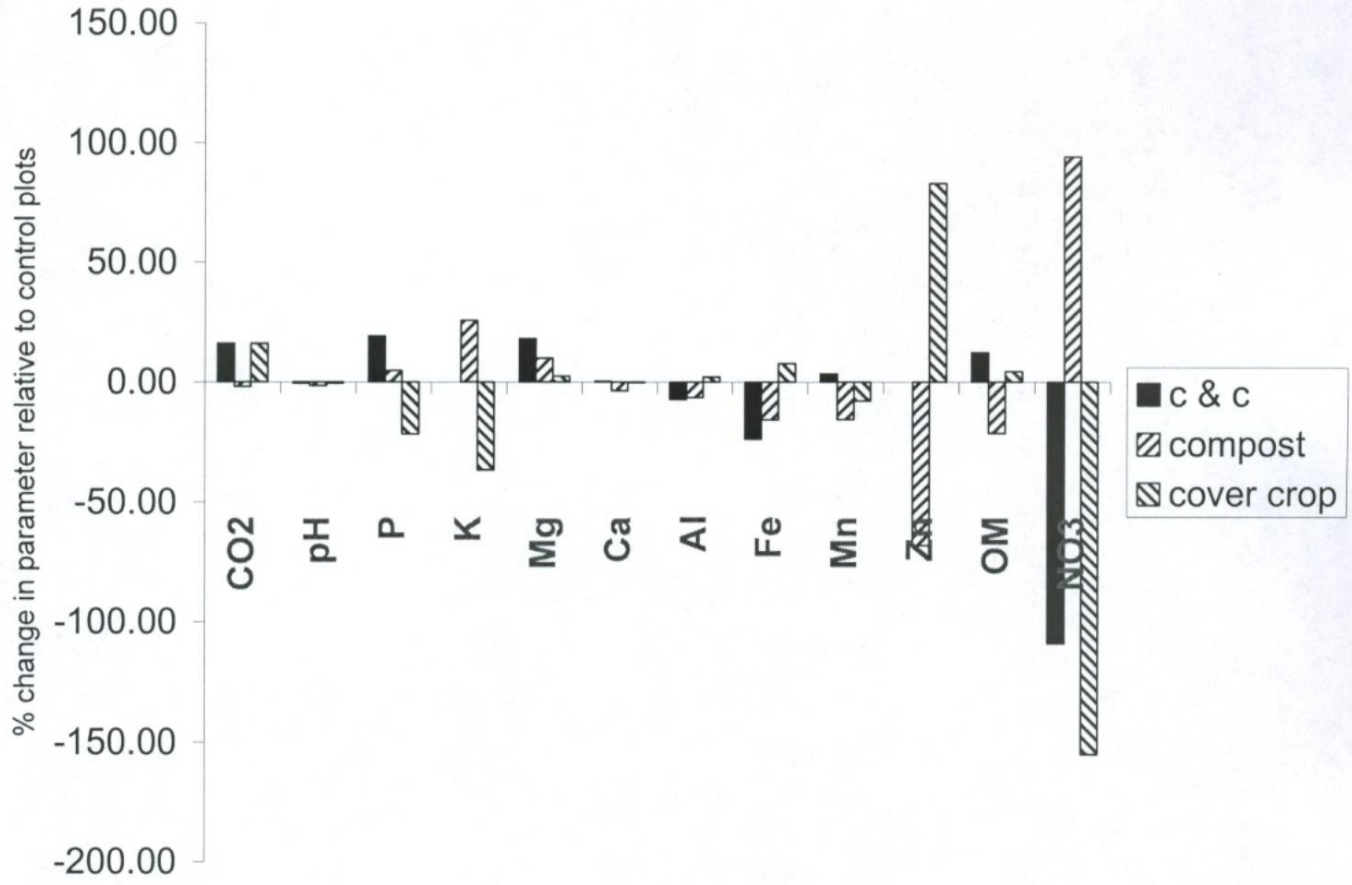
23 September 2004. Chisel plowing bed after manure application and before seeding. (Seeding was subsequently done by hand with rye, vetch and red clover.)

Experimental Bed (on left, plots marked out by white flags along border), 7 Dec 04

Experimental Plots during 2005 growing season. On left, 6 June with young lettuce coming up in open plots and cover crop trimmed. On right, 3 October, after lettuce harvest, weeds growing into to open plots.

The Solvita soil life test used to measure soil microbial activity. Carbon dioxide production is graded according to color of the palates inserted into each jar.

6. Results



The figure above illustrates the initial effects of our treatments in terms of soil values. "CO2" refers to the production of carbon dioxide and is used to measure microbial activity. "OM" is organic matter. "c & c" are plots that received both compost and cover crop. Values indicate treatment effects relative to control plots (those with neither compost nor cover crop). They are expressed as percent of average initial values for the given parameter. So, for example, for phosphorus, *relative to the changes observed in the control plots*, the "c & c" plots increased by almost 20%, compost-only plots (planted to lettuce) increased by almost 5%, and the cover-crop-only plots decreased by slightly more than 20%. In this presentation, all of the control plots have the value of 0 and are not plotted.

No doubt there are complex interactions occurring. In terms of regularly-cited plant nutrient (P, K and N), the cover crop treatment appeared to drain nutrients from the soils (however, these nutrients may well be in the biomass that has not yet been ploughed under). The compost treatment was associated with slightly increased nutrient levels, despite the fact that a lettuce crop was taken off of these plots. The double treatment (compost and cover crop) appeared to have a middling effect: increasing P, having no net effect on K, and being associated with reduced N. However, because, as already noted, the cover crop has not yet been ploughed under, these results are very partial. During the upcoming growing season, all plots will be planted to lettuce. Next year's lettuce production and end-of-season soil conditions should give us a better understanding of net effects.

7. Conditions
So far so good.

8. Economics
N/A

9. Assessment
Our results are still incomplete and so cannot yet be applied to farm management. Steffen has said that he enjoys this new way of looking at the Farm and its activities.

10. Outreach
We had a couple of farm tours during the growing season of 2005. While these focused on various on-farm activities, they included visits to our plots. Without results, these visits simply demonstrated our approach. During this upcoming season, harvest and measurements of the experimental plots will be done in collaboration with our apprentices and included in CRAFT program visits.

Conrad Vispo.
23 January 05