

Effects of Vermicompost Applied in a High Tunnel SARE # FNE03-486

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Goals

The problem is the lack of data on the effect that applications of Vermicompost have on plants in a High Tunnel and what are the financial impacts of this?

Questions we would like answered are:

1. Does Vermicompost change the yield, both weight and quantity of plants?
2. Does Vermicompost change the health of plants?
3. Does the added expense of Vermicompost return more then the expense?
4. What are yields, expenses, incomes and returns to management of the planned individual crops with or with out Vermicompost in a high tunnel?
5. Does Vermicompost change the maturity rate of plants?

Farm Update

Quiet Creek Herb Farm & School of Country Living added a second high tunnel greenhouse in 2003 and will be used for summer production of Vegetables and, in the winter will be used for the production of lettuce and other greens.

Collaborators

Mark Douglass served as technical advisor, providing advice on grant application, Project and Treatment set up, data collection and Final report to SARE. He also took pictures; put together a Power Point for a presentation at NOFA 2003 and 2004 PASA, developed a poster, wrote an article for BioCycle about the Grant, and developed id tags for the treatments and data analysis. PASA held a field day at Quiet Creek highlighting the High Tunnels and the SARE project.

Project

Treatment and setup

The High Tunnel green house has twelve raised beds and each bed was soil tested early in the spring, attached as appendix 1. Soil fertility was found to be suitable for the crop to be grown in that bed. The High Tunnel green house has twelve raised beds 32 inches by 18 feet, which are trickle, irrigated. Six beds had Vermicompost applied and six beds had

composted dairy cattle manure applied. Both were applied about every 40 days starting when the tomatoes were planted, dates were 4-20,5-29,7-5 and 8-16 and was applied approximately at the rate of one cup per plant with the first application placed in the hole before the seedling the following three application were surface applied with water applied with a hose to incorporate the compost. The Vermicompost supplier recommended that the compost be applied every 30 days due to scheduling and labor constraints the application was done approximately every 40 days. Approximately 300 cups were needed per treatment and per application. Three cups is equal to one pound thus 100 pounds of Vermicompost and 100 pounds of composted dairy cattle manure was applied four times for a total of 400 pounds each. This rate is approximately 30 tons per acre or 1.3774 pounds per square foot.

The Dairy compost is of excellent quality made from Dry cow and Dairy heifer manure that freshly cut alfalfa is mixed with and properly aged. This Dairy Compost is fed to worms to make the Vermicompost. This has excellent levels of Bacteria and fungus levels. The Dairy Compost and Vermicompost have an N-P-K content of 12-11-14 and 14-12-13 respectively per ton at the 30 tons to the acre rate this equals 360N-330P-420K and 420N-360P-390K.

Crops planted were Vegetables:

1. Jimmy Nardello Pepper,
2. Fat & Sassy Pepper,
3. Big Beef Tomato,
4. Amish Paste Tomato
5. Grape Tomato,
6. Neon Eggplant

and Herbs

1. Stevia,
2. Lemon Verbena,
3. Lemon Grass,
4. African Blue Basil.

All production was weighed as produced and totaled at the end for each crop and treatment. Detailed financial records were kept of all expenses and income. Prices were determined either by farmer market values or on farm sales prices.

The plants were monitored each week for insects, fungi and pests and recorded. Many pictures were taken to try to document any differences. All beds were tested at the end of the year to check the levels of N-P-K and pH test results that are labeled B is for beds treated with Dairycompost and A is for beds treated with Vermicompost attached as appendix 2. Also attached as Appendix 3 is a lay out of the High Tunnel with beds labeled with crops grown in them, treatment for each bed, and the soil test id number for each bed. There were some results from the soil tests that seemed very high namely the 1200 lbs of P₂O₅ and 1013 MgO Lbs for bed 1HTA1. Which by its self could be consider normal, but after the crop was grown the results for bed 1HTA was within the same range as the other beds. These high reading could be the result of variability of the soil since these beds were created the previous year from leave compost and topsoil and

may not have had time to be mixed thoroughly. Further study of this year's results and future years of the Pre and Post Soil test will need to be conducted. So enough data is collected to have some value.

Results and Accomplishments

Questions answered:

1. Does Vermicompost change the yield, both weight and quantity of plants?

Crop	Treatment	Yield in Lbs	Price	Total value
Jimmy Nardello Pepper	Vermi	61.19	\$3.00	\$183.57
Jimmy Nardello Pepper	Dairy	48.15	\$3.00	\$144.45
Stevia	Vermi	3.57	\$40.00	\$142.80
Stevia	Dairy	2.71	\$40.00	\$108.40
Lemon Verbena	Vermi	5.8	\$20.00	\$116.00
Lemon Verbena	Dairy	4.13	\$20.00	\$82.60
Lemon Grass	Vermi	4.88	\$20.00	\$97.60
Lemon Grass	Dairy	2.05	\$20.00	\$41.00
Fat & Sassy Pepper	Vermi	75.85	\$3.00	\$227.55
Fat & Sassy Pepper	Dairy	58.91	\$3.00	\$176.73
African Blue Basil	Vermi	18.94	\$13.34	\$252.66
African Blue Basil	Dairy	15.34	\$13.34	\$204.64
Big Beef Tomato	Vermi	172.92	\$2.00	\$345.84
Big Beef Tomato	Dairy	90.85	\$2.00	\$181.70
Amish Paste Tomato	Vermi	75.51	\$2.00	\$151.02
Amish Paste Tomato	Dairy	56.56	\$2.00	\$113.12
Grape Tomato	Vermi	12.56	\$2.50	\$31.40
Grape Tomato	Dairy	10.96	\$2.50	\$27.40
Neon	Vermi	15.3	\$1.50	\$22.95
Neon	Dairy	18.93	\$1.50	\$28.40
	Vermi	446.52		
	Dairy	308.59		
Total		755.11	Avg \$3.55	\$2,679.82

The results of this Project indicated that Vermicompost did increase the total Yield of plants by 137.93 Lbs with Vermicompost treated crops yielding 446.52 Lbs and 308.59 for crops treated with Dairycompost. All crops treated with Vermicompost yielded more than those treated with Dairycompost, except the Egg Plant which yielded less when treated with Vermicompost.

Some samples of vegetables were weighed per unit and no large difference was found between treatments as an example on July Eleventh the Bell Peppers averaged weight was .244 for those treated with Dairycompost and .270 treated with Vermicompost.

2. Does Vermicompost change the health of plants?

The high tunnel showed no disease problems, with the trickle irrigation and no overhead watering, fungal spores would not be spread with overripe vegetables and plant debris was cleaned out of beds weekly.

Insect populations never reached epidemic levels. Aphids were present from May-June in very low numbers. Ladybird beetles came in on their own, along with many spiders and wasps. By July all beds were pest free with the exception of flea beetles on eggplant which we just lived with. Whitefly arrived in August but never reached critical levels. No difference in any pest problems between Vermicompost and Dairycompost sides was noticed. The plants treated with Vermicompost were not as wilted as those plants treated with Dairycompost after several frosts.

3. Does the added expense of Vermicompost return more than the expense?

The results of this project indicated that Vermicompost did increase the total yield and income of vegetables and herbs in a high tunnel, but with the High cost of Vermicompost 1 Dollar per lb versus 10 cent per lb for dairy compost (Retail Prices) off setting the income, there was only a difference of \$9.94 Return to management (This is the amount left over after paying all bills allowing 10 dollars per hour for labor and a cost for overhead) between the 2 treatments in favor of the Vermicompost. Using retail prices the High tunnel Returned to Management, Labor and Overhead was \$1043.43 for Vermicompost and \$940.47 for Dairycompost a difference of \$102.96. Using wholes sale prices cost of Vermicompost .65 Dollar per lb and .025 cents per lb for dairy compost, there was a difference in profit between the 2 treatments of \$119.98 Return to management in favor of the Vermicompost. Using wholesale prices the High tunnel Returned to Management, Labor and Overhead was \$1183.41 for Vermicompost and \$970.41 for Dairycompost a difference of \$213.00

4. What are yields, expenses, incomes and returns to management of the planned individual crops with or with out Vermicompost in a high tunnel?

Detailed financial Data is listed in Appendix 4, which details Yield, Income Expense, and Return to Management (This is the amount left over after paying all bills, allowing 10 dollars per hour for labor and a cost for overhead) for 50 Square feet Beds; this is part of the information handed out at the SARE presentation.

5. Does Vermicompost change the maturity rate of plants?

This Question needs to be studied further, from the graphs of the raw data it looks like the plants treated with Vermicompost started to yield later then the plants treated with Dairy Compost. Attached as Appendix 5 is a graph comparing yield on a percentage bases.

New Ideas, Future Plans

Because of our findings in 2003 this year, we would like to try to determine if Vermicompost tea applied with Dairycompost would increase the yields of Vegetables and Herbs and reduce costs as compared to Vermicompost. The Vermicompost tea is cheap and easy to make, as compared to the cost of Vermicompost. We would also like to spray Vermicompost tea on the plants that have Vermicompost applied to the soil to check to see if a yield increase would result from this treatment.

We will compare Vermicompost and Dairycompost with or with out being sprayed with Vermicompost tea on Vegetables and Herbs crops both in a High tunnel and out side at two locations. There will be four treatments

1. Vermicompost
2. Vermicompost plus sprayed with Vermicompost Tea
3. Dairycompost
4. Dairycompost plus sprayed with Vermicompost tea.

Out Reach

1. Field day was held October 4 in conjunction with PASA, 23 farmers and interested people attended. One of the couples attending will be collaborating with Quiet Creek on a research project for 2004 called Comparison of Vermicompost, and Dairy Compost with or with out being sprayed with Vermicompost tea on Vegetables and Herbs crops.
2. The technical Advisor wrote an article for BioCycle.
3. .During different festivals and activities a total of 136 people visited and toured the High Tunnel and the Vermicompost project was explained to them.
4. Spoke at NOFA 2003 and presented results to date.
5. Presented at PASA 2004 to over a 100 people results of the project.
6. Green House was labeled showing the different treatments.

Name & date

Claire and Rusty Orner 12-20-03

Appendix 1

Pre Soil Test

	pH	P	K	Mg	Ca	CEC	Acidity	K	Mg	Ca
IHT 1A	6.4	1200	962	1013	5360	15.2	2	6.8	16.7	63.4
IHT 1B	6.1	325	648	604	4710	12.7	2	5.5	12	66.8
IHT 2A	6.2	330	418	647	4573	12.3	2	3.6	13.2	66.9
IHT 2B	6.1	330	600	568	4430	12.5	2.5	5.1	11.4	63.6
IHT 3A	6.6	504	962	833	5792	15.5	2	6.6	13.5	67
IHT 3B	6.3	472	775	740	4909	13.5	2	6.1	13.7	65.3
IHT 4A	6.5	481	842	780	5645	15	2	6	13	67.6
IHT 4B	6.4	522	960	810	5149	14.3	2	7.2	14.2	64.7
IHT 5A	6.8	797	1644	1125	5573	14.6	0	12	19.3	68.6
IHT 5B	6.2	334	485	627	4849	13.3	2.5	3.9	11.8	65.5
IHT 6A	6.4	362	521	737	5621	14.5	2	3.8	12.7	69.6
IHT 6B	6.3	426	706	727	5129	13.8	2	5.5	13.2	66.8

Appendix 2

Post Soil Test

	pH	P	K	Mg	Ca	CEC	Acidity	K	Mg	Ca
HT1A	6.3	449	422	807	4869	13.2	2	3.4	15.3	66.2
HT1B	6.4	408	408	913	6050	15.6	2	2.8	14.7	69.7
HT2A	6.6	641	814	1175	6019	16.6	2	5.2	17.7	65
HT2B	6.2	435	504	860	5292	14.2	2	3.8	15.2	67
HT3A	6.2	687	802	1076	6008	16.9	2.5	5.1	16	64.1
HT3B	6.4	504	710	1132	7245	18.6	2	4.1	15.3	69.9
HT4A	6.7	582	773	1026	5353	15	2	5.5	17.1	64.1
HT4B	6.3	394	576	837	5344	14.3	2	4.3	14.7	67.1
HT5A	6.7	783	1123	1215	5820	16.7	2	7.2	18.2	62.6
HT5B	6.1	412	619	847	4942	13.7	2	4.8	15.5	65
HT6A	6.1	504	622	950	5945	15.7	2	4.2	15.1	67.9
HT6B	6.2	545	864	1046	5904	16.7	2.5	5.5	15.7	63.7

Appendix 3

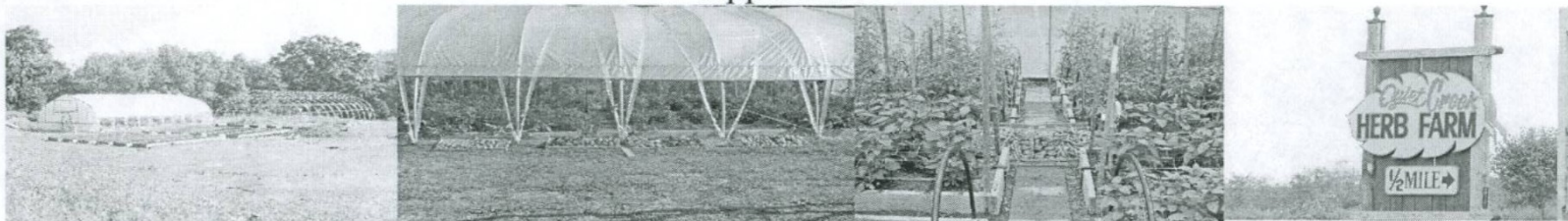
North

IHT1B Big Beef Tomatoes		IHT1A Big Beef Tomatoes
90.85		172.92
IHT2B Amish Paste & Grape Tomatoes		IHT2A Amish Paste & Grape Tomatoes
56.61 10.96		75.51 12.56
IHT3B Jimmy Nardello Peppers		IHT3A Jimmy Nardello Peppers
48.15		61.19
IHT4B Fat & Sassy Peppers		IHT4A Fat & Sassy Peppers
58.91		75.85
IHT5B Basil Lemon Verbena Lemon Grass		IHT5A Basil Lemon Verbena Lemon Grass
15.34 4.13 2.05		18.94 5.8 4.88
IHT6B Stevia Eggplant		IHT6A Stevia Eggplant
2.71 18.93		3.57 15.3

Composted Dairy Cattle Manure Applied Vermicompost Applied

South

Appendix 4



Income and Expenses for 50 Square feet raised beds in a high tunnel.

Data from 2003 QuietCreek high tunnel as collected by Rusty Orner and analysis by Mark Douglass.

Crop	Treatment	Yield in Lbs		Price	Total value	Labor							Total Costs	Return to Management
						Vermi	Dairy	Seed/Plant	Plant	Weed	Ventilation	Harvest		
Jimmy Nardello Pepper	Vermi	68	\$3.00	\$203.97	\$48.14	\$0.00	\$27.78	\$4.17	\$34.72	\$25.00	\$45.33	\$51.85	\$236.99	(\$33.02)
Jimmy Nardello Pepper	Dairy	54	\$3.00	\$160.50	\$0.00	\$1.86	\$27.78	\$4.17	\$34.72	\$25.00	\$35.67	\$51.85	\$181.04	(\$20.54)
Fat & Sassy Pepper	Vermi	84	\$3.00	\$252.83	\$48.14	\$0.00	\$27.78	\$4.17	\$34.72	\$25.00	\$56.19	\$51.85	\$247.85	\$4.99
Fat & Sassy Pepper	Dairy	65	\$3.00	\$196.37	\$0.00	\$1.86	\$27.78	\$4.17	\$34.72	\$25.00	\$43.64	\$51.85	\$189.01	\$7.36
Grape Tomato	Vermi	28	\$2.50	\$69.78	\$48.14	\$0.00	\$8.89	\$4.17	\$34.72	\$25.00	\$37.21	\$51.85	\$209.99	(\$140.21)
Grape Tomato	Dairy	24	\$2.50	\$60.89	\$0.00	\$1.86	\$8.89	\$4.17	\$34.72	\$25.00	\$32.47	\$51.85	\$158.96	(\$98.07)
Big Beef Tomato	Vermi	192	\$2.00	\$384.27	\$48.14	\$0.00	\$13.33	\$4.17	\$34.72	\$25.00	\$128.09	\$51.85	\$305.31	\$78.96
Big Beef Tomato	Dairy	101	\$2.00	\$201.89	\$0.00	\$1.86	\$13.33	\$4.17	\$34.72	\$25.00	\$67.30	\$51.85	\$198.23	\$3.66
Amish Paste Tomato	Vermi	168	\$2.00	\$335.60	\$48.14	\$0.00	\$17.78	\$4.17	\$34.72	\$25.00	\$111.87	\$51.85	\$293.53	\$42.07
Amish Paste Tomato	Dairy	126	\$2.00	\$251.38	\$0.00	\$1.86	\$17.78	\$4.17	\$34.72	\$25.00	\$83.79	\$51.85	\$219.17	\$32.21
Neon	Vermi	34	\$1.50	\$51.00	\$48.14	\$0.00	\$22.22	\$11.11	\$34.72	\$25.00	\$22.67	\$51.85	\$215.72	(\$164.72)
Neon	Dairy	42	\$1.50	\$63.00	\$0.00	\$1.86	\$22.22	\$11.11	\$34.72	\$25.00	\$22.67	\$51.85	\$169.43	(\$106.43)
Vegetables	Vermi	574	14	\$1,297.44	\$288.87	\$0.00	\$117.78	\$31.94	\$208.33	\$150.00	\$401.35	\$311.11	\$1,509.38	(\$211.94)
Vegetables	Dairy	412	14	\$934.02	\$0.00	\$11.14	\$117.78	\$31.94	\$208.33	\$150.00	\$285.53	\$311.11	\$1,115.84	(\$181.82)
Vegetables	Total	986	28	\$2,231.47	\$288.87	\$11.14	\$235.56	\$63.89	\$416.67	\$300.00	\$686.88	\$622.22	\$2,625.22	(\$393.75)
African Blue Basil	Vermi	42	\$13.34	\$561.47	\$48.14	\$0.00	\$33.33	\$11.11	\$34.72	\$25.00	\$28.06	\$51.85	\$232.22	\$329.24
African Blue Basil	Dairy	34	\$13.34	\$454.75	\$0.00	\$1.86	\$33.33	\$11.11	\$34.72	\$25.00	\$22.73	\$51.85	\$180.60	\$274.15
Stevia	Vermi	8	\$40.00	\$317.33	\$48.14	\$0.00	\$33.33	\$11.11	\$34.72	\$25.00	\$5.29	\$51.85	\$209.45	\$107.88
Stevia	Dairy	6	\$40.00	\$240.89	\$0.00	\$1.86	\$33.33	\$11.11	\$34.72	\$25.00	\$4.01	\$51.85	\$161.89	\$79.00
Lemon Verbena	Vermi	26	\$20.00	\$515.56	\$48.14	\$0.00	\$26.67	\$11.11	\$34.72	\$25.00	\$17.19	\$51.85	\$214.68	\$300.87
Lemon Verbena	Dairy	18	\$20.00	\$367.11	\$0.00	\$1.86	\$26.67	\$11.11	\$34.72	\$25.00	\$12.24	\$51.85	\$163.44	\$203.67
Lemon Grass	Vermi	22	\$20.00	\$433.78	\$48.14	\$0.00	\$35.56	\$11.11	\$34.72	\$25.00	\$14.46	\$51.85	\$220.84	\$212.93
Lemon Grass	Dairy	9	\$20.00	\$182.22	\$0.00	\$1.86	\$35.56	\$11.11	\$34.72	\$25.00	\$6.07	\$51.85	\$166.17	\$16.05
Herbs	Vermi	97	93	\$1,828.13	\$192.58	\$0.00	\$128.89	\$44.44	\$138.89	\$100.00	\$64.99	\$207.41	\$877.20	\$950.93
Herbs	Dairy	68	93	\$1,244.97	\$0.00	\$7.42	\$128.89	\$44.44	\$138.89	\$100.00	\$45.05	\$207.41	\$672.10	\$572.86
Herbs	Total	165	187	\$3,073.10	\$192.58	\$7.42	\$257.78	\$88.89	\$277.78	\$200.00	\$110.04	\$414.81	\$1,549.30	\$1,523.80
Herbs and Vegetables	Vermi		\$671.60	\$3,125.58	\$481.44	\$0.00	\$246.67	\$76.39	\$347.22	\$250.00	\$466.34	\$518.52	\$2,386.58	\$739.00
Herbs and Vegetables	Dairy		\$479.52	\$2,178.99	\$0.00	\$18.56	\$246.67	\$76.39	\$347.22	\$250.00	\$330.59	\$518.52	\$1,787.94	\$391.05
Herbs and Vegetables	Total		1151	\$5,304.57	\$481.44	\$18.56	\$493.33	\$152.78	\$694.44	\$500.00	\$796.93	\$1,037.04	\$4,174.52	\$1,130.04

Appendix 5

Percent Harvested By Weeks

