

Table 1. 1995 Field results from western NY (L.Brooke Farm). Crop yield on deep-tilled (DT) and non deep-tilled (NDT) plots.

Crop	Yield (ton/A)	
	DT	NDT
Beet	14.0	13.1
Snap bean	2.6	2.2
Sweet corn (total)	6.7	6.7
Sweet corn (mktble)	2.8	4.1

Table 2. Compost experiment results. 1996 table beet yield response to two years of composted chicken manure applications at rates indicated at Western NY farm site.

Yield Components	Compost Application Rate			LSD ₀₅
	0 tons/acre	2 tons/acre	4 tons/acre	
Mkt. Yield (tons/acre)	3.9	8.2	8.9	3.7
Total Yield (tons/acre)	7.3	12.0	12.2	3.3
% unmarketable	46	32	28	17
No. mkt/sq. ft.	1.6	3.4	3.5	1.8
Total no./sq. ft.	8.2	10.5	10.2	2.0

Table 3. Percent total marketable yield reduction of four vegetable crops due to compaction at our Freeville replicated field site. Each year the compacted plots were re-compacted then conventionally tilled to leave a compacted layer at about the 6-inch depth, and control plots were deep subsoiled each year. Data are for direct-seeded crops except where noted. (Adapted from: Wolfe et. al. 1995 *J. Amer. Soc. Hort. Sci.* 120:956-963; and 1995 SARE Annual Report).

Crop	Percent Yield Reduction Due to Compaction			
	1992	1993	1994	1995
Cabbage	---	- 63.8	- 82.6	---
Cabbage (transplanted)	---	- 29.1	---	---
Cucumber	- 26.8	- 43.6	- 52.9	---
Snap bean	- 35.0	- 51.8	- 61.7	- 51.6
Sweet corn	---	- 6.2	- 61.1	- 50.1

Table 4. CU (Geneva) site results for 1995 showing influence of deep tillage and/or compost on snap bean growth, yield, and root lesion nematode (*Pratylenchus* spp.) numbers.

Treatment		Yield (kg/3.1 m row)		Root Size	Root Vol.	Nematodes
Tillage	Compost	Total	Pod	Rating*	(cm ³)	per g root
Deep	Yes	3.94	1.38	3.00	38.50	136
"	No	3.97	1.81	2.25	30.75	132
Shallow	Yes	3.29	1.16	2.00	29.50	224
"	No	2.86	1.24	1.50	29.00	304
(LSD _{.05}):		(0.50)	(0.32)	(1.08)	(NS)	(NS)

* Root size rating: 1= small; 4=large

Table 5(a). 1997 snap bean yield at Freeville site, with focus on effect of 1995 summer cash crop (averaging across fall cover crops and 1996 summer cash crops).

1994 Tillage	1995 Summer Crop	1996 Summer Crop	1995/6 1996/7 Fall Crop	1997 Bean Yield (lb/A)	Yield Rank	Soil Penetrometer (MPa)					
						1997 Spring Avg.			1997 Fall Avg.		
						15cm	30cm	45cm	15cm	30cm	45cm
DT	---	Bean	---	4349	4	1.66	4.00	5.19	1.43	2.64	4.47
NDT	---	Bean	---	5362	3	1.71	4.01	5.26	1.72	3.18	5.14
DT	---	Corn	---	5783	1	1.72	4.15	5.22	1.49	2.70	4.67
NDT	---	Corn	---	5775	2	1.82	4.51	5.24	1.71	3.53	5.17

Table 5(b). 1997 snap bean yield at Freeville site, with focus on effect of 1995 summer crops (averaging across fall cover crops and 1996 summer crops).

1994 Tillage	1995 Summer Crop	1996 Summer Crop	1995/6 1996/7 Fall Crop	1997 Bean Yield (lb/A)	Yield Rank	Soil Penetrometer (MPa)					
						1997 Spring Avg.			1997 Fall Avg.		
						15cm	30cm	45cm	15cm	30cm	45cm
DT	Bean	---	---	3788	7	1.60	4.05	5.12	1.40	2.53	4.46
NDT	Bean	---	---	3428	8	1.68	3.99	5.23	1.63	2.99	5.13
DT	Corn	---	---	5821	3	1.70	4.12	5.25	1.56	2.73	4.71
NDT	Corn	---	---	5813	4	1.84	4.25	5.25	1.59	3.12	5.10
DT	Hubam	---	---	5323	6	1.72	4.10	5.23	1.47	2.76	4.57
NDT	Hubam	---	---	6480	2	1.87	4.48	5.26	1.81	3.68	5.12
DT	Sudan	---	---	5333	5	1.72	4.03	5.22	1.39	2.64	4.54
NDT	Sudan	---	---	6552	1	1.70	4.32	5.26	1.83	3.65	5.25

Table 6(a). 1997 root rot evaluation in snap bean yield at Freeville site, with focus on effect of 1996 summer crops (averaging across 1995 summer crops and cover crops).

1994 Tillage	1995 Summer Crop	1996 Summer Crop	1995/6	Plant Stand no./2ft	Plants Infested no./2 ft	Severely Infested no./2 ft	Overall Rating
			1996/7 Fall Crop				
DT	---	Bean	---	7.9	5.7	2.7	2.94
NDT	---	Bean	---	9.4	6.6	3.6	3.06
DT	---	Corn	---	9.6	5.1	2.8	2.75
NDT	---	Corn	---	9.5	5.6	2.8	2.63

Table 6(b). 1997 root rot evaluation in snap bean yield at Freeville site, with focus on effect of 1995 summer crops (averaging across 1996 summer crops and cover crops).

1994 Tillage	1995 Summer Crop	1996 Summer Crop	1995/6	Plant Stand no./2ft	Plants Infested no./2 ft	Severely Infested no./2 ft	Overall Rating
			1996/7 Fall Crop				
DT	Bean	---	---	8.8	5.1	2.8	2.92
NDT	Bean	---	---	8.7	7.2	4.2	3.58
DT	Corn	---	---	9.0	5.3	2.7	2.83
NDT	Corn	---	---	9.2	4.8	2.5	2.63
DT	Hubam	---	---	8.7	5.8	2.4	2.75
NDT	Hubam	---	---	10.0	6.4	3.1	2.63
DT	Sudan	---	---	8.4	5.4	3.0	2.88
NDT	Sudan	---	---	10.0	6.0	2.9	2.54

Table 7. Effect of incorporation time of grain rye on snap bean growth and root rot severity. Greenhouse trial in infested field soil, 1997. Root rot severity ratings based on scale of 1=none, 9=severe. Asterisk (*) indicates statistically significant difference between wet and dry treatments at $P < .05$.

Treatment	# plants of 7 total		Plant Wt. g/pot	Root Rot Severity Rating	
	<u>emerged</u>	<u>final stand</u>		<u>Average</u>	<u>Adjusted</u>
<u>RYE KEPT DRY</u>					
1 week	6.5	5.8	48.8	7.00	7.36
2 weeks	5.8	5.5	37.3	6.75	7.18
4 weeks	6.5	6.8	31.5	7.25	7.32
LSD .05	(ns)	(1.8)	(13.7)	(ns)	(ns)
Average:	6.3	6.0	38.8	7.00	7.29
<u>RYE KEPT WET</u>					
1 week	0.5	0.8	2.0	8.50	8.89
2 weeks	1.8	1.8	11.0	7.50	8.40
4 weeks	4.5	4.5	25.5	5.25	6.54
LSD .05	(2.8)	(2.6)	(12.4)	(1.50)	(1.31)
Average	2.3*	2.3*	12.8*	7.08	7.94

Table 8. Soil penetrometer resistance values at 3 depths at CU (Freeville) site before planting and at the end of the first growing season (1995) on deep tilled (DT) and compacted (CP) plots of snap bean, sweet corn, hubam sweet clover, and sudangrass.

<u>CROP</u>	<u>SOIL TMT</u>	<u>Penetrometer resistance (kg force)</u>		
		<u>15 cm</u>	<u>30 cm</u>	<u>45 cm</u>
--Before Planting----				
	DT	1.37	3.39	4.43
	CP	2.86	4.57	5.71
--End of Season-----				
Bean	DT	1.79	3.42	4.78
	CP	2.67	4.20	5.43
Corn	DT	1.82	3.38	4.61
	CP	3.04	3.63	4.41
Hubam	DT	1.41	3.01	5.06
	CP	3.05	4.62	5.26
Sudan	DT	1.26	2.72	4.59
	CP	2.18	3.77	5.33
(Avg Std. Error):		(.30)	(.34)	(.36)

Table 9. Results from greenhouse experiment showing the percent of total root growth (biomass) found in the 6 - 12 inch depth (compacted layer of compacted pots). Adapted from: Wolfe et al. 1995 *J. Amer. Soc. Hort. Sci.* 120:956-961.

<u>Crop</u>	<u>Treatment</u>	<u>Percent of roots at 6 - 12 inch depth</u>
Cabbage	Control	34.6
	Compact	16.2
Cucumber	Control	41.6
	Compact	9.2
Snap bean	Control	64.2
	Compact	14.8
Sweet corn	Control	35.8
	Compact	20.2

Table 10. Summer cover crop above-ground biomass yields from selected on-farm trials in New York state. Data provided by Cornell Cooperative Extension Staff: L. Stivers, B. Caldwell and D. Riggs. Adapted from: Stivers 1997 *Proceedings NYS Vegetable Conference*, pp 124-126.

<u>Cover Crop</u>	<u>Planting Date</u>	<u>Sampling Date</u>	<u>Dry Wt. tons/A</u>	<u>County</u>
Hubam Sweetclover	5/9/96	10/16/96	6.4	Rensselaer
	5/26/96	10/28/96	1.3	Genesee
Yellow Blossom Sweetclover	5/9/96	10/16/96	3.6	Rensselaer
	5/26/96	10/28/96	1.0	Genesee
Crimson Clover	5/15/96	10/16/96	4.3	Rensselaer
Berseem Clover	5/26/96	10/28/96	2.1	Genesee
Cowpeas	6/7/95	9/20/95	1.3	Erie
Nitroalfalfa	5/9/96	10/16/96	0.7	Rensselaer
	5/26/96	10/28/96	0.8	Genesee
Buckwheat	6/16/95	8/8/95	1.8	Genesee
	5/26/96	7/12/96	0.7	Tompkins
	6/27/96	8/15/96	1.1	Tompkins
Japanese Millet	5/26/96	8/8/96	1.2	Tompkins
	6/24/96	7/12/96	1.5	Tompkins
	7/19/96	8/15/96	2.6	Tompkins
	6/9/96	10/3/96	1.5	Genesee
Sudangrass	6/9/96	10/3/96	1.4	Genesee
	7/11/96	10/1/96	20.0*	Rensselaer
	6/24/96	8/15/96	1.8	Tompkins

*not mowed

Table 11. CU (Freeville) site results showing productivity of snap bean, sweet corn, hubam sweet clover, and sudangrass grown on deep tilled (DT) and compacted (CP) soils 1995. Weed biomass in cover crop plots is also shown. Weeds in bean and corn plots were controlled with herbicides.

<u>CROP</u>	<u>SOIL</u>	<u>Total Above-ground Dry Wt. (kg/A)</u>	<u>Fresh Wt. Pod or Ear Yield (kg/A)</u>	<u>Weed Dry Wt. (g/m²)</u>
Bean	DT	1557	4527	-----
	CP	916	2192	-----
Corn	DT	3467	5904	-----
	CP	2362	2944	-----
Hubam	DT	1788	-----	967
	CP	1293	-----	623
Sudan	DT	3546	-----	259
	CP	2608	-----	405

Table 12. Results of greenhouse experiment conducted at CU (Ithaca) evaluating several cover crops for their growth rate, root:shoot ratio, and rate of root growth within the 10-20 cm depth (compacted layer of compacted, CP, treatment).

Crop	Days to Emerge	Growth Rate (g/m ² -day)		Root:Shoot		Root Growth Rate at 10-20 cm Depth (g/m ² -day)	
		Ctrl	CP	Ctrl	CP	Ctrl	CP
Bahiagrass	11	10.4	6.0	.52	.50	0.9	0.8
Buckwheat	4	19.7	15.2	.10	.14	0.2	0.3
Hub. clov.	4	14.6	5.7	.18	.24	0.7	0.5
Nitroalf.	3	17.9	9.9	.23	.28	0.7	0.6
Per. ryegr.	8	20.0	20.3	.38	.42	2.0	2.0
Sudangr.	3	21.1	19.3	.28	.28	2.3	1.8
Yel. Bl. clov.	5	15.0	13.0	.30	.22	0.4	0.6
Yel. mustard	5	19.2	14.4	.11	.13	0.3	0.5
(LSD _{.05}):		(1.4)	(1.1)	(.03)	(.02)	(0.3)	(0.1)

Table 13. Soil quality data for first year (1995) at Freeville site comparing deep-tilled (DT) and compacted (non deep-tilled, NDT) plots. Asterisk (*) indicates statistically different at $P < .05$; ns= not significant. See Table 8 for soil penetrometer resistance data.

Treatment	Organic Matter (%)	Bulk Density		Time to Ponding (min.)	Infiltration Rate (in/hr)	Vol. Water Content 2-5 in.			Vol. Water Content 12-15 in.		
		2-5 in.	12-15 in.			.10 kPa	.38 kPa	2.5 kPa	.10 kPa	.38 kPa	2.5 kPa
NDT	2.5	1.44	1.53	6.8	0.04	.47	.44	.38	.38	.33	.26
DT	2.5	1.21	1.35	14.6	0.90	.54	.48	.39	.50	.46	.40
	ns	*	*	*	*	*	ns	ns	*	ns	ns

Table 14. Soil quality data for third year (1998) at Freeville site comparing several of the rotation sequence treatments. Abbreviations used: NDT=not deep tilled in 1995; DT=deep tilled in 1995; B=bean summer crop; C=sweet corn summer crop; H=Hubam sweetclover summer crop; S=sudangrass summer crop; F=fallow with no fall/winter cover crop; PR=perennial ryegrass fall/winter cover; RV= rye+hairy vetch fall/winter cover crop. All plots were planted to bean in the third summer. Statistical analyses are not yet complete.

Treatment	Organic Matter (%)	Bulk Density		Time to Ponding (min.)	Infiltration Rate (in/hr)	Vol. Water Content 2-5 in.			Vol. Water Content 12-15 in.		
		2-5 in.	12-15 in.			.10 kPa	.38 kPa	2.5 kPa	.10 kPa	.38 kPa	2.5 kPa
NDT-B-F-B-F	2.6	1.32	1.65	7.3	0.34	.50	.46	.37	.36	.33	.28
DT-B-F-B-F	3.2	1.27	1.38	9.8	0.45	.51	.47	.38	.48	.45	.38
DT-S-PR-C-PR	3.4	1.23	1.43	13.7	0.76	.54	.50	.40	.47	.43	.38
DT-H-RV-C-RV	3.1	1.25	1.56	15.0	0.37	.53	.48	.39	.40	.37	.32
DT-H-PR-C-PR	3.0	1.36	1.48	16.2	0.52	.45	.42	.33	.44	.41	.35
DT-S-RV-C-RV	3.1	1.31	1.45	16.9	0.48	.51	.46	.39	.45	.42	.37
DT-H-RV-B-RV	3.3	1.29	1.42	18.3	1.12	.51	.48	.40	.48	.44	.39
DT-B-PR-C-PR	3.2	1.26	1.42	19.8	1.62	.53	.49	.41	.48	.43	.40

Figure 1. Effect of incorporated cover crops on root rot severity of beans. Greenhouse, 1997. Severity rating of 1=none; 9=severe.

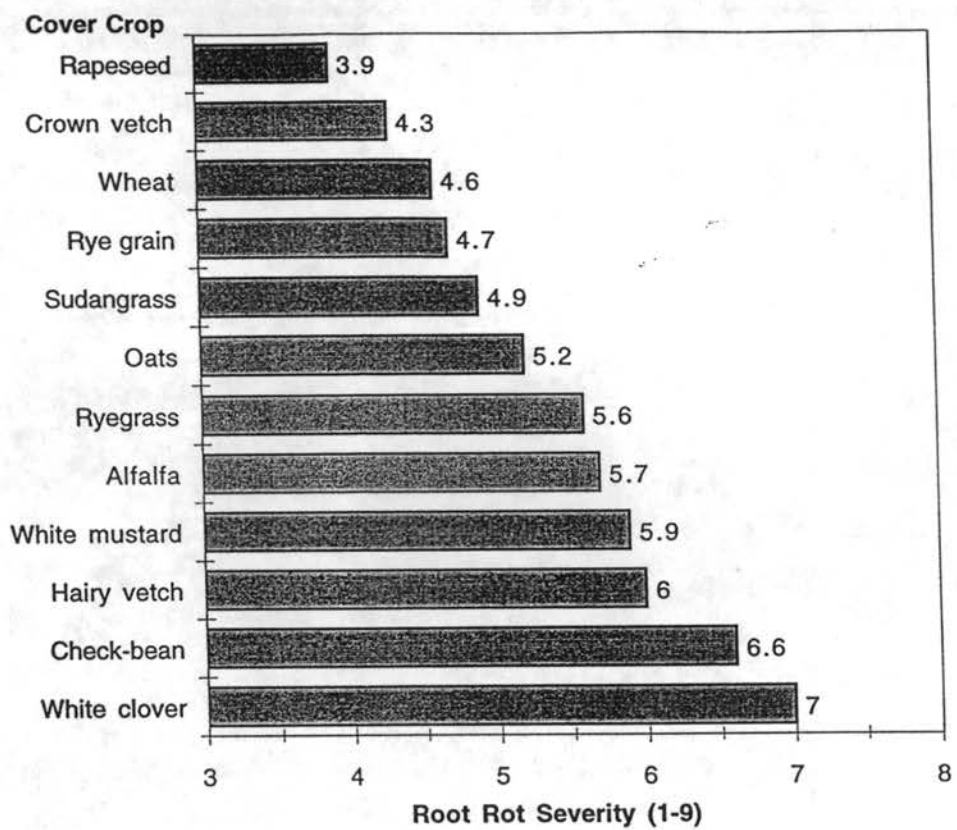


Figure 2. Root lesion nematode (*Pratylenchus penetrans*) per gram of bean root following a cover crop. Greenhouse, 1997.

