

ENVIROFIELD REPORT

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Field Trials on
Compost –Spring Barley
For: EnventureLtd

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Trial work commenced: 21.11.00
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ABBREVIATIONS

cm	centimetre
CV%	Co-efficient of Variation
DM	dry matter
g	gram
GM	General Mean
ha	hectare
K, K ₂ O	potassium, potash
kg	kilogram
l	litre
LA	Levington Agriculture Ltd
LSD	Least Significant Difference
Mg	magnesium
mg	milligram
mm	millimetre
N	nitrogen
NS	Not Significant
P, P ₂ O ₅	phosphorus, phosphate
S	sulphur
SE	Standard Error
t	tonnes
yr	year
+	(P=0.10) significant at 0.10 probability level
*	(P=0.05) significant at 0.05 probability level
**	(P=0.01) significant at 0.01 probability level

SUMMARY

Treatments were first applied to this site in 1999 with compost and inorganic fertilizer being applied. In 2000 only inorganic fertilizer was applied to this site to evaluate the benefits of the compost application in the longer term. Both compost and inorganic fertilizer were applied for the 2001 growing season although a prolonged wet winter and spring made it impossible to plough the compost treatments in until March and necessitated spring barley to be sown rather than winter barley as originally intended. Soil analysis showed the benefit of compost in reducing the acidifying effects of inorganic fertilizers and also the additional potash in the compost. In a season where soil available nitrogen reserves were limited due to leaching, the treatments with compost and inorganic nitrogen applied gave the best yields. Due to the very wet season it was impossible to determine the possible benefits of the compost to the soil structure and water holding capacity.

OBJECTIVE

To assess the continued effects of composted green waste to land in a third year by growing winter barley in order to carry out a market evaluation of the compost in agriculture.

METHODS

Year 1 1999 Sugarbeet Treatments

1. Untreated control
2. Base inorganic fertilizer + N top dressing
3. 50 t/ha compost + base inorganic fertilizer + N top dressing
4. 100 t/ha compost + base inorganic fertilizer + N top dressing
5. 50 t/ha compost
6. 100 t/ha compost
7. 50 t/ha compost + N top dressing
8. 100 t/ha compost + N top dressing

Rates of inorganic fertilisers kg/ha

	<u>Sugarbeet</u>
Base inorganic fertilizer	50 kg N no phosphate 100 kg K ₂ O 150 kg Na (400 kg salt)
N top dressing	50 kg N/ha
Timing of top dressing	2 true leaf

Based on the compost analysis results the addition of the compost gave the equivalent nutrient addition as follows:

<u>50 t/ha</u>	<u>100 t/ha</u>
260 kg N	520 kg N
220 kg P ₂ O ₅	440 kg P ₂ O ₅
393 kg K ₂ O	786 kg K ₂ O
74 kg S	148 kg S

The Code of Good Agricultural Practice for the Protection of Water recommends a limit of 250 kg N/ha/yr for organic materials applied to land unless, as in this case, the material is relatively inert, when the limit is 500 kg N/ha/yr. Less than 10% of the total nitrogen in the compost used was extractable in water (1:6 ratio).

The sugarbeet trial gave positive responses in terms of yield to the applied compost (see 1999 report).

Year 2 2000 Winter wheat Treatments

The treatments applied to the wheat were of nitrogen only to allow the assessment of the carryover effects of the compost applied in 1999. The treatments were applied to the same plots as in 1999.

Nitrogen kg/ha

	<u>February</u>	<u>March</u>
1	0	0
2	40	160
3	40	160
4	40	160
5	0	0
6	0	0
7	40	80
8	40	80

The compost provided sulphur as a nutrient, which was otherwise deficient in the crop, as well as the major nutrients, especially potassium. Some residual effects in terms from yield were seen from the higher rate of compost alone probably due to slow nitrogen release. Compost plus a low addition of fertilizer nitrogen gave yields similar to high levels of nitrogen. The best yields were seen from compost plus high nitrogen, indicating a positive interaction.

Year 3 2001 Spring Barley Treatments

1. Untreated control
2. N top dressing
3. 50 t/ha compost + N top dressing
4. 100 t/ha compost + N top dressing
5. 50 t/ha compost
6. 100 t/ha compost
7. 50 t/ha compost + Low N top dressing
8. 100 t/ha compost +Low N top dressing

Rates of inorganic fertilisers kg/ha

	<u>Spring Barley</u>
Full N Top Dressing	100 kg N
Low N	50 Kg N
Timing of top dressing	Zadoks Growth Stage 13

Based on the compost analysis results, the addition of the compost gave the equivalent nutrient addition as follows:

<u>50 t/ha</u>	<u>100 t/ha</u>
232 kg N	464 kg N
106.5 kg P ₂ O ₅	213 kg P ₂ O ₅
154 kg K ₂ O	308 kg K ₂ O

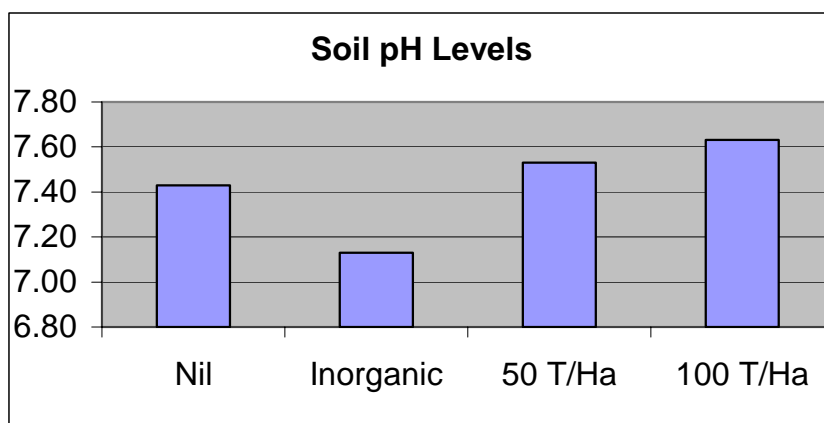
The trial, with four replicates of each treatment, was of randomised block design and statistically analysed accordingly. The soil was sampled and analysed by plot and the soil structure measured by penetrometer. The crop was assessed for colour and vigour during growth and crop samples taken in June for nutrient content. At harvest the yield of grain was measured and the grain analysed for nitrogen and sulphur contents.

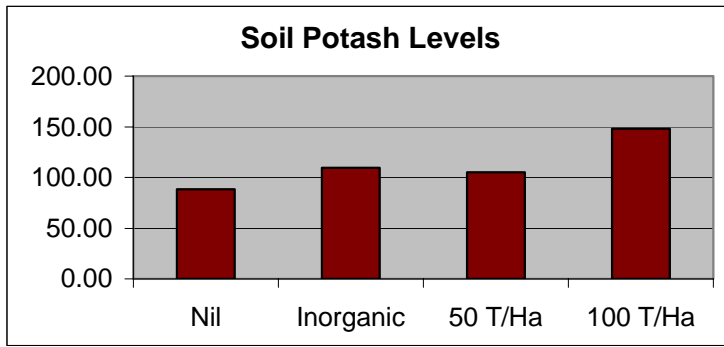
RESULTS For full statistical analysis of results, see Appendix

Soil measurements

The residual effects on soil fertility from the compost applied to the previous crop were measured in November 2000 by analysing the soil in each plot. Where inorganic fertilizer alone had been applied, the soil pH had fallen compared with the unfertilized soil (Graph 1). The application of compost in addition to inorganic fertilizer counteracted this acidification. The highest pH was found where 100 t/ha compost alone had been applied the previous year. There were no significant effects on soil phosphorus levels, which were generally high (index 3). Soil potassium was significantly raised by the previous compost additions, more so by the higher rate of compost as would be expected (Graph 2). Soil structural effects were measured by using a penetrometer, but no significant differences were found between treatments.

Graph 1





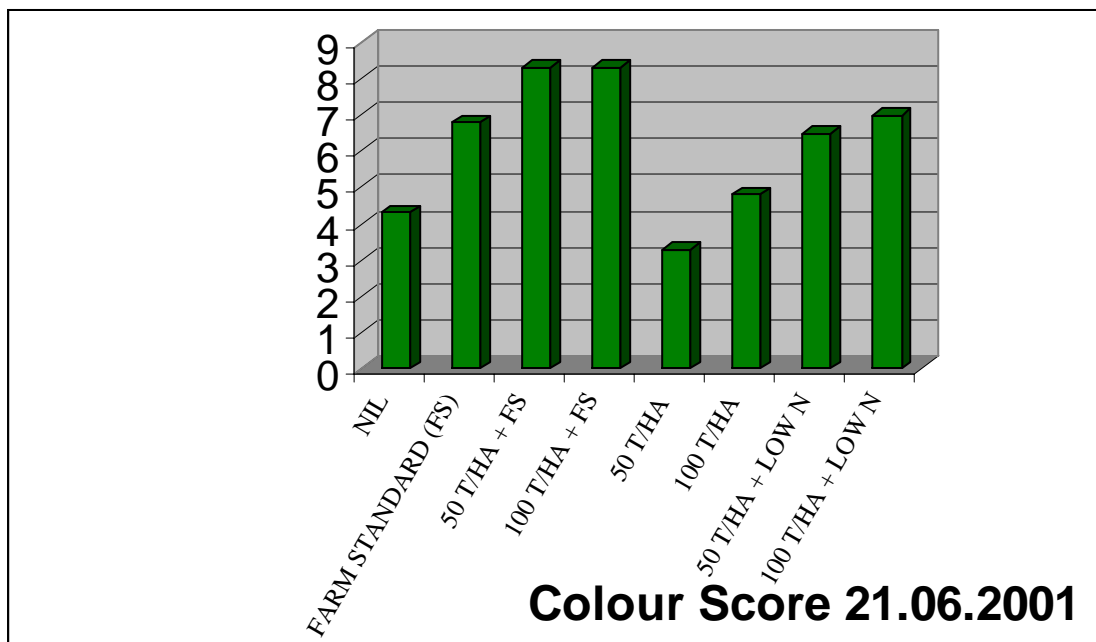
Graph 2

Crop assessment

Due to the prolonged wet weather in the winter and spring the field was not ploughed until March and the crop not planted until April 30th. The inorganic nitrogen treatments were applied in mid May and colour and vigour scores made in early and late June. Crop samples were taken from the plots in June 2001.

The differences between treatments in colour and vigour (Graph 3) were clearly visible and on assessment showed that there was a clear shortage of nitrogen in all plots except for where inorganic fertilizer had been applied. The readily available nitrogen from the compost applied in November may have leached during the prolonged wet winter, prior to ploughing. Where inorganic fertilizer had been added on top of the compost the best colour and vigour scores were seen, with no difference between high and low compost rates. Tissue analysis in June did not show significant effects. Sulphur appeared to be in adequate supply, perhaps due to the wet weather, whereas magnesium was generally low.

Graph 3



APPENDICES - STATISTICAL ANALYSIS OF RESULTS

Appendix 1.1

011720 Loudham Soil Analysis November 2000 & Penetrometer Readings January 2001

Trt	Treatment	22.11.2000 pH	22.11.2000 Soil P	22.11.2000 Soil K	22.11.2000 Soil Mg	22.11.2000 Soil OM	10.01.2001 Penetro- meter reading
No	Name		mg/l	mg/l	mg/l	%	
1	NIL	7.43	87.50	88.50	62.25	1.02	101.25
2	FARM STANDARD (FS)	7.13	73.75	109.75	64.25	0.94	93.75
3	50 T/HA + FS	7.43	79.50	138.50	71.75	0.91	90
4	100 T/HA + FS	7.57	86.50	130.00	71.50	1.07	88.13
5	50 T/HA	7.53	87.75	105.00	61.75	0.85	106.88
6	100 T/HA	7.63	84.25	148.25	70.75	1.07	102.5
7	50 T/HA + LOW N	7.13	76.50	109.50	68.75	1.02	118.13
8	100 T/HA + LOW N	7.55	83.75	132.50	68.75	0.91	103.13
	LSD (P=.05)	0.21	16.5	29.35	6.58	0.221	28.31
	Standard Deviation	0.1	7.94	14.11	3.16	0.06	13.61
	CV	1.95	13.61	16.6	6.63	15.29	19.16

Appendix 1.2

LOUDHAM 011720

**Colour & Vigour
Scores**

Trt No	Treatment	07.06.200	07.06.200	21.06.200	21.06.200
		1	1	1	1
		GS 31 Colour 0 - 10	GS 31 Vigour 0 - 10	GS 39 Colour 0 - 10	GS 39 Vigour 0 - 10
1	NIL	6.5	6	4.3	4.3
2	FARM STANDARD (FS)	7.8	6.8	6.8	6.5
3	50 T/HA + FS	8.8	8	8.3	8.5
4	100 T/HA + FS	8.5	8.3	8.3	8.3
5	50 T/HA	7.3	6.8	3.3	3.5
6	100 T/HA	6.8	6	4.8	4.8
7	50 T/HA + LOW N	8.3	7.8	6.5	6.5
8	100 T/HA + LOW N	8.3	7.8	7	7
	LSD (P=.05)	1.68	1.4	2.04	1.98
	Standard Deviation	1.14	0.96	1.38	1.34
	CV	14.77	13.35	22.6	21.82
	Replicate F	0.255	0.948	0.565	0.802
	Replicate Prob(F)	0.8572	0.4354	0.644	0.5066
	Treatment F	2.127	3.519	7.155	7.437
	Treatment Prob(F)	0.0855	0.0117	0.0002	0.0002

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Appendix 1.3

011720 Loudham Tissue Analysis June 2001

Trt No	Treatment Name	07.06.2001	07.06.2001	07.06.2001	07.06.2001	07.06.2001
		Tissue N % DM	Tissue P % DM	Tissue K % DM	Tissue Mg % DM	Tissue S % DM
1	NIL	2.29	0.37	2.71	0.11	0.25
2	FARM STANDARD (FS)	2.31	0.34	2.55	0.11	0.22
3	50 T/HA + FS	2.42	0.35	2.90	0.10	0.21
4	100 T/HA + FS	2.42	0.37	3.00	0.10	0.24
5	50 T/HA	2.19	0.38	2.74	0.10	0.22
6	100 T/HA	2.45	0.40	2.96	0.10	0.26
7	50 T/HA + LOW N	2.23	0.29	2.43	0.09	0.21
8	100 T/HA + LOW N	2.34	0.38	2.85	0.10	0.23
	LSD (P=.05)	0.3065	0.0511	0.4383	0.0172	0.0443
	Standard Deviation	0.2084	0.0348	0.298	0.0117	0.0301
	CV	8.95	9.67	10.77	11.8	13.15
	Replicate F	0.771	2.072	0.637	0.516	2.09
	Replicate Prob(F)	0.523	0.1346	0.5997	0.676	0.1321
	Treatment F	0.802	3.886	1.847	1.546	1.441
	Treatment Prob(F)	0.5951	0.0072	0.1307	0.2064	0.2416
		NS	**	NS	NS	NS

Appendix 1.4

011720 Loudham Yield Results

Trt No	Treatment	23.08.2001					
		Grain Yield Tonnes/Ha	Grain Moisture	Specific Weight (g)	% Dry Matter	Grain N % DM	Grain S % DM
1	NIL	1.00	17.38	59.77	87.2	1.775	0.1293
2	FARM STANDARD (FS)	1.60	17.38	59.9	87.13	2.308	0.1575
3	50 T/HA + FS	2.10	17.42	59.7	86.82	2.457	0.153
4	100 T/HA + FS	2.30	16.83	59.47	86.93	2.438	0.1643
5	50 T/HA	1.10	18.02	58.08	86.85	1.89	0.1383
6	100 T/HA	1.10	16.98	60.05	86.72	1.675	0.121
7	50 T/HA + LOW N	1.80	17.52	59.7	87.5	2.043	0.1435
8	100 T/HA + LOW N	1.70	17.35	59.38	87.22	2.115	0.1445
LSD (P=.05)		0.48	0.757	1.492	0.695	0.3738	0.02266
Standard Deviation		0.33	0.514	1.014	0.473	0.2541	0.01541
CV		20.45	2.96	1.7	0.54	12.17	10.71
Replicate F		0.334	0.234	0.599	1.541	1.342	1.016
Replicate Prob(F)		0.8011	0.8713	0.6229	0.2334	0.2876	0.4055
Treatment F		8.37	1.964	1.48	1.204	5.463	3.498
Treatment Prob(F)		0.0001	0.1094	0.2279	0.3436	0.0011	0.0121
		**	NS	NS	NS	**	*