

1.2. THE IMPROVEMENT OF SOIL CONDITION BY ROTATION, NAS 200 ML 79
ORGANIC MANURING AND LIME APPLICATION

SUMMARY

In the third year of the test crop sequence, the ware yield of potatoes tended to be depressed by 125 t/ha of Factory Waste Line applied 6 years earlier. FYM applied to the beet crops in the rotation tended to increase potato yield. These effects were consistent with those observed in the potato test crops in the previous two phases of the experiment. These other phases were in the first and second crops of the second treatment sequence (sugar beet and potatoes, respectively). Some effects of past and present treatments on yield were observed in these crops.

OBJECT

To examine the long term effects of certain soil conditioning treatments which are likely to improve the structure of unstable soils such as that at Morley. The effects on the soil at Morley are measured directly by recording various physical characteristics of the soil and in yield.

TREATMENTS

The trial consists of three phases of two blocks each, giving a total of six blocks. Phases entered the trial in three consecutive years (1972, 1973 and 1974) so that each phase is at a different stage of the rotation and the rotation progresses through the trial beginning at Phase I. The 6 year crop rotation is divided up into a treatment sequence of sugar beet and two cereals which is followed by a test sequence of sugar beet, spring barley and potatoes.

The soil conditioning treatments applied to the treatment sequence consist of:-

- A Arable control
 - B Arable control (spare plot) in the first rotation^φ
 - C Farm yard manure at 50 t/ha applied prior to the sugar beet in year 1 of the treatment sequence and for sugar beet in the test sequence.
 - D Factory waste line at 125 t/ha applied prior to the sugar beet in year 1 of the treatment sequence (for the first rotation only).
 - E 1 year ley of Italian ryegrass instead of the second cereal in year 3 of the treatment sequence.
 - F 3 year ley of perennial ryegrass sown in year 1 of the rotation to stand for the duration of the treatment sequence.
- ^φ At the start of the second rotation, Factory Waste Line at 62.5 t/ha was applied to this treatment, to add to the information given by treatment D.

The cropping and treatments during the first six year rotation of each phase are summarised in the table below.

Rotations and soil conditionign treatments

Year of Rotation	Treatments					
	A	B	C	D	E	F
	<u>Treatment Sequence</u>					
1	S.Beet	S.Beet +62.5t/ha Factory line*	S.Beet +50 t/ha FYM	S.Beet +125 t/ha Factory line**	S.Beet	Ley(P.R.G.)
2	W.Wheat	W.Wheat	W.Wheat	W.Wheat	W.Wheat	Ley(P.R.G.)
3	S.Barley	S.Barley	S.Barley	S.Barley	Ley(I.R.G.)	Ley(P.R.G.)
	<u>Test Sequence</u>					
4	S.Beet	S.Beet	S.Beet +50 t/ha FYM	S.Beet	S.Beet	S.Beet
5	S.Barley	S.Barley	S.Barley	S.Barley	S.Barley	S.Barley
6	Potatoes	Potatoes	Potatoes	Potatoes	Potatoes	Potatoes

* This dressing only applied once, at the start of the second rotation

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The experimental design is such that treatments A-E are sub-plots within an arable main plot, while the 3 year ley is another main plot. In the test rotation the treatment sub-plots are further divided into sub-sub-plots to examine various levels of nitrogen as follows:-

Sugar beet: Nil, 38, 75, 113, 151, 188 kg N/ha
 Spring barley: 38, 75, 113, 151 kg N/ha
 Potatoes: 80, 120, 160, 200, 240, 280 kg N/ha

In 1979 Phases I and II were in treatment crops of winter wheat and sugar beet respectively and phase III was in the third year test crop of potatoes.

RESULTS

Year 2 of 2nd treatment sequence (Phase I) - Winter wheat and 3 year ley

Winter Wheat (Mardler)

Soil treatment	Plants/m ²	Grain yield in t/ha at 85% d.m.
Arable control	181.8	6.89
Arable + FWL (62.5 t/ha in 1978)	195.6	6.90
Arable + FYM 50 t/ha	195.6	7.32
Arable + FWL 125 t/ha in 1972	209.7	7.04
Arable + 1 yr ley	188.4	7.16

All the soil treatments tended to give slightly higher plant populations than the arable control, with the FWL, at 125 t/ha treatment, being the highest. The FYM treatments yielded considerably higher than the arable control. All the soil treatments, particularly FYM, appeared to yield better than the arable control, with the exception of the 62.5 t/ha rate of FWL applied in the previous year.

Year 1 of treatment sequence (Phase II) - Sugar beet and 3 yr ley

FYM was applied to the appropriate treatment on 27 November. No further factory waste line was applied to the treatment that had received 125 t/ha before the start of the first treatment sequence in 1972, the aim being to continue to assess the effect of this dressing on subsequent test crops. However, on 9 November factory waste line was applied at 62.5 t/ha for the first time on the treatment that had previously been run as a spare control. This was ploughed down.

Sugar Beet

Soil treatment	Plant population at harvest '000s/ha	Sugar yield t/ha	Sugar %
Arable control	78.5	9.07	18.41
Arable + 62.5 t/ha in 1979	76.9	9.01	18.62
Arable + FYM	79.0	9.24	18.58
Arable + FWL (125 t/ha in 1973)	73.9	8.76	18.26
Arable + 1 yr ley	77.1	8.98	18.49

Populations were satisfactory on all treatments.

In contrast to past results, FWL applied in 1973 appeared to give a reduced sugar yield and sugar content in 1979. FYM tended to give the highest sugar yield.

Year 3 of test sequence (Phase III) - Potatoes

Potatoes: Ware Yield 40-80 mm (t/ha)

<u>Soil Treatment</u>	Nitrogen						MEAN
	80	120	160	200	240	280	
Arable control 1	31.9	34.8	34.6	33.5	32.1	32.6	33.2
Arable control 2	26.8	33.1	32.7	30.8	32.7	29.9	31.0
Arable + FYM 50 t/ha	36.8	37.6	32.0	36.5	32.7	34.6	35.0
Arable + FWL 125 t/ha	32.6	30.1	33.1	32.2	28.5	25.3	30.3
Arable + 1 yr ley	32.7	34.9	33.7	33.4	30.8	27.3	32.1
3 yr ley	33.6	35.1	33.2	34.8	31.1	32.9	33.5
MEAN	32.4	34.3	33.2	33.5	31.3	30.4	

This crop of potatoes marks the completion of the first 6 year rotation on all three phases of the experiment. A report giving statistically-analysed data from the combined phases will be provided to the SBREC in due course.

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