

**MORLEY RESEARCH CENTRE**

**Straw incorporation on light land**  
(MAFF sponsored project carried out in collaboration with ADAS)

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**Abstract**

Straw treatments did not appear to significantly affect soil mineral nitrogen levels sampled in the winter after 9 years of repeated incorporation at Morley. The yield of the 1993 sugar beet crop, grown as a root break in the mainly cereals rotation at this site, was not significantly affected by previous straw treatment.

**Objective**

To determine on light mineral soils the long term effects of incorporation of straw on the nitrogen requirements of subsequent crops and the potential for nitrate leaching together with effects on crop yields.

**Introduction**

It is anticipated that any extra nitrogen immobilised as a result of ploughing-in cereal straw, rather than removing or burning it, will eventually be re-released into the soil following further microbial degradation. During the early years of the trial there was some evidence of reduced amounts of soil mineral nitrogen where straw was ploughed-in at this site. The treatments are continuing in order to test the validity of the latter part of the theory concerning enhanced soil mineral nitrogen levels.

**Method**

**Site** Morley Research Centre, Ravens Grove Field. Soil: sandy loam over chalky boulder clay (Ashley series). Further site details are given in the Appendix.

**Crop** Sugar beet, drilled on 25 March and harvested on 28 October 1993. Managed with normal farm inputs, including 123 kg/ha nitrogen applied overall.

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\*Not for publication without the Director's consent. This report deals primarily with only one year's work, so any conclusions given are provisional.

### **Previous cropping**

1992	Winter barley	1991	Winter oats
1990	Spring wheat	1989	Sugar beet
1988	Winter wheat	1987	Winter wheat
1986	Sugar beet	1985	Winter barley

### **Preceding straw treatments**

Winter barley, cv Pipkin, harvested on 22 July 1992

Cultivations:

1. Straw chopped at harvest. Ploughed 19 October.
2. Straw chopped at harvest. Cultivated by Flexicoil to 100 cm on 27 August. Ploughed 19 October.
3. Straw burnt on 10 September. Ploughed 19 October.

### **Preceding nitrogen treatments - applied to barley in 1992**

1. Nil
2. 50 kg/ha
3. 100 kg/ha
4. 150 kg/ha
5. 200 kg/ha
6. 250 kg/ha

**Layout** Straw treatments were applied to main plots arranged in randomised blocks with 4 replicates. Nitrogen treatments were superimposed on sub-plots.

## **Results**

### **Available soil nitrogen**

Total available soil nitrogen content, assessed in the winter, was significantly affected by previous nitrogen treatment but not by straw treatment. There was more soil mineral nitrogen following the highest rate sampled compared with the sub-plots which had received nil or 50 kg/ha nitrogen.

Table 1. *Soil mineral nitrogen content (NH<sub>4</sub>-N and NO<sub>3</sub>-N, kg/ha)  
Total 0 - 0.9 m, 22 January 1993*

Straw treatment	0	Previous nitrogen rate applied each year (kg/ha)			Mean
		100	150	200	
		(SED vi ± 4.7, h ± 4.6)			(SED ± 2.6)
Plough	50	46	51	54	50
Tine/plough	46	46	47	53	48
Burn straw, plough	44	46	52	52	48
		(SED ± 2.6)			
Mean	46	46	50	53	

Main plot CV% (6 df) = 7.6

Sub-plot CV% (26 df) = 13.2

### Crop yield

Sugar beet yield, measured on sub-plots where previous cereal crops had received 150 kg/ha nitrogen, was not significantly affected by previous straw treatment.

Table 2. *Yield assessments of 1992 sugar beet crop*

Straw treatment	Sugar yield (t/ha)	Root yield (t/ha @ 16% sugar)	Relative yield (% straw burnt treatment)
(SED)	(±0.876)	(±5.48)	
Plough	13.50	84.4	102.1
Tine/plough	14.08	88.0	106.4
Burn straw, plough	13.23	82.7	100

Main plot CV% (6 df) = 8.1

### Acknowledgements

Thanks are given to colleagues at Morley Research Centre for help in carrying out this work, to ADAS for their soil analysis and to MAFF for funding the experiment.

## Appendix

The following information is presented as an appendix which is available on request.

Field and experiment details

Method

Results

Table A1. Soil mineral nitrogen content ( $\text{NH}_4\text{-N}$  and  $\text{NO}_3\text{-N}$ , kg/ha)  
Totals by depth (0-30, 30-60 and 60-90 cm)

**Field details**

**Site:** Morley Research Centre  
**Field reference:** 10, Ravens Grove  
**Crop:** Sugar beet **Variety:** Saxon

**Soil type and series:** Sandy loam over chalky boulder clay (Ashley)

<b>Soil analysis:</b>	pH	P	K	Mg
8 Aug 92	7.1	5.0	2.0	2.0

**Seed Commercial Seedrate:** 1 kg/ha

**Date sown:** 25 March 1993

<b>Fertilizer applied:</b>	Rate kg/ha		
	P	K	N
10 October 1992	28	200	-
8 April 1993	-	-	36
29 April	-	-	87
			—
		Total N	123

**Applications to crop:**

		Rate/ha
21 April	Goltix + Betanal E (metamitron + phenmedipham, 70%w/w + 114g)	1.25 kg + 1.7 l
30 April	Protrum K + Venzar (phenmedipham + lenacil, 114g + 80%w/w)	2.5 l + 0.25 kg
13 May	Decisquick (deltamethrin + heptenophos, 25 + 400g)	0.3 l
24 May	Avadex BW + Betanal E (triallate + phenmedipham, 400 + 114g)	1.5 + 3.5 l
28 May	Fusilade (fluazifop-P-butyl, 125g)	3.0 l

## **Method**

These are an abbreviated version of the Standard Operating Procedures used at Morley Research Centre.

### *Plot layout*

The trial area was drilled as farm crop with rows aligned with the sub-plots. Common treatments such as fertiliser, insecticides, herbicides, fungicides or growth regulators were applied across all plots with farm machinery using wheelings, 12 m apart. For harvest purposes, sample lengths of row (2x16m) were lifted by hand, weighed after being washed, the roots were then sliced for standard % sugar analysis.

### *Agronomic factors*

Plant population was determined by counting roots harvested.

**Experiment diary** - as field diary

## Results

Table A1. Soil mineral nitrogen content ( $NH_4-N$  and  $NO_3-N$ , kg/ha)  
0-30 cm, 30-60 cm and 60-90 cm, January 1993

Straw treatment	Previous nitrogen rate applied each year (kg/ha)				
	0	100	150	200	Mean
<b>0 - 30 cm</b>					
		(SED vi $\pm$ 1.6, h $\pm$ 1.6)			(SED $\pm$ 0.9)
Plough	20	22	20	22	21
Tine/plough	17	17	17	19	18
Burn straw, plough	16	16	16	16	16
		(SED $\pm$ 0.9)			
Mean	18	18	18	19	
<b>30 - 60 cm</b>					
		(SED vi $\pm$ 2.4, h $\pm$ 2.3)			(SED $\pm$ 1.3)
Plough	18	14	18	16	17
Tine/plough	15	16	17	16	16
Burn straw, plough	15	16	18	20	17
		(SED $\pm$ 1.4)			
Mean	16	15	18	17	
<b>60 - 90 cm</b>					
		(SED vi $\pm$ 2.0, h $\pm$ 2.1)			(SED $\pm$ 0.8)
Plough	11	11	13	16	13
Tine/plough	14	13	13	18	14
Burn straw, plough	12	13	17	16	15
		(SED $\pm$ 1.2)			
Mean	12	12	15	17	
	0-30 cm	30-60 cm	60-90 cm		
Main plot CV% (6 df) = 6.6		10.7	8.3		
Sub-plot CV% (26 df) = 12.2		20.1	21.6		