*CONFIDENTIAL

4.26 STRAW INCORPORATION - LONG TERM STUDY OF NITROGEN EFFECTS ON A SANDY-LOAM SOIL, 1990

(In co-operation with ADAS: ST09/013)

Summary

After a sugar beet break crop a range of straw treatments applied over the preceding 5 years, including burning or baling and removing straw, chopping straw then incorporating it into the top-soil by cultivator before ploughing it in, and direct ploughing-in of chopped straw, failed to give detectable differences in grain yield or quality at a site where wheat was grown on a sandy loam soil. The crop response to applied nitrogen and the amount of nitrogen found in the crop at harvest were similar on each of the straw treatments.

Object

To investigate the long term implications of straw incorporation on a and on the potential for nitrate leaching and the nitrogen requirement crops.

Treatments and method

The present trial utilises a site at Morley (sandy loam over Chalky B Clay) where straw has been burnt, baled and removed or incorporated ways since 1984. In 1989 the crop was sugar beet, which was harvest October, and the subsequent crop of Tonic wheat was drilled on 14 Nov residual effects of the preceding straw treatments were assessed on receiving a range of nitrogen top-dressings to determine any change requirements for nitrogen resulting from these straw treatments.

Preceding straw treatments (main plots):

1. Straw burnt or baled and removed
2. Straw chopped, then incorporated into the top-soil before being
3. Straw chopped and ploughed-in

Nitrogen rates (sub-plots) (kg/ha):

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

The trial is a split-plot design with straw treatments on main plots in 4 replicates.

*NOT FOR PUBLICATION WITHOUT THE DIRECTOR'S CONSENT. This report dea primarily with only one year's work so any conclusions given are only provisional.

Results 1990

Grain yield (t/ha at 85% dm)

Straw treatment	Nitrogen top-dressing (kg/ha) Nil	50	100	150	200	250	Mean
(LSD)			(0.746)				(NS)
1 Straw burnt or baled and removed	7.12	7.19	8.17	8.36	8.37	9.09	8.05
2 Straw incorporated then ploughed in	7.04	7.25	8.44	8.54	8.94	8.59	8.13
3 Straw ploughed in	7.69	7.69	7.97	8.50	8.66	8.85	8.22
(LSD)			(0.430)				
Mean	7.28	7.38	8.19	8.46	8.65	8.84	
S.E. per main plot (6 d.f.) = ±0.848 or 10.4% of G.M.							
S.E. per sub-plot (45 d.f.) = ±0.524 or 6.4% of G.M.							

(LSD = least significant difference at 95% probability level)
(NS = not statistically significant)

There were no significant effects from the preceding straw treatments on grain yields. Yields responded similarly to nitrogen top-dressing following all straw treatments, with a trend for increasing yield with each nitrogen increment.

Grain specific weight (kg/hl at 85% dm)

Straw treatment	Nitrogen top-dressing (kg/ha) Nil	50	100	150	200	250	Mean
(LSD)			(0.83)				(NS)
1 Straw burnt or baled and removed	78.2	78.4	79.2	78.6	78.4	77.9	78.5
2 Straw incorporated then ploughed in	78.1	78.2	79.1	78.9	78.1	77.9	78.4
3 Straw ploughed in	79.0	78.7	79.1	79.0	78.6	78.0	78.7
(LSD)			(0.48)				
Mean	78.4	78.4	79.1	78.8	78.4	77.9	
S.E. per main plot (6 d.f.) = ±0.678 or 0.9% of G.M.							
S.E. per sub-plot (45 d.f.) = ±0.583 or 0.7% of G.M.							

There were no significant effects from the preceding straw treatments on specific weights. There was a trend for the specific weights to increase with increasing nitrogen use up to 100 kg/ha and to fall again where higher rates of nitrogen were used.

Thousand grain weight (g at 85% dm)

Straw treatment	Nitrogen top-dressing (kg/ha) Nil	50	100	150	200	250	Mean
(LSD)			(1.692)				(NS)
1 Straw burnt or baled and removed	50.03	51.14	50.28	49.52	48.60	48.21	49.63
2 Straw incorporated then ploughed in	49.96	49.47	49.15	48.43	46.75	47.07	48.47
3 Straw ploughed in	49.91	50.13	49.10	48.60	48.65	47.78	49.03
(LSD)			(0.977)				
Mean	49.97	50.25	49.51	48.85	48.00	47.69	
S.E. per main plot (6 d.f.) = ±2.149 or 4.4% G.M.							
S.E. per sub-plot (45 d.f.) = ±1.189 or 2.4% G.M.							

There were no significant effects from the preceding straw treatments on thousand grain weights (TGW). Increasing nitrogen rates above 100 kg/ha tended to reduced TGW.

Nitrogen offtakes (kg/ha) at selected nitrogen rates

Straw treatment	Nitrogen top-dressing (kg/ha) Nil	100	150	200	Mean
N in grain					
(LSD)		(17.03)			(NS)
1 Straw burnt or baled and removed	85.3	122.3	160.0	173.3	135.2
2 Straw incorporated then ploughed in	90.0	131.0	160.8	184.0	141.4
3 Straw ploughed in	103.5	121.5	154.8	175.0	138.7
(LSD)		(9.83)			
Mean	92.9	124.9	158.5	177.4	
N in straw					
(LSD)		(6.71)			
1 Straw burnt or baled and removed	15.8	22.3	31.0	38.0	26.8
2 Straw incorporated then ploughed in	17.0	23.8	33.3	38.8	28.2
3 Straw ploughed in	19.8	23.3	31.8	34.3	27.3
(LSD)		(3.88)			
Mean	17.5	23.1	32.0	37.0	
N in grain: S.E. per main plot (6 d.f.) = ±13.20 or 9.5% G.M.					
S.E. per sub-plot (27 d.f.) = ±11.73 or 8.5% G.M.					
N in straw: S.E. per main plot (6 d.f.) = ±4.90 or 17.9% G.M.					
S.E. per sub-plot (27 d.f.) = ±4.62 or 16.9% G.M.					

Preceding straw treatment did not significantly affect the total amounts of nitrogen in the straw or grain of the wheat crop grown in 1990. Increasing spring applied nitrogen top-dressings were reflected in higher levels of nitrogen found in the above-ground crop parts sampled at harvest.

G.M. Palmer
D.B. Stevens

APPENDIX - NAS 206 ML 90

STRAW INCORPORATION
(ADAS Experiment Code: ST01/013)

Site:	Morley
Soil type:	Sandy loam over Chalky Boulder Clay
Previous cropping:	1989 Sugar beet
	1988 Winter wheat
	1987 Winter wheat
	1986 Sugar beet
	1985 Winter barley

Diary

November 1989	Sugar beet harvested and site ploughed
14 November	Site drilled with Tonic at 145 kg/ha
30 March 1990	Farm applied chlormequat (Chlormequat 700 at 2.2 l/ha) overall to site
2 April	Initial dressing of 50 kg/ha nitrogen applied to appropriate plots. GS 24-25
24 April	Remainder of nitrogen applied as required. GS 30-31
17 May	Farm applied Terpal (1.0 l/ha) overall to site
9 August	Trial harvested. No lodging.