

Summary

4.1 t/ha of chopped barley straw was ploughed down successfully, both with and without pre-plough mixing. Plant establishment was equally good on all treatments. None of the cultivation systems used nor the presence of straw affected grain yield. There was no yield benefit from applying autumn nitrogen, neither did the presence of straw affect total nitrogen response.

Object

To assess the effect of incorporating straw by ploughing on the establishment and yield of the following crop and on its long term agronomic effect.

This trial was one of a series carried out on four ADAS Experimental Husbandry Farms, in addition to the Norfolk Agricultural Station.

Treatments - all straw chopped at harvest

<u>Within 5 days of combine</u>	<u>At least 21 days after chopping</u>
1. Burn and plough	-
2. Plough	-
3. -	Plough
4. Incorporate with tines to 10 cm	Plough
5. Incorporate with tines to 20 cm to give a thorough mix	Plough
6. Bale straw and remove	Plough

Nitrogen application (kg/ha) (all combinations of)1. Autumn applied

- (a) Nil
- (b) 40

2. Spring applied

- (c) 100 (farm standard)
- (d) (c) - 40
- (e) (c) + 40

Three randomised blocks were used with cultivations on main plots and nitrogen treatments on sub plots.

*NOT FOR PUBLICATION WITHOUT THE DIRECTOR'S CONSENT.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

Results 1985

Grain yield (t/ha at 85% dm)

Cultivations	Spring nitrogen	Autumn nitrogen (kg/ha)						Mean	
		60	Nil 100	140	40				
					60	100	140		
(ESE)								(+0.103)	(+0.142)
Burn and plough early (within 5 days of harvest)		5.42	6.34	6.78	5.99	5.76	5.81		6.02
Plough early		5.39	5.96	6.43	5.76	6.10	6.00		5.94
Plough late (within 21 days of harvest)		5.27	5.91	6.73	5.90	6.39	5.66		5.98
Incorporate early to 10 cm plough late		5.27	6.10	6.87	5.42	6.14	5.93		5.95
Incorporate early to 20 cm plough late		5.36	6.25	6.77	5.81	6.54	6.69		6.24
Bale and plough late		5.53	6.62	6.46	5.86	5.65	5.82		5.99
(ESE)								(+0.097)	
Mean		5.37	6.20	6.67	5.79	6.10	5.99		6.02
SE per main plot (10 d.f.) = +0.247 t/ha or 4.1 % of GM									
SE per sub plot (60 d.f.) = +0.406 t/ha or 6.7% of GM									

1. None of the cultivation systems used nor the presence of straw affected grain yield.
2. Autumn nitrogen gave no yield benefit; neither did the presence of straw affect total nitrogen response.
3. When autumn nitrogen was followed by 140 kg in the spring lodging was increased and the results suggest some reduction in grain yield.
4. These first year results match those obtained in recent years from other centres on similar soils. In all cases chopped straw was ploughed down successfully without pre-plough mixing, time of ploughing was not important and autumn nitrogen was not required.

W.E.R. MADGE

Straw incorporation by ploughing

Method and Diary

The previous crop of spring barley left 4.1 t/ha of straw lying on a 10 cm high stubble. The straw was chopped using a Nobile tritulator chopper. A spring tine cultivator was used for the pre-ploughing incorporation treatment. Trash boards were fitted to the plough and a furrow press attached. The ploughing depth was 25 cm. Without further cultivation, Tipper winter barley was sown on 3 October using a Carrier drill at a seedrate of 150 kg/ha.

All cultivations were carried out without difficulty in moist soil conditions. Plant establishment was good on all treatments.

Crop diary

30 October	40 kg/ha of nitrogen applied to appropriate plots
11 March	spring nitrogen applied at rates of 60-100 and 140 kg/ha to appropriate treatments
4 April	sprayed with Assett at 2 l/ha tank mixed with 3 l/ha of CMPP
April	crop growth stage 31 (first node) sprayed Sportak Alpha at 1.5 l/ha tank mixed with New 5C Cycocel at 2.5 l/ha
17 May	GS 49 (awns visible) sprayed Radar at 0.5 l/ha tank mixed with Cerone at 1.0 l/ha
14 August	trial harvested

Results

Chopped straw % in length category (cms)

10	10-20	20
39	32	29

1. This standard of chop can only be regarded as poor. In less favourable conditions it is likely that plough blockage would have occurred.

Crop establishment 2 November and number of roots per plant 18 December

Cultivation	Number of plants/m ²	Number of roots/plant
(ESE)	(13.84)	
Burn and plough early (within 5 days of harvest)	279	7.8
Plough early	295	7.7
Plough late (within 21 days of harvest)	287	-
Incorporate early to 10 cm and plough late	274	7.7
Incorporate early to 20 cm and plough late	258	8.1
Bale and plough late	271	-
Mean	277	7.8
SE per plot (10 d.f.) = +24.0 plants/m ² or 8.7 % of GM		

1. Plant establishment was not affected by any cultivation treatment.
2. On those treatments assessed similar root numbers per plant were recorded.

Crop growth - plant weight and number of tillers per plant in late March

Cultivation	Plant dry weight (g)		Tillers/plant	
	nil	Autumn nitrogen applied	nil	applied
Burn and plough early (within 5 days of harvest)	4.76	5.07	3.5	4.2
Plough early	4.98	4.93	3.3	4.3

1. Nitrogen applied in the autumn had a marked visual effect on the crop during the autumn and in early spring. Despite this, it appears that plant weight was not increased.
2. Autumn nitrogen did increase the number of tillers per plant.

Number of fertile tillers/m² 15 July

Cultivation	Spring nitrogen	Autumn nitrogen (kg/ha)				Mean
		60	100	140	60 100 140	
(ESE)					(+53.1)	
Burn and plough early (within 5 days harvest)	576	689	730	695	816	834 723
Plough early	594	621	648	688	704	775 671
Mean	585	655	689	691	760	804 697
SE per plot (10 d.f.) = ± 44.18 tillers/m ² or 6.34% of GM						

1. The number of fertile tillers increased in line with the total amount of nitrogen applied.
2. Nitrogen applied in the autumn also increased further tiller numbers, reflecting the result of the March assessment.

Take-all root disease and net blotch leaf disease 17 December

	Take-all		Net blotch
	% plants infected	% roots infected	% leaf area infected
Burn and plough early (within 5 days of harvest)	35	6.8	0.13
Plough early	20	3.9	0.16
Incorporate early to 10 cm and plough late	33	7.7	-
Incorporate early to 20 cm and plough late	18	2.6	-

1. It is unlikely that disease levels were affected by either the presence of straw or the method of incorporation.

Root and stem disease 4 June

Cultivation	% Tillers		Take-all	
	Eyespot	Sharp Eyespot	% Plant	% Roots
(ESE)	(+3.1)	(+2.4)	(+7.0)	(+1.2)
Burn and plough early (within 5 days of harvest)	8.3	2.9	46.6	5.7
Plough early	17.3	2.2	71.7	6.8
Incorporate early to 10 cm plough late	12.9	7.4	70.0	7.1
Incorporate early to 20 cm plough late	6.7	2.2	46.7	4.1
Mean	11.3	3.7	58.7	5.9
SE per plot (3 d.f.) = +5.2 eyespot tillers or 46.2% of mean +4.0 sharp eyespot tillers or 108% of mean +19.7 plant or 33.6% of mean +1.2 root or 20.9% of mean				

1. The above disease assessments were made on main plots only and it is highly unlikely that any apparent difference is real.

Soil nitrogen kg/ha November and March

Cultivation	15 November		29 March	
	nil	applied	nil	applied
Burn and plough early (within 5 days of harvest)	9.2	29.1	6.1	6.2
Plough early	10.2	31.0	6.6	6.2

1. These results indicate that the amount of available nitrogen was not affected by the presence of ploughed in straw neither in the autumn or in the spring.
2. It is interesting to note the increase in available nitrogen in November where an autumn application had been made and how this has disappeared when the spring assessment was made.

Lodging assessment % 15 July

Cultivations	Spring nitrogen	Autumn nitrogen (kg/ha)						Mean
		60	Nil 100	140	60	40 100	140	
Burn and plough early (within 5 days of harvest)	-	-	13	-	20	53	14	
Plough early	-	-	-	-	10	53	10	
Plough late (within 21 days of harvest)	-	-	-	-	13	50	10	
Incorporate to 10 cm plough late	-	-	3	-	13	50	11	
Incorporate to 20 cm plough late	-	-	3	-	13	32	8	
Bale and plough late	-	-	22	-	36	53	18	
Mean	-	-	7	-	17	48	12	

1. Autumn nitrogen increased lodging regardless of cultivation, particularly when 140 kg/ha of nitrogen was used in the spring.

Grain specific weight (kg/hl)

Cultivations	Spring nitrogen	Autumn nitrogen (kg/ha)						Mean
		60	Nil 100	140	60	40 100	140	
(ESE)					(<u>±</u> 0.258)		(<u>±</u> 0.306)	
Burn and plough early (within 5 days of harvest)		58.6	60.2	60.4	59.1	60.3	59.2	59.6
Plough early		60.9	60.7	61.0	61.0	61.0	59.4	60.7
Plough late (within 21 days of harvest)		60.4	61.4	61.6	60.6	60.8	60.6	60.9
Incorporate early to 10 cm plough late		60.1	59.6	60.9	60.5	61.1	61.1	60.5
Incorporate early to 20 cm plough late		60.6	60.7	60.8	60.0	60.6	60.6	60.5
Bale and plough late		60.0	61.1	60.2	60.9	60.5	59.8	60.4
(ESE) Mean		60.1	60.6	60.8	(<u>±</u> 0.242) 60.3	60.7	60.1	60.5
SE per plot (60 d.f.) = <u>±</u> 0.83 kg/hl or 1.4% of GM								

1. Specific weights were not affected by any of the treatments applied.