

CSG-COMMISSIONED R & D - EXPERIMENT REPORT

A/A2/ST09/004

STRAW INCORPORATION ON LIGHT LAND

Experiment Leader Mr Michael Palmer, Norfolk Agricultural Station, Morley St Botolph, Wymondham, Norfolk
Tel: Wymondham (0953) 605511

Project Leader Mr Robin Jarvis, Boxworth Experimental Husbandry Farm, Boxworth, Cambridge CB3 8NN
Tel: Elsworth (09547) 666

Status of Work Experimental work continuing

Year of Experiment 4

Report No. 2

Period Covered Financial year 1988/89; Harvest year 1988

Abstract

In this, the fourth year, of a long term study into the effect of different methods of straw disposal on light soils, there were no significant differences in the yield of cereal crops between the straw treatments at any of the three sites: Gleadthorpe, Morley and Arthur Rickwood.

At Gleadthorpe, winter barley yields were increased by the use of autumn nitrogen, but this effect was balanced by a similar response to the use of an equal amount of additional nitrogen applied in the spring.

At Morley, mixing chopped straw with the soil by cultivating before ploughing tended to reduce yields of a second wheat crop, but only at the lowest rate of spring nitrogen.

Objective

To determine the effects of time of ploughing and of mixing the chopped straw with a tined cultivator before ploughing on the subsequent crop.

Introduction

Earlier experimental work has shown that in some circumstances the incorporation of straw into the soil may lead to a reduction in the yield of the following crop. Incorporation by ploughing has generally kept yield reduction to a minimum and is the preferred primary cultivation on the lighter soils.

However, claims from continental Europe that pre-ploughing incorporation of the straw with a tined machine beneficial and that time of ploughing is a significant factor, need to be evaluated under United Kingdom conditions.

Materials and Methods

Sites

- 1 Arthur Rickwood EHF, Mepal, Ely, Cambs. (Peaty loam)
- 2 Gleadthorpe EHF, Meden Vale, Mansfield, Notts. (Loamy sand)
- 3 Norfolk Agricultural Station, Morley St Botolph, Wymondham, Norfolk. (Sandy loam)

Previous Cropping Sequence:

| | Gleadthorpe | Morley | A Rickwood |
|------|--------------|------------|------------|
| 1985 | W Barley | W Barley | W Wheat |
| 1986 | Oilseed Rape | Sugar Beet | Sugar Beet |
| 1987 | W Wheat | W Wheat | Onions |
| 1988 | W Barley | W Wheat | W Wheat |

Treatments

All combinations of:

- 1
 - i) Straw burnt; plough early
 - ii) Straw chopped; plough early
 - iii) Straw chopped; plough late
 - iv) Straw chopped; mix to 10 cm early, plough late
 - v) Straw chopped; mix to 20 cm early, plough late
 - vi) Straw baled; plough late

- 2
 - i) No autumn nitrogen
 - ii) Autumn nitrogen at 40kg/ha N

- 3 3 levels of spring nitrogen (actual levels depending on crop)

Design/layout

Cultivation treatments in randomised blocks, nitrogen treatments to subplots.

Results and Discussion

Table 1 Effect of straw treatment

Grain yield at 85% DM at all sites as a percentage of burn and plough early

| | Gleadthorpe (W Barley) | Morley (W Wheat) | A Rickwood (W Wheat) |
|-------------------------------------|---------------------------|---------------------|-------------------------|
| Burn and plough early (tonne/ha) | 100 (5.03) | 100 (6.35) | 100 (7.27) |
| Plough early | 101 | 100 | 101 |
| Plough late | 104 | 106 | 98 |
| Mix early to 10 cm, plough late | 102 | 97 | 101 |
| Mix early to 20 cm, plough late | 103 | 92 | 97 |
| Bale and plough late | 94 | 101 | - |
| (SED) | \pm 3.5 | \pm 3.8 | \pm 2.8 |

Table 2 Effect of autumn nitrogen

Grain yield at 85% DM at each site as a percentage of straw burnt without autumn nitrogen.

| Autumn nitrogen | Gleadthorpe | | Morley | | A Rickwood | |
|-------------------------------------|---------------|---------|---------------|---------|---------------|---------|
| | nil | applied | nil | applied | nil | applied |
| <u>Straw treatment</u> | | | | | | |
| Burn and plough early (tonne/ha) | 100 (4.81) | 109 | 100 (6.46) | 97 | 100 (7.24) | 101 |
| Plough early | 101 | 110 | 98 | 99 | 103 | 101 |
| Plough late | 105 | 112 | 102 | 106 | 98 | 98 |
| Mix early to 10 cm, plough late | 103 | 110 | 90 | 101 | 102 | 100 |
| Mix early to 20 cm, plough late | 104 | 112 | 92 | 89 | 97 | 99 |
| Bale and plough late | 98 | 98 | 99 | 100 | - | - |

1 The results from this fourth year of testing on two light mineral soils and one organic soil indicate no adverse effects on cereal yields from ploughing down straw compared with burning the straw then ploughing. This is in line with previous results.

2 There was no merit in deep straw incorporation rather than shallow or no incorporation prior to ploughing at any site.

3 Autumn nitrogen had no effect on yield at Morley or Arthur Rickwood. At Gleadthorpe, grain yield was increased by autumn nitrogen but this response was matched by a similar response to spring applied nitrogen.

4 There was no interaction between straw disposal treatment and nitrogen rate or timing at Gleadthorpe or Arthur Rickwood, but at Morley straw mixing before ploughing appeared to reduce yields at the lowest rate of spring nitrogen.

Conclusions

Results over 4 years have shown:

1 No reduction in yield from incorporating straw by ploughing.

2 No advantage from incorporating straw with tines before ploughing.

3 No advantage from deep incorporation before ploughing.

4 A unique response in yield to 40 kg/ha N applied in the autumn to oilseed rape at one site (High Mowthorpe) in 1987 only.

5 A yield reduction from straw incorporation before ploughing at the lowest spring N rate at Morley in 1988 suggesting increased lock-up of soil nitrogen by this extra cultivation. This has not been apparent in previous years or at other sites.

Acknowledgements

Thanks are due to all staff who contributed to the trials at the three centres.

Recommendations for future action

Future R and D

In view of the success of straw disposal on light soils by chopping and ploughing without encountering any serious problems in the short term, it is proposed that the present three sites should continue, but at a reduced level of monitoring, in order to provide information on the long term effects of the main cultivation treatments.