



Conversion strategies for stockless organic farming

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Introduction

Identification and analysis of optimum conversion strategies for stockless organic farming systems on the basis of **agronomic** and **economic** performance and applicability to different soil types and farm business situations.

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Objectives

- Monitor soil structure and nutrient status
- Assess the impact of strategies on subsequent cropping
 - three organic crops after conversion
- Assess impact of strategies on profit, risk, return on investment and cash flow
- Provide a practical aid to growers

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Background

- 20 ha entered conversion August 1999
 - Previous crop winter wheat
- 1.5 ha experiment
 - 2 replicates on sandy soil, 2 replicates on clay loam
- Conversion strategies for stockless systems
- Strategies chosen to stretch the agronomic and economic test bed as far as possible
- Three crops post conversion:
 - Winter wheat
 - Winter beans
 - Winter oats

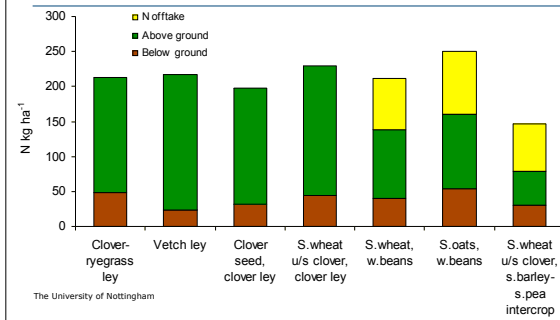
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Conversion strategies

Year 1 Conversion	Year 2 Conversion	Perceived risk
Red clover / ryegrass	Red clover / ryegrass	Low
Vetch	Vetch	Low
Red clover seed	Red clover	Medium
S.wheat u/s red clover	Red clover	Medium
S.wheat	W.beans	High
S.oats	W.beans	High
S.wheat u/s red clover	S.barley/peas	High

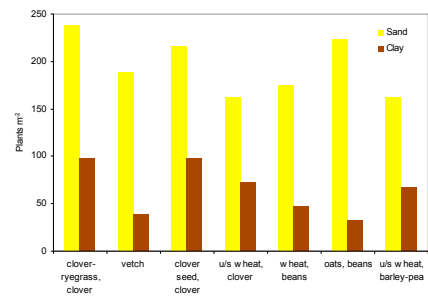
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System N at end of conversion period



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Wheat establishment



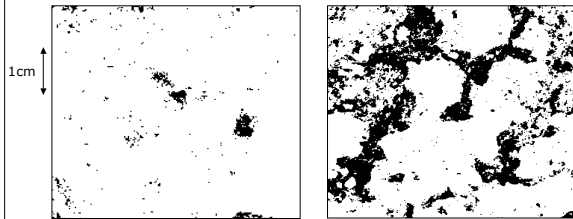
Visual soil structure scores

Conversion cropping	Sand	Clay	Mean
RCRC	7.29	6.21	6.75
VEVR	6.50	5.50	6.00
CSRC	6.71	6.21	6.46
UWRC	6.29	5.93	6.11
WHBE	6.50	5.00	5.75
OABE	6.57	5.00	5.79
UWBP	6.00	5.57	5.79
Mean	6.55	5.63	

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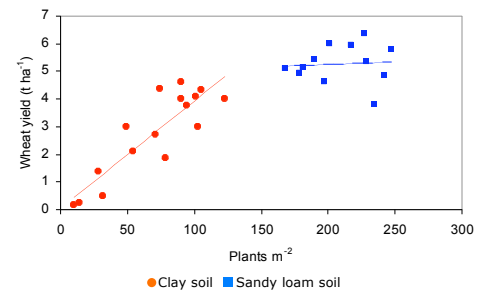
Images of soil structure

Black pixels indicate pore spaces

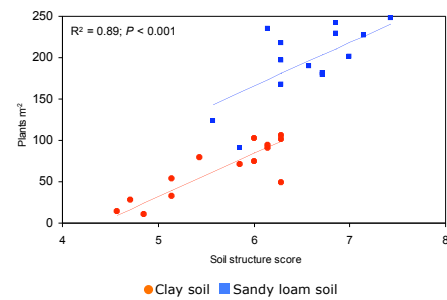


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Relationship between plant population and yield



Relationship between soil structure and plant population



What determined yield of wheat?

- Plant population was the main yield determining factor
- Variation in plant population caused by:
 - Impact of conversion strategies on soil structure
 - Interaction of soil structure and texture
- Weed competition did not limit yield
- Any effects of N were masked by response to plant population

Subsequent organic crops

- Winter beans (2002/3)
- Winter oats (2003/4)

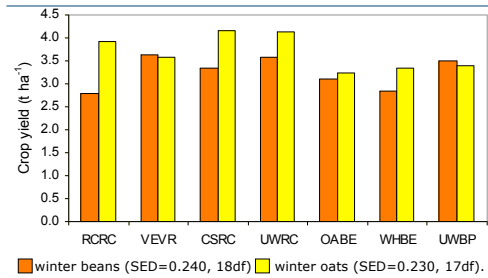
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Soil mineral nitrogen (kg ha^{-1})

Conversion strategy	Dec 01	Sep 02	Feb 03	Nov 03	Feb 04	Aug 04
RCRC	134.1	37.7	37.0	83.4	30.6	23.2
VEVR	93.7	23.0	35.0	74.2	32.9	19.9
CSRC	118.0	33.7	53.3	91.0	38.8	23.4
UWRC	126.0	33.5	38.6	90.4	38.6	22.3
OABE	78.2	15.1	26.8	71.0	25.2	16.4
WHBE	85.9	15.2	26.3	64.8	24.3	16.9
UWBP	79.1	19.2	33.2	79.4	25.5	21.4
P Value	<0.001	< 0.001	< 0.001	0.026	0.144	0.007
SED(18 df)	12.78	4.76	4.35	7.82	6.43	1.97

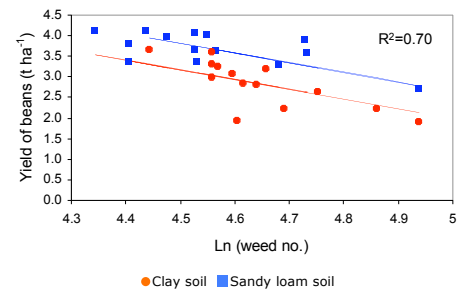
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Winter bean and winter oat yield



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Relationship between weed number and yield of beans



What determined the yield of oats?

Soil mineral nitrogen, together with weed competition, accounted for 72% of the variation in oat yield ($P < 0.001$):

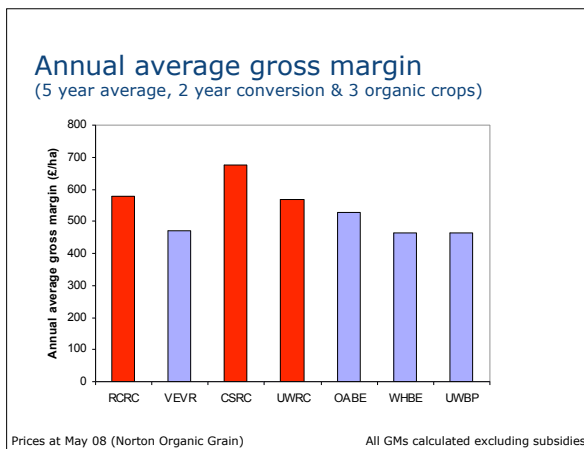
$$\text{Oat yield} = 4.196 - 0.192 \times \text{sqrt}(\text{weed no.}) + 0.01837 \times \text{SMN}$$

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What determined yield of the organic crops?

Crop	Yield determining factor		
	Soil structure	Soil mineral N	Weed competition
Wheat	✓	?	✗
Beans	✗	✗	✓
Oats	✗	✓	✓

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- ### Recommendations
- **Red clover/ryegrass**
 - Recommended for risk averse grower (2nd highest GM)
 - Provides good soil structure
 - Soil mineral N improved for next 3 years
 - Suppresses weeds post-conversion
 - **Undersown wheat – red clover**
 - Medium risk option
 - Similar GM to RCRC
 - Acceptable soil structure
 - SMN improved for next 3 years
 - Potential to provide income during conversion period
 - **Clover seed – red clover**
 - Highest gross margin over 5 years
 - Highly variable clover seed yield
 - Uncertain market / difficulty in obtaining reproduction seed
 - Recommended for a risk-taking grower



Thank you for listening.

Any questions?