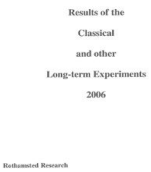
Results of the Classical and Other Long-term Experiments 2006



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06/W/RN/3

LEY/ARABLE

Object: To compare the effects on soil fertility of rotations with or without leys - Woburn, Stackyard D.

Sponsors: P.R. Poulton and A.J. Macdonald.

The 69th year, leys, w. beans, w. wheat, w. rye, forage maize.

For previous years see 'Details' 1967 & 1973 and 74-05/W/RN/3.

Design: 5 series of 8 plots, split for treatments other than rotations.

Whole plot dimensions: 8.53 x 40.7.

Treatments: All phases of four five-course rotations were originally present:

ROTATION

LEY	Clover/grass ley:	L, L, L, P, W
CLO	All legume ley:	SA, SA, SA, P, W until 1971 then CL, CL, CL, P, W
A	Arable with roots:	P, R, C, P, W until 1971 then P, B, B, P, W
A H	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, W

P = potatoes, R = w. rye, C = carrots, W = w. wheat, B = s. barley, H = hay, L = clover/grass ley, SA = sainfoin ley, CL = red clover ley

Rotations themselves followed different cycles:

On four plots in each block the rotations were repeated

On four plots in each block arable rotations alternated each five years with ley rotations

From 1976 all the rotations were changed on all phases except for the first and second test crops in 1976:

LN 3	(Previous LEY) LN1, LN2, LN3, W, R
LC 3	(Previous CLO) LC1, LC2, LC3, W, R
AF	(Previous A) F, F, BE, W, R
AB	(Previous A H) B, B, BE, W, R

From 1998 rotations AF and AB are replaced by AM and ABe respectively. Phased in at the beginning of each treatment crop sequence.

AM	R, BE, M, W, R
ABe	R, M, BE, W, R

ROTATION (continued)

LN1 to LN3 = three year grass ley with N, 1st year to 3rd year,
LC = clover/grass ley, no N, BE = beans (s. oats until 1980), F = fallow,
M = forage maize

Plots hitherto in alternating rotations were changed to test eight-year leys and two test crops:

LLN	LLN1, LLN2, LLN3, LLN4, LLN5, LLN6, LLN7, LLN8, W, R
LLC	LLC1, LLC2, LLC3, LLC4, LLC5, LLC6, LLC7, LLC8, W, R

LLN1 to LLN8 = eight year grass ley with nitrogen, first year to eighth year, similarly for LLC - clover/grass ley, no nitrogen

The new scheme started by sowing these new leys in spring 1976 on four phases and in spring 1977 on the fifth phase (2nd test crop in 1976).

In 1992 w. rye (R) replaced s. barley (B) as the second test crop.

Yields are taken from the leys, arable treatment crops and the test crops.

Treatments to first test crop w. wheat, all combinations of:

Whole plots:

1. **ROTATION** Rotations before wheat:

   LLN 8
   LN 3
   LLC 8
   LC 3
   AM
   ABe

1/2 plots:

2. **NSPLIT(FYM res)** Farmyard manure residues, last applied 1960s: Split N *v* single N dressing to wheat, tested 2001-5

   Nsplit(noFYM)
   Nsingle(FYM)

1/8 plots:

3. **N** Nitrogen fertilizer as single dressing in spring 2006 (kg N) as 34.5% N:

   0
   70
   140
   210

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Treatments to second test crop w. rye, all combinations of:

Whole plots:

1. **ROTATION** Rotations before first test crop:

   LLN 8
   LN 3
   LLC 8
   LC 3
   AF
   AB

1/2 plots:

2. **NSPLIT(FYM res)** Farmyard manure residues, last applied 1960s:

   Nsplit to wheat in 2005(noFYM)
   Nsingle to wheat in 2005 (FYM)

1/8 plots:

3. **N** Nitrogen fertilizer in spring 2006(kg N) as 34.5% N:

   0
   40
   80
   120

Treatments to leys:

FYM RES Farmyard manure residues:

NONE
FYM 38 t on each occasion, last applied 1960s.

NOTE: Corrective K dressings (kg K_2O) as muriate of potash, applied where necessary to first test crop w. wheat and long-term leys in the wheat block, applied 8 October 2005.

Continuous rotations before wheat	No FYM half plots	FYM Res half plots
ABe	230	330
AM	190	190

None to other plots.

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Experimental diary:
Grass ley and clover/grass ley, 1st year (**ROTATION** LN1, LLN1, LC1, and LLC1)

21-Sep-05	Azural @ 3.0 l in 200 l.
08-Oct-05	Triplesuperphosphate at 213 kg Potassium sulphate at 140 kg.
10-Oct-05	Ploughed 35cm wide furrows.
11-Oct-05	Rolled.
14-Oct-05	Power harrowed. Drilled Promesse Timothy + Tyko Fescue, 50:50, @ 30 kg and Promesse Timothy + Tyko Fescue + Chieftan White Clover, 44:44:12 @ 30 kg with the Accord drill.
18-Oct-05	Rolled.
02-Nov-05	27.0% N at 93 kg, 1st year grass/clover leys; at 185 kg, 1st year grass leys.
02-Mar-06	Muriate of potash at 167 kg.
17-Mar-06	34.5% N at 218 kg.
28-Jun-06	Cut yield strips, weighed and sampled.
29-Jun-06	Baled.
03-Jul-06	Muriate of Potash at 83 kg to all leys. 34.5% N at 218 kg to grass leys only.

Note: Due to poor re-growth the scheduled second grass or grass/clover ley cut was abandoned.

Grass leys 2nd to 8th year (**ROTATION** LN2-3 and LLN2-8)

01-Mar-06	Potassium sulphate at 140 kg, Triple superphosphate at 213 kg.
02-Mar-06	Muriate of potash at 167 kg.
17-Mar-06	34.5% N at 203 kg
28-Jun-06	Cut yield strips, weighed and sampled.
29-Jun-06	Baled.
03-Jul-06	Muriate of Potash at 83 kg 34.5% N at 218 kg.
10-Aug-05	Azural at 4.0 l in 200 l to ley plots going into wheat.

Note: Due to poor re-growth the scheduled second grass ley cut was abandoned.

Clover/grass leys 2nd to 8th year (**ROTATION** LC2-3 and LLC2-8)

01-Mar-06	Potassium sulphate at 140 kg, Triple superphosphate at 213 kg.
02-Mar-06	Muriate of potash at 167 kg.
28-Jun-06	Cut yield strips, weighed and sampled.
29-Jun-06	Baled.
03-Jul-06	Muriate of Potash at 83 kg.
18-Jul-06	Azural at 5.0 l in 200 l to ley plots going into wheat.

Note: Due to poor re-growth the scheduled second grass/clover ley cut was abandoned.

W. beans, 2nd and 3rd treatment crop (**ROTATION** AM and ABe)

08-Oct-05	Triple superphosphate at 127 kg.
20-Oct-05	Broadcast, Wizard, recleaned at 20 seeds/m^2. Ploughed 35 cm wide furrows, springtine.
27-Oct-05	Stomp 400 SC at 3.3 l.
01-Mar-06	Potassium sulphate at 140 kg.
16-May-06	tm)Bravo 500 at 1.0 l in 200 l. tm)Folicur at 0.5 l in 200 l. tm)Decis at 0.3 l in 200 l.

	tm) Mancozin at 1.0 l in 200 l.
18-Jun-06	tm) Bravo 500 at 2.0 in 200 l.
	tm) Folicur at 0.75 in 200 l.
	tm) Aphox at 0.28 g in 200 l.
27-Aug-06	Combine harvested plots for yield. Straw swathed.
	Combine harvested discards. Straw swathed.

Forage maize, 2nd and 3rd treatment crop (**ROTATION** ABe and AM)

08-Oct-05	Triple superphosphate at 127 kg.
10-Oct-05	Ploughed 35 cm wide furrows.
01-Mar-06	Potassium sulphate at 140 kg.
11-May-06	Flexitined and power harrowed.
12-May-06	Drilled, Hudson, tr. Thiram + Methiocarb + fludioxonil + metalaxyl M, at 10.2 seeds/m^2 with the Nodet drill.
	34.5% N at 290 kg.
07-Jun-06	tm) Jester at 0.5 l in 200 l.
	tm) Griffin Gex 1664 at 0.2 l in 200 l.
05-Oct-06	Cut sampled and weighed.

W. wheat, 1st test crop (W)

10-Aug-05	Azural at 4.0 l in 200 l
08-Sep-05	Baled
08-Oct-05	Triple superphosphate at 127 kg.
	Muriate of potash (corrective K) at 190 kg K_2O to plots 39 and 40, 230 kg to 45 and 330 kg to 46.
10-Oct-05	Ploughed 35 cm wide furrows.
11-Oct-05	Rolled.
14-Oct-05	Power harrowed. Drilled Hereward, tr. Sibutol Secur, at 350 seeds/m^2 with the Accord drill. Rolled.
13-Nov-05	tm) Alpha IPU 500 at 2.0 l in 200 l.
	tm) Stomp 400 SC at 2.5 l in 200 l.
	tm) Hallmark with Zeon Technology at 50 ml in 200 l.
	tm) Mantrac 500 at 1.0 l in 200 l.
01-Mar-06	Potassium sulphate at 140 kg
19-Apr-06	34.5% N treatments.
24-Apr-06	tm) Opus at 0.75 l in 200 l.
	tm) Bravo 500 at 1.25 l in 200 l.
	tm) Mantrac 500 at 1.25 l in 200 l.
16-May-06	tm) Quantum SX at 30 g in 200 l.
	tm) Copper Man at 2.0 kg in 200 l.
	tm) Opus at 0.75 l in 200 l.
07-Jun-06	tm) Opus at 0.75 l in 200 l.
	tm) Bravo 500 1.0 l in 200 l.
	tm) Vivid 0.4 l in 200 l.
27-Aug-06	Combine harvested plots for yield. Straw swathed.

W. rye, 2nd test crop and 1st treatment crop (**ROTATION** ABe and AM)

21-Sep-05	Azural @ 3.0 l in 200 l.
08-Oct-05	Chalk at 5.0 t, (not to ROTATION ABe and AM plots).
	Triple superphosphate at 127 kg.
10-Oct-05	Ploughed 35 cm wide furrows.
11-Oct-05	Rolled.
18-Oct-05	Power harrowed. Drilled, Matador, tr. Robust and Premis, at 125 kg/ha with the Accord drill. Rolled.
13-Nov-05	Stomp 400 SC at 2.5 l in 200 l.
	tm) Hallmark with Zeon Technology at 50 ml in 200 l.
	tm) Mantrac 500 at 1.0 l in 200 l.
01-Mar-06	Potassium sulphate at 140 kg
19-Apr-06	34.5% N treatments to 2nd test crop only.
24-Apr-06	Opus at 0.75 l in 200 l.
	Moddus at 0.2 l in 200 l.

26 Apr-06`	34.5% N at 232 kg to 1st treatment crops.
16-May-06	tm)Quantum SX at 30 g in 200 l.
	tm)Copper Man at 2.0 kg in 200 l.
27-Aug-06	Combine harvested plots for yield. Straw swathed.

Note: Samples of grain, forage maize, herbage taken for chemical analysis

06/W/RN/3

LEYS

1ST (AND ONLY) CUT (28/6/06) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FYM_RES	NONE	FYM	Mean
LEY			
LC1	3.53	3.54	3.54
LC2	4.48	4.75	4.61
LC3	6.16	5.24	5.70
LN1	6.60	6.77	6.68
LN2	8.84	8.64	8.74
LN3	7.43	8.56	8.00
LLC1	4.39	3.81	4.10
LLC2	3.74	3.36	3.55
LLC3	6.74	7.15	6.95
LLC4	4.54	5.20	4.87
LLC5	4.49	3.87	4.18
LLC6	4.70	4.40	4.55
LLC7	4.23	3.99	4.11
LLC8	5.31	5.06	5.19
LLN1	5.97	6.07	6.02
LLN2	7.51	6.92	7.21
LLN3	6.49	7.18	6.83
LLN4	6.69	7.45	7.07
LLN5	7.00	6.49	6.75
LLN6	6.08	6.21	6.15
LLN7	6.83	6.73	6.78
LLN8	7.85	6.74	7.29
Mean	5.89	5.82	5.86

1ST CUT MEAN DM% 35.2

PLOT AREA HARVESTED 0.00200

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ARABLE TREATMENT CROPS

RYE

GRAIN (85% DRY MATTER) TONNES/HECTARE

***** Tables of means *****

FYMRES / ROTATION	NONE	FYM	Mean
AM	5.22	4.71	4.96
ABe	4.96	5.36	5.16
Mean	5.09	5.03	5.06

GRAIN MEAN DM% 81.5

PLOT AREA HARVESTED 0.00413

MAIZE

WHOLE CROP (100% DRY MATTER) TONNES/HECTARE

***** Tables of means *****

FYMRES / ROTATION	NONE	FYM	Mean
AM	15.64	14.52	15.08
ABe	15.29	14.14	14.72
Mean	15.47	14.33	14.90

GRAIN MEAN DM% 42.5

PLOT AREA HARVESTED 0.00108

BEANS

GRAIN (85% DRY MATTER) TONNES/HECTARE

***** Tables of means *****

FYMRES / ROTATION	NONE	FYM	Mean
AM	1.60	3.10	2.35
ABe	3.62	2.67	3.15
Mean	2.61	2.88	2.75

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00413

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W. WHEAT

GRAIN TONNES/HECTARE

***** Tables of means *****

FYMRES	none	FYM	Mean
ROTATION			
LLN 8	6.80	8.16	7.48
LN 3	7.76	7.29	7.52
LLC 8	7.42	7.86	7.64
LC 3	7.46	7.61	7.53
AM	5.43	5.96	5.69
ABe	7.03	7.97	7.50
Mean	6.98	7.47	7.23

N	0	70	140	210	Mean
ROTATION					
LLN 8	6.80	8.19	7.20	7.73	7.48
LN 3	5.80	8.06	8.34	7.90	7.52
LLC 8	6.79	7.78	8.23	7.77	7.64
LC 3	6.10	8.11	8.41	7.50	7.53
AM	1.84	5.90	7.11	7.93	5.69
ABe	4.04	7.96	8.65	9.34	7.50
Mean	5.23	7.67	7.99	8.03	7.23

N	0	70	140	210	Mean
FYMRES					
none	4.85	7.53	7.76	7.79	6.98
FYM	5.61	7.80	8.22	8.27	7.47
Mean	5.23	7.67	7.99	8.03	7.23

N		0	70	140	210
ROTATION	FYMRES				
LLN 8	none	5.70	7.95	6.22	7.34
	FYM	7.90	8.43	8.17	8.12
LN 3	none	5.58	8.39	9.03	8.05
	FYM	6.02	7.74	7.65	7.74
LLC 8	none	6.40	7.49	7.98	7.80
	FYM	7.17	8.07	8.48	7.74
LC 3	none	6.32	8.27	8.25	6.98
	FYM	5.89	7.95	8.58	8.03
AM	none	1.40	5.66	6.93	7.71
	FYM	2.28	6.14	7.28	8.14
ABe	none	3.68	7.42	8.15	8.86
	FYM	4.40	8.50	9.15	9.82

GRAIN MEAN DM% 80.7

PLOT AREA HARVESTED 0.00183

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06/W/RN/3

W. RYE

GRAIN TONNES/HECTARE

***** Tables of means *****

NSPLITFYM / **ROTATION**	Nsplit(noFYM)	Nsingle(FYM)	Mean
LLN 8	4.36	4.96	4.66
LN 3	6.32	5.98	6.15
LLC 8	6.46	5.92	6.19
LC 3	6.43	5.82	6.13
AM	4.48	4.59	4.54
ABe	5.57	5.47	5.52
Mean	5.60	5.46	5.53

N / **ROTATION**	0	40	80	120	Mean
LLN 8	3.33	4.43	5.03	5.87	4.66
LN 3	4.94	6.26	6.31	7.09	6.15
LLC 8	5.27	6.10	6.65	6.73	6.19
LC 3	4.77	6.48	6.67	6.58	6.13
AM	2.30	4.05	5.71	6.09	4.54
ABe	3.57	5.01	6.13	7.37	5.52
Mean	4.03	5.39	6.08	6.62	5.53

N / **NSPLITFYM**	0	40	80	120	Mean
Nsplit(noFYM)	4.21	5.44	6.29	6.48	5.60
Nsingle(FYM)	3.85	5.34	5.88	6.76	5.46
Mean	4.03	5.39	6.08	6.62	5.53

N / **ROTATION** / **NSPLITFYM**	0	40	80	120
LLN 8N split(noFYM)	3.43	3.76	4.55	5.73
Nsingle(FYM)	3.23	5.09	5.52	6.01
LN 3N split(noFYM)	4.96	6.53	6.63	7.17
Nsingle(FYM)	4.93	5.98	6.00	7.00
LLC 8N split(noFYM)	5.63	6.19	7.26	6.76
Nsingle(FYM)	4.92	6.02	6.04	6.70
LC 3N split(noFYM)	5.08	7.04	7.45	6.16
Nsingle(FYM)	4.47	5.93	5.89	6.99
AM Nsplit(noFYM)	2.32	4.01	5.88	5.72
Nsingle(FYM)	2.27	4.09	5.54	6.45
Abe Nsplit(noFYM)	3.83	5.10	5.99	7.35
Nsingle(FYM)	3.30	4.92	6.27	7.39

GRAIN MEAN DM% 81.1

PLOT AREA HARVESTED 0.00183