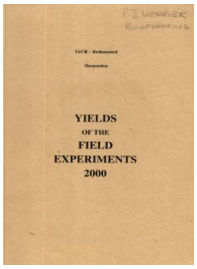
ROTHAMSTED RESEARCH

Yields of the Field Experiments 2000

Full Table of Content



00/W/RN/3 Ley/ARABLE - Leys, W. Beans, W. Wheat, W. Rye, Forage Maize

Rothamsted Research

Rothamsted Research (2001) *00/W/RN/3 Ley/ARABLE - Leys, W. Beans, W. Wheat, W. Rye, Forage Maize ;* Yields Of The Field Experiments 2000, pp 35 - 45 **- DOI: https://doi.org/10.23637/ERADOC-1-55**

00/W/RN/3

LEY/ARABLE

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

Sponsor: P.R. Poulton.

The 63rd year, leys, w. beans, w. wheat, w. rye, forage maize.

For previous years see 'Details' 1967 & 1973 and 74-99/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.

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

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

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 only from the leys, forage maize 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
   AF
   AB

1/2 plots:

2. **FYMRES64** Farmyard manure residues, last applied 1964:

   NONE
   FYM 38 t on each occasion

1/8 plots:

3. **N** Nitrogen fertilizer in spring 2000 (kg N) as 27% N:

   0
   70
   140
   210

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

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. **FYMRES63** Farmyard manure residues, last applied 1963:

   NONE
   FYM 38 t on each occasion

1/8 plots:

3. **N** Nitrogen fertilizer in spring 2000 (kg N) as 27% N:

   0
   40
   80
   120

Treatments to leys:

FYM RES Farmyard manure residues:

NONE
FYM 38 t on each occasion, last applied 1962 to 1st and 6th year leys, 1966 to 2nd and 7th year leys, 1965 to 3rd and 8th year leys, 1964 to 4th year leys, 1963 to 5th year leys.

NOTE: Corrective K dressings (kg K_2O) as muriate of potash, applied to first test crop w. wheat and long-term leys in the wheat block. This was omitted in error and will be applied in spring 2001 to the rye crop.

Continuous rotations before wheat	No FYM half plots	FYM half plots
AF	(265)	(245)
AB	(245)	(360)

None to other plots.

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00/W/RN/3

Experimental diary:

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

13-Sep-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 213 kg.
14-Sep-99 : **T** : Ploughed.
17-Sep-99 : **T** : Rolled.
03-Oct-99 : **T** : Spring-tine cultivated.
04-Oct-99 : **T** : LC1 and LLC1 only: 27% N at 93 kg.
: **T** : LN1 and LLN1 only: 27% N at 185 kg.
: **T** : Rotary harrowed.
: **T** : LC1 and LLC1 only: Promesse Timothy, Laura Meadow Fescue and Merwi white clover mixture (44.4:44.4:11.2 %) drilled at 30kg.
: **T** : LN1 and LLN1 only: Promesse Timothy and Laura Meadow Fescue mixture (50:50 %) drilled 30kg.
07-Oct-99 : **T** : Rolled.
19-Mar-00 : **T** : Legumex Extra at 7.0 l in 200 l.
22-Mar-00 : **T** : LN1 and LLN1 only: 27% N at 278 kg.
23-Mar-00 : **T** : Muriate of potash at 167 kg
13-Jun-00 : **T** : First cut.
17-Jun-00 : **T** : Hay turned.
18-Jun-00 : **T** : Hay turned.
19-Jun-00 : **T** : Hay baled and removed.
22-Jun-00 : **T** : Muriate of potash at 83kg.
: **T** : LN1 and LLN1 only: 27% N at 278 kg.
23-Jun-00 : **T** : Topped.
15-Jan-01 : **T** : Second cut.

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

08-Dec-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 213 kg.
19-Mar-00 : **T** : Legumex Extra at 7.0 l in 200 l.
22-Mar-00 : **T** : 27% N at 278 kg.
23-Mar-00 : **T** : Muriate of potash at 167 kg.
13-Jun-00 : **T** : First cut.
17-Jun-00 : **T** : Hay turned.
18-Jun-00 : **T** : Hay turned.
19-Jun-00 : **T** : Hay baled and removed.
22-Jun-00 : **T** : Muriate of potash at 83kg, 27% N at 278 kg.
23-Jun-00 : **T** : Topped.
30-Aug-00 : **T** : LN3 and LLN8 only: Second cut
15-Jan-01 : **T** : Remaining leys: Second cut.

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

08-Dec-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 213 kg.
19-Mar-00 : **T** : Legumex Extra at 7.0 l in 200 l.
23-Mar-00 : **T** : Muriate of potash at 167 kg.
13-Jun-00 : **T** : First cut.
17-Jun-00 : **T** : Hay turned.
18-Jun-00 : **T** : Hay turned.
19-Jun-00 : **T** : Hay baled and removed.
22-Jun-00 : **T** : Muriate of potash at 83kg.
23-Jun-00 : **T** : Topped.
30-Aug-00 : **T** : LN3 and LLN8 only: Second cut.
15-Jan-01 : **T** : Remaining leys: Second cut.

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

Experimental diary:

W. beans, 2nd and 3rd treatment crop (**ROTATION** ABe and AM):
- 13-Sep-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 127 kg.
- 28-Oct-99 : **T** : Punch C broadcast at 27 seeds/m^2, ploughed.
- 16-Dec-99 : **T** : Alpha Simazine 50 SC at 2.0 l in 220 l.
- 21-Aug-00 : **T** : Combine harvested.
- 25-Aug-00 : **T** : Straw baled and removed.

Forage maize, 2nd treatment crop (**ROTATION** ABe):
- 13-Sep-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 213 kg.
- 04-Feb-00 : **T** : Ploughed.
- 17-May-00 : **T** : Rotary harrowed. Hudson, tr. Mesurol, drilled at 10.2 seeds/m^2 with the Nodet Gougis drill.
- 01-Jun-00 : **T** : 27 % N at 370 kg.
- 16-Jun-00 : **T** : Gesaprim at 3.0 l with Toil at 3.0 l in 200 l.
- 02-Oct-00 : **T** : Cut.

W. wheat, 1st test crop (W):
- 28-Aug-99 : **T** : Roundup at 4.0 l in 200 l.
- 13-Sep-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 213 kg.
- 14-Sep-99 : **T** : Ploughed.
- 17-Sep-99 : **T** : Rolled.
- 03-Oct-99 : **T** : Spring-tine cultivated.
- 04-Oct-99 : **T** : Rotary harrowed, Hereward, tr. Sibutol, drilled at 380 seeds/m^2 with the Accord drill.
- 07-Oct-99 : **T** : Rolled
- 12-Nov-99 : **T** : Spannit 1.5 l in 100 l
- 21-Mar-00 : **T** : Ally at 30 g with Topic at 125 ml and Cropoil at 1.0 in 200 l.
- 13-Apr-00 : **T** : **N** 70, 140, 210: N applied as 27% N.
- 20-May-00 : **T** : Opus at 0.75 l in 200 l.
- 22-Aug-00 : **T** : Combine harvested.

W. rye, 2nd test crop (R) and 1st treatment crop (**ROTATION** ABe and AM):
- 28-Aug-99 : **T** : Roundup at 3.0 l in 200 l.
- 13-Sep-99 : **T** : Potassium sulphate at 140 kg, triple superphosphate at 213 kg.
- 14-Sep-99 : **T** : Ploughed.
- 17-Sep-99 : **T** : Rolled.
- 03-Oct-99 : **T** : Spring-tine cultivated.
- 04-Oct-99 : **T** : Rotary harrowed.
- 06-Oct-99 : **T** : Esprit, tr. Baytan Flowable, drilled at 300 seeds/m^2 with the Accord drill. Rolled.
- 12-Oct-99 : **T** : Stomp 400 SC at 2.5 l with Isoguard at 1.0 l in 200 l.
- 11-Nov-99 : **T** : Hallmark at 100 ml in 100 l.
- 13-Apr-00 : **T** : R only: **N** 40, 80, 120: N applied as 27% N.
- : **T** : ABe and AM only: 27 % N at 296 kg.
- 08-Jun-00 : **T** : Folicur at 0.5 l in 200 l.
- 22-Aug-00 : **T** : Combine harvested.

NOTE: Samples of grass, grass and clover, forage maize, bean, wheat and rye grains were taken for chemical analysis.

https://doi.org/10.23637/ERADOC-1-55 *pp 6*

00/W/RN/3

LEYS

1ST CUT (13/6/00) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	2.97	3.16	3.07
LC2	6.87	6.66	6.76
LC3	7.70	8.15	7.93
LN1	1.03	1.20	1.11
LN2	9.13	8.63	8.88
LN3	7.08	7.72	7.40
LLC1	1.48	1.97	1.73
LLC2	6.44	6.21	6.32
LLC3	7.13	7.03	7.08
LLC4	5.80	5.74	5.77
LLC5	4.50	5.71	5.10
LLC6	6.53	6.69	6.61
LLC7	5.99	5.77	5.88
LLC8	5.32	4.45	4.88
LLN1	3.91	4.73	4.32
LLN2	8.75	8.92	8.84
LLN3	8.58	8.91	8.74
LLN4	7.19	7.26	7.22
LLN5	7.75	7.28	7.52
LLN6	7.50	7.84	7.67
LLN7	7.65	7.74	7.70
LLN8	7.85	6.88	7.37
Mean	6.23	6.30	6.27

1ST CUT MEAN DM% 28.3

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

LEYS

2ND CUT (30/08/00 AND 15/01/01) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	0.10	0.20	0.15
LC2	0.54	0.48	0.51
LC3	0.62	0.78	0.70
LN1	1.26	0.84	1.05
LN2	0.59	0.52	0.56
LN3	2.47	3.02	2.74
LLC1	0.40	0.40	0.40
LLC2	1.25	2.01	1.63
LLC3	0.82	0.49	0.65
LLC4	0.03	0.07	0.05
LLC5	0.16	0.09	0.13
LLC6	0.22	0.19	0.20
LLC7	0.17	0.09	0.13
LLC8	0.68	0.88	0.78
LLN1	1.21	1.50	1.35
LLN2	0.77	0.78	0.78
LLN3	1.36	1.59	1.47
LLN4	0.53	0.85	0.69
LLN5	0.95	1.27	1.11
LLN6	1.97	2.18	2.08
LLN7	0.75	0.75	0.75
LLN8	2.24	2.51	2.38
Mean	0.87	0.98	0.92

2ND CUT MEAN DM% 43.4

NOTE: LN3, LLN8, LC3, LLC8 cut on 30/08/00, remainder on 15/01/01.

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

LEYS

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	3.07	3.36	3.22
LC2	7.41	7.14	7.27
LC3	8.33	8.93	8.63
LN1	2.30	2.03	2.17
LN2	9.73	9.15	9.44
LN3	9.55	10.75	10.15
LLC1	1.88	2.37	2.13
LLC2	7.69	8.22	7.95
LLC3	7.95	7.52	7.73
LLC4	5.82	5.80	5.81
LLC5	4.66	5.80	5.23
LLC6	6.76	6.87	6.81
LLC7	6.16	5.86	6.01
LLC8	6.00	5.33	5.66
LLN1	5.11	6.23	5.67
LLN2	9.53	9.70	9.61
LLN3	9.94	10.50	10.22
LLN4	7.71	8.11	7.91
LLN5	8.70	8.55	8.62
LLN6	9.48	10.02	9.75
LLN7	8.40	8.49	8.44
LLN8	10.09	9.39	9.74
Mean	7.10	7.28	7.19

TOTAL OF 2 CUTS MEAN DM% 35.8

PLOT AREA HARVESTED 0.00200

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

MAIZE

WHOLE CROP (100% DRY MATTER) TONNES/HECTARE

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

FYMRES / ROTATION	NONE	FYM	Mean
AM	11.61	15.78	13.69
AB	12.18	12.04	12.11
Mean	11.90	13.91	12.90

GRAIN MEAN DM% 30.0

PLOT AREA HARVESTED 0.00108

BEANS

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES	
NONE	3.97
FYM	4.36
Mean	4.17

GRAIN MEAN DM% 85.5

PLOT AREA HARVESTED 0.00472

https://doi.org/10.23637/ERADOC-1-55

00/W/RN/3

W. WHEAT

GRAIN TONNES/HECTARE

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

FYMRES64	NONE	FYM	Mean
ROTATION			
LLN 8	6.27	6.09	6.18
LN 3	6.90	7.01	6.95
LLC 8	7.86	7.33	7.59
LC 3	8.34	7.95	8.15
AF	5.04	4.71	4.87
AB	4.24	3.78	4.01
Mean	6.44	6.14	6.29

N	-	1	2	3	Mean
ROTATION					
LLN 8	3.42	6.58	7.22	7.49	6.18
LN 3	3.40	7.06	8.64	8.71	6.95
LLC 8	4.31	7.47	8.95	9.65	7.59
LC 3	5.05	8.24	8.96	10.33	8.15
AF	0.96	4.87	6.28	7.39	4.87
AB	1.45	4.54	4.52	5.53	4.01
Mean	3.10	6.46	7.43	8.18	6.29

N	-	1	2	3	Mean
FYMRES64					
NONE	3.17	6.87	7.39	8.33	6.44
FYM	3.03	6.05	7.46	8.04	6.14
Mean	3.10	6.46	7.43	8.18	6.29

N	-	1	2	3
ROTATION	FYMRES64			
LLN 8	NONE	3.45	7.76	6.91	6.95
	FYM	3.40	5.39	7.52	8.04
LN 3	NONE	3.42	7.11	8.78	8.27
	FYM	3.37	7.00	8.50	9.14
LLC 8	NONE	4.71	8.10	8.99	9.64
	FYM	3.91	6.83	8.91	9.65
LC 3	NONE	5.77	8.73	8.58	10.27
	FYM	4.33	7.74	9.34	10.40
AF	NONE	0.37	4.99	6.15	8.64
	FYM	1.54	4.75	6.40	6.15
AB	NONE	1.28	4.52	4.93	6.22
	FYM	1.61	4.57	4.10	4.83

GRAIN MEAN DM% 83.5

PLOT AREA HARVESTED 0.00183

https://doi.org/10.23637/ERADOC-1-55 *pp 11*

00/W/RN/3

W. RYE

GRAIN TONNES/HECTARE

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

FYMRES63	NONE	FYM	Mean
ROTATION			
LLN 8	8.78	7.97	8.38
LN 3	8.28	7.70	7.99
LLC 8	7.67	7.60	7.63
LC 3	7.73	8.18	7.95
AF	7.10	5.99	6.54
AB	6.30	6.64	6.47
Mean	7.64	7.35	7.49

N	-	1	2	3	Mean
ROTATION					
LLN 8	6.08	8.57	9.49	9.36	8.38
LN 3	6.48	8.06	8.88	8.54	7.99
LLC 8	6.33	8.15	8.19	7.86	7.63
LC 3	5.65	7.62	9.15	9.38	7.95
AF	3.86	6.64	7.44	8.24	6.54
AB	3.34	5.99	7.84	8.72	6.47
Mean	5.29	7.50	8.50	8.68	7.49

N	-	1	2	3	Mean
FYMRES63					
NONE	5.45	7.80	8.62	8.71	7.64
FYM	5.13	7.21	8.39	8.66	7.35
Mean	5.29	7.50	8.50	8.68	7.49

N		-	1	2	3
ROTATION	**FYMRES63**				
LLN 8	NONE	6.88	8.94	9.81	9.50
	FYM	5.27	8.20	9.17	9.23
LN 3	NONE	6.90	8.52	8.97	8.71
	FYM	6.07	7.59	8.78	8.36
LLC 8	NONE	6.65	8.37	8.22	7.42
	FYM	6.01	7.92	8.17	8.29
LC 3	NONE	4.50	7.91	9.28	9.21
	FYM	6.80	7.34	9.03	9.54
AF	NONE	4.78	7.27	7.55	8.80
	FYM	2.93	6.00	7.34	7.69
AB	NONE	2.98	5.78	7.86	8.59
	FYM	3.70	6.20	7.82	8.86

GRAIN MEAN DM% 86.1

PLOT AREA HARVESTED 0.00183

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