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Yields of the Field Experiments 1992

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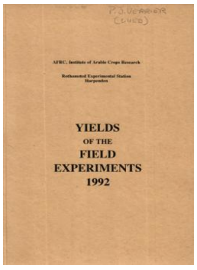

92/W/RN/3 Ley/ARABLE - Leys, S. Barley, W. Beans, W. Wheat, W. Rye,

Rothamsted Research

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92/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 55th year, leys, w. beans, w. wheat, w. rye, s. barley.

For previous years see 'Details' 1967 & 1973 and 74-91/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) LN, LN, LN, W, R
LC 3	(Previous CLO) LC, LC, LC, W, R
AF	(Previous A) F, F, BE, W, R
AB	(Previous A H) B, B, BE, W, R

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

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

LLN	LN, LN, LN, LN, LN, LN, LN, LN, W, R
LLC	LC, LC, LC, LC, LC, LC, LC, LC, W, R

LLN1 to LLN8 = eight year grass ley with N, first year to eighth year, similarly for LLC

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 and the test crops.

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

Whole plots

1. **ROTATION** Rotations:

   LN 8
   LN 3
   LC 8
   LC 3
   AF
   AB

1/2 plots

2. **FYMRES66** Farmyard manure residues, last applied 1966:

NONE	None
FYM	38 tonnes on each occasion

1/8 plots

3. **N** Nitrogen fertilizer (kg N) as 'Nitro-Chalk':

   0
   70
   140
   210

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92/W/RN/3

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

Whole plots

1. **ROTATION** Rotations:

   LN 8
   LN 3
   LC 8
   LC 3
   AF
   AB

1/2 plots

2. **FYMRES65** Farmyard manure residues, last applied 1965:

   NONE None
   FYM 38 tonnes on each occasion

1/8 plots

3. **N** Nitrogen fertilizer (kg N) as 'Nitro-Chalk':

   0
   30
   60
   90

Treatments to leys:

FYM RES Farmyard manure residues:

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

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, applied: 17 Sep, 1991:

Continuous rotations	No FYM half plots	FYM half plots
LN	0	75
LC	0	0
AF	260	235
AB	260	230

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92/W/RN/3

Ex-alternating rotations

LN 8 ploughed for w. wheat	45	40
LN 8 not ploughed	75	30
LC 8 ploughed for w. wheat	0	0
LC 8 not ploughed	0	0

Experimental diary:

Treatment Crops:

NOTE: Fourth year leys were treated with herbicide in error and were re-sown without cultivations as follows:

Grass ley and clover/grass ley, 4th year (**ROTATION** LLN4 and LLC4):

02-Sep-91 : **T** : Barclay Gallup at 4.0 l in 200 l in error.
25-Sep-91 : **T** : Direct drilled Climax timothy at 15 kg and meadow fescue 15 kg.
06-Mar-92 : **T** : PK as (0:16:36) at 470 kg. LLN4 only: NK as (25:0:16) at 300 kg. LLC4 only: Muriate of potash at 90 kg.
12-Jun-92 : **T** : LLC4 only: Topped.
18-Jun-92 : **T** : LLN4 only: 1st cut.
22-Jun-92 : **T** : LLN4 only: Produce removed.
23-Jun-92 : **T** : LLN4 only: NK as (25:0:16) at 300 kg.
29-Jun-92 : **T** : LLC4 only: Direct drilled Erecta timothy at 13.2 kg, meadow fescue at 13.2 kg and Huia white clover at 3.6 kg.
15-Sep-92 : **T** : LLN4 only: 2nd cut. LLC4 only: 1st cut.
16-Sep-92 : **T** : Produce removed.

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

04-Sep-91 : **T** : Ploughed, rolled.
06-Sep-91 : **T** : LN1 only: 34.5% N at 220 kg. Rotary harrowed, drilled Climax timothy at 15 kg and meadow fescue at 15 kg. Rolled.
LC1 only: 34.5% N at 145 kg. Rotary harrowed, drilled. Climax timothy at 14.4 kg, meadow fescue at 12.0 kg and Huia white clover at 3.6 kg. Rolled.
06-Mar-92 : **T** : PK as (0:16:36) at 470 kg. LN1 and LLN1 only: NK as (25:0:16) at 300 kg. LC1 and LLC1 only: Muriate of potash at 90 kg.
18-Jun-92 : **T** : 1st cut.
22-Jun-92 : **T** : Produce removed.
23-Jun-92 : **T** : LN1 and LLN1 only: NK as (25:0:16) at 300 kg. LC1 and LLC1 only: Muriate of potash at 90 kg.
15-Sep-92 : **T** : 2nd cut.
16-Sep-92 : **T** : Produce removed.

Grass leys, 2nd, 3rd, 5th, 6th, 7th and 8th years (**ROTATION** LN2-3, LLN2-3 and LLN5-8):

11-Oct-92 : **T** : LLN5 only: Dolomite at 5.0 t.
06-Mar-92 : **T** : PK as (0:16:36) at 470 kg. NK as (25:0:16) at 300 kg.
18-Jun-92 : **T** : 1st cut.

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Experimental diary:

22-Jun-92 : **T** : Produce removed.
23-Jun-92 : **T** : NK as (25:0:16) at 300 kg.
15-Sep-92 : **T** : 2nd cut.
17-Sep-92 : **T** : Produce removed.

Clover/grass leys, 2nd, 3rd, 5th, 6th, 7th and 8th years (**ROTATION** LC2-3, LLC2-3 and LLC5-8):

11-Oct-91 : **T** : LLC5 only: Dolomite at 5.0 t.
06-Mar-92 : **T** : PK as (0:16:36) at 470 kg. Muriate of potash at 90 kg.
18-Jun-92 : **T** : 1st Cut.
22-Jun-92 : **T** : Produce removed.
23-Jun-92 : **T** : Muriate of potash at 90 kg.
15-Sep-92 : **T** : 2nd Cut.
16-Sep-92 : **T** : Produce removed.

S. barley, 1st and 2nd treatment crops (**ROTATION** AB).

08-Oct-91 : **T** : Ploughed.
06-Mar-92 : **T** : NPK as (20:10:10) at 400 kg.
13-Mar-92 : **T** : Rotary cultivated with crumbler attached. Alexis, dressed Baytan, drilled at 157 kg.
20-May-92 : **T** : Deloxil at 1.0 l, Duplosan New System CMPP at 2.0 l and Calixin at 0.50 l in 200 l.
06-Aug-92 : **T** : Combine harvested.

W. beans 3rd treatment crop (**ROTATION** AF and AB):

30-Oct-91 : **T** : Punch broadcast at 163 kg, ploughed.
19-Feb-92 : **T** : Carbetamex at 3.0 kg in 200 l.
14-May-92 : **T** : Chiltern Olé at 2.0 l and Benlate at 1.0 kg with Vassgro Spreader at 0.03 l in 200 l.
15-May-92 : **T** : Decis at 0.30 l in 200 l.
04-Sep-92 : **T** : Combine harvested.

Fallow, 1st and 2nd treatment years (**ROTATION** AF):

08-Oct-92 : **T** : Ploughed.
05-May-92 : **T** : Rotary cultivated.

W. wheat, 1st test crop (W):

02-Oct-91 : **T** : Ploughed and rolled.
03-Oct-91 : **T** : PK as (0:24:24) at 260 kg. Yaltox at 150 kg. Rotary cultivated, drilled Mercia at 140 kg.
30-Oct-91 : **T** : Stomp 400 at 2.5 l, Arelon WDG at 0.50 kg and Decis at 0.20 l in 200 l.
13-Apr-92 : **T** : **N** 70, 140 and 210: Applied as 27% N.
03-May-92 : **T** : Dorin at 1.0 l in 300 l.
15-May-92 : **T** : Dorin at 1.0 l and Ally at 0.03 kg in 300 l.
09-Jun-92 : **T** : Impact Excel at 2.0 l in 200 l.
29-Jul-92 : **T** : Barclay Gallup at 2.0 l and Team at 0.30 l in 300 l.
29-Aug-92 : **T** : Combine harvested.

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Experimental diary:

W. rye, 2nd test crop (R):

08-Oct-91 : **T** : Ploughed.
11-Oct-91 : **T** : Dolomite at 5.0 t. PK as (0:24:24) at 260 kg. Yaltox at 150 kg. Rotary cultivated, Amando drilled at 110 kg.
16-Jan-92 : **T** : Stomp 400 at 3.3 l in 200 l.
16-Apr-92 : **T** : **N** 30, 60 and 90: Applied as 27% N.
31-Jul-92 : **T** : Combine harvested.

NOTE: Samples of grass, clover/grass and wheat and rye grain were taken for chemical analysis.

LEYS

1ST CUTTING OCCASION (18/6/92) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	2.67	3.11	2.89
LC2	4.33	4.72	4.53
LC3	6.34	5.23	5.79
LN1	4.71	5.52	5.12
LN2	6.71	7.16	6.94
LN3	6.53	7.19	6.86
LLC1	4.49	3.03	3.76
LLC2	6.39	7.30	6.84
LLC3	5.95	6.36	6.15
LLC4	*	*	*
LLC5	5.69	6.07	5.88
LLC6	4.06	3.07	3.56
LLC7	3.31	3.86	3.59
LLC8	6.54	5.13	5.83
LLN1	5.63	5.52	5.58
LLN2	6.85	5.92	6.39
LLN3	6.80	6.94	6.87
LLN4	3.51	4.97	4.24
LLN5	6.99	6.64	6.82
LLN6	4.18	4.99	4.59
LLN7	6.14	5.58	5.86
LLN8	5.20	5.80	5.50
Mean	5.38	5.43	5.41

1ST CUT MEAN DM% 24.6

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92/W/RN/3

LEYS

2ND CUTTING OCCASION (15/9/92) DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	2.33	3.06	2.70
LC2	5.19	4.06	4.63
LC3	4.12	3.68	3.90
LN1	3.01	2.60	2.80
LN2	3.33	3.42	3.38
LN3	3.59	3.58	3.58
LLC1	3.15	3.03	3.09
LLC2	3.52	3.27	3.39
LLC3	3.24	3.44	3.34
LLC4	1.59*	1.54*	1.57*
LLC5	3.29	3.64	3.46
LLC6	2.70	2.57	2.63
LLC7	2.88	3.31	3.09
LLC8	3.15	3.82	3.49
LLN1	3.04	3.60	3.32
LLN2	4.19	3.57	3.88
LLN3	2.83	2.98	2.90
LLN4	2.03	2.91	2.47
LLN5	4.03	3.37	3.70
LLN6	2.42	2.63	2.52
LLN7	2.93	3.34	3.13
LLN8	4.18	4.76	4.47
Mean	3.22	3.28	3.25

2ND CUT MEAN DM% 23.5

NOTE: * First and only cut.

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LEYS

TOTAL OF 2 CUTTING OCCASIONS DRY MATTER TONNES/HECTARE

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

FYM RES LEY	NONE	FYM	Mean
LC1	5.00	6.17	5.59
LC2	9.52	8.79	9.15
LC3	10.47	8.91	9.69
LN1	7.73	8.11	7.92
LN2	10.04	10.58	10.31
LN3	10.11	10.77	10.44
LLC1	7.64	6.06	6.85
LLC2	9.91	10.56	10.23
LLC3	9.18	9.80	9.49
LLC4	1.59*	1.54*	1.57*
LLC5	8.98	9.70	9.34
LLC6	6.75	5.64	6.20
LLC7	6.19	7.17	6.68
LLC8	9.69	8.95	9.32
LLN1	8.68	9.11	8.90
LLN2	11.05	9.49	10.27
LLN3	9.63	9.92	9.77
LLN4	5.54	7.88	6.71
LLN5	11.02	10.01	10.52
LLN6	6.60	7.62	7.11
LLN7	9.06	8.93	8.99
LLN8	9.38	10.55	9.97
Mean	8.35	8.47	8.41

TOTAL OF 2 CUTS MEAN DM% 23.9

PLOT AREA HARVESTED 0.00204

NOTE: * One cut only

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92/W/RN/3

W.WHEAT 1ST TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES66	NONE	FYM	Mean
ROTATION			
LN 8	6.47	6.31	6.39
LN 3	5.70	6.27	5.99
LC 8	6.94	6.24	6.59
LC 3	6.46	5.91	6.19
AF	7.37	6.47	6.92
AB	6.71	7.38	7.04
Mean	6.61	6.43	6.52

N	0	70	140	210	Mean
ROTATION					
LN 8	4.19	7.17	7.54	6.67	6.39
LN 3	2.73	6.47	7.49	7.26	5.99
LC 8	7.11	6.65	6.45	6.14	6.59
LC 3	6.33	7.48	6.13	4.79	6.19
AF	3.82	8.05	8.21	7.59	6.92
AB	6.31	7.84	7.21	6.81	7.04
Mean	5.08	7.28	7.17	6.54	6.52

N	0	70	140	210	Mean
FYMRES66					
NONE	5.18	7.31	7.16	6.78	6.61
FYM	4.99	7.25	7.18	6.31	6.43
Mean	5.08	7.28	7.17	6.54	6.52

N		0	70	140	210
ROTATION	**FYMRES66**				
LN 8	NONE	4.14	7.18	7.22	7.33
	FYM	4.25	7.16	7.85	6.00
LN 3	NONE	2.27	6.10	6.86	7.57
	FYM	3.18	6.85	8.11	6.95
LC 8	NONE	7.12	7.05	6.95	6.62
	FYM	7.10	6.25	5.96	5.66
LC 3	NONE	6.75	7.65	6.34	5.09
	FYM	5.92	7.32	5.92	4.49
AF	NONE	4.38	8.22	8.36	8.52
	FYM	3.27	7.87	8.07	6.67
AB	NONE	6.40	7.63	7.23	5.56
	FYM	6.23	8.05	7.18	8.07

GRAIN MEAN DM% 81.7

PLOT AREA HARVESTED 0.00183

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92/W/RN/3

W. RYE 2ND TEST CROP

GRAIN TONNES/HECTARE

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

FYMRES65	NONE	FYM	Mean
ROTATION			
LN 8	6.30	6.16	6.23
LN 3	7.24	6.47	6.86
LC 8	6.98	6.47	6.72
LC 3	6.07	7.03	6.55
AF	4.15	4.87	4.51
AB	5.05	5.68	5.36
Mean	5.96	6.11	6.04

N	0	30	60	90	Mean
ROTATION					
LN 8	3.97	5.71	7.81	7.43	6.23
LN 3	5.53	6.94	7.74	7.21	6.86
LC 8	5.52	6.99	6.56	7.82	6.72
LC 3	3.91	6.42	7.61	8.26	6.55
AF	1.60	4.37	5.59	6.48	4.51
AB	3.25	5.47	6.03	6.70	5.36
Mean	3.96	5.98	6.89	7.32	6.04

N	0	30	60	90	Mean
FYMRES65					
NONE	3.72	5.85	7.03	7.26	5.96
FYM	4.20	6.12	6.76	7.38	6.11
Mean	3.96	5.98	6.89	7.32	6.04

N		0	30	60	90
ROTATION	**FYMRES65**				
LN 8	NONE	4.13	5.37	8.08	7.64
	FYM	3.81	6.05	7.54	7.22
LN 3	NONE	6.01	7.52	7.45	7.96
	FYM	5.05	6.36	8.04	6.45
LC 8	NONE	5.44	6.88	7.75	7.85
	FYM	5.60	7.11	5.37	7.80
LC 3	NONE	3.10	5.94	7.60	7.63
	FYM	4.72	6.90	7.62	8.89
AF	NONE	1.12	3.83	5.46	6.17
	FYM	2.08	4.90	5.72	6.79
AB	NONE	2.52	5.55	5.81	6.30
	FYM	3.97	5.39	6.25	7.11

GRAIN MEAN DM% 87.4

PLOT AREA HARVESTED 0.00183

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