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Yields of the Field Experiments 2015

Full Table of Content

W/RN3 Ley Arable

Rothamsted Research

Rothamsted Research (2016) *W/RN3 Ley Arable ;* Yields Of The Field Experiments 2015, pp 36 - 45 **- DOI: https://doi.org/10.23637/ERADOC-1-225**

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15W/RN/3

LEY/ARABLE

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

Sponsors: A. J. Macdonald

The 78th year, leys, w. beans, w. wheat, w. rye

For previous years see 'Details' 1967 & 1973 and Yield Books for 74-14/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 1988 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

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

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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.

From 2007 plots previously in the 1st cycle of testing eight-year leys followed by two arable test crops (i.e. those plots which were changed to eight-year ley treatments in 1976 or 1977) changed to a three-year arable rotation followed by two arable test crops. Plots were "phased in" but joined the relevant point in the rotation. From 2008 the second cycle 8-yr grass and grass/clover leys changed to 3-yr grass or grass/clover leys respectively. They were phased in between 2008 and 2012.
LLN/AO (Previously 1st cycle, 8-yr grass ley) R, BE, O, W, R
LLC/ABe (Previously 1st cycle, 8-yr grass/clover ley) R, O, BE, W, R
LLC/LC3 (Previously 2nd cycle, 8-yr grass ley) Lc 1, Lc 2, Lc 3, W, R
LLN/LN3 (Previously 2nd cycle, 8-yr grass/clover ley) Ln 1, Ln 2, Ln 3, W, R

From 2009 W oats (O) replaced forage maize (M) in the AM and ABe rotations on block III and were phased in on blocks V, IV, II and I in subsequent years. The AM treatment was re-named AM/AO.

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
   LLC/LC3 not yet in phase
   LLN/LN3 not yet in phase
   LLN/AO not yet in phase
   LLC/ABe not yet in phase
   AM/AO
   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:

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15/W/RN/3

3. **N** Nitrogen fertilizer as split dressings in spring 2015 (kg N) as 34.5% N:

0	0	
80	40 + 40	) to be applied
160	40 + 120	) late-February/early-March
240	40+ 200	) and mid-April

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

Whole plots:

1. **ROTATION** Rotations before first test crop:
   LLN8
   LN 3
   LLC 8
   LC 3
   LLC/LC3 not yet in phase
   LLN/LN3 not yet in phase
   LLN/AO not yet in phase
   LLC/ABe not yet in phase
   AM/AO
   ABe

1/ 2 plots:

2. **NSPLIT (FYM res)** Farmyard manure residues, last applied 1960s:
   N split to wheat (no FYM)
   N single to wheat (FYM)

   1/8 plots:

3. **N** Nitrogen fertilizer in spring 2013 (kg N) as 34.5%:
   0
   50
   100
   150

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 ha^{-1}) as muriate of potash, applied where necessary to first test crop w. wheat and long-term leys in the wheat block, applied 2015 (see date below).

Continuous rotations	No FYM	FYM Res
Before wheat	Half plots	Half plots
ABe/Be	420	500
AO/O	390	480
LLn/AO	310	290
LLn/ABe	190	150
None to other plots.		

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15/W/RN/3

Experimental Diary

Date		Application	Rate	Units
ALL			-	-
20/05/2015	a	Cut paths	-	-
27/05/2015	a	Cut paths	-	-
07/07/2015	a	Cut paths	-	-
23/07/2015	a	Cut paths	-	-
03/09/2015	a	Cut paths	-	-
Grass ley and clover/grass leys (first year leys)				
22/10/2014	f	Applied SOP to all leys	140	kg/ha
22/10/2014	f	Applied TSP to all ley plots	213	kg/ha
23/10/2014	f	Applied Nitram - Plots 55,56,59 and 60.	72.5	kg/ha
21/11/2014	s	Drilled Grass	30	kg/ha
21/11/2014	s	Drilled Grass and Clover plots	30	kg/ha
17/04/2015	f	Applied MOP to all leys	167	kg/ha
17/04/2015	f	Applied Nitro-chalk to Grass only plots 57,58,61,62	278	kg/ha
08/07/2015	a	Cut grass plots for yield	-	-
09/07/2015	a	Mowed grass plots	-	-
09/07/2015	a	Turned grass	-	-
10/07/2015	a	Turned grass	-	-
16/07/2015	a	Turned hay	-	-
17/07/2015	a	Rowed up hay	-	-
17/07/2015	a	Baled hay	-	-
09/12/2015	a	Cut grass plots for yield - 2nd and Final Cut	-	-
Grass ley and clover/grass leys (2nd and 3rd year leys)				
22/10/2014	f	Applied SOP to all leys	140	kg/ha
22/10/2014	f	Applied TSP to all ley plots	213	kg/ha
17/04/2015	f	Applied MOP to all leys	167	kg/ha
17/04/2015	f	Applied Nitro-chalk to Grass only plots 37,38,43,44,65,66,69,70	278	kg/ha
08/07/2015	a	Cut grass plots for yield	-	-
09/07/2015	a	Mowed grass plots	-	-
09/07/2015	a	Turned grass	-	-
10/07/2015	a	Turned grass	-	-
16/07/2015	a	Turned hay	-	-
17/07/2015	a	Rowed up hay	-	-
17/07/2015	a	Baled hay	-	-
09/12/2015	a	Cut grass plots for yield - 2nd and Final Cut	-	-
W Beans				
22/10/2014	f	Applied TSP to all arable plots	127	kg/ha
30/10/2014	a	Ploughed	-	-

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19/11/2014	s	Drilled Winter Beans cv. Wizzard	35	seeds/m^2
01/12/2014	p	Sprayed Linzone in 250 l/ha of water - Bean Plots only	2	l/ha
01/12/2014	p	Sprayed Stomp Aqua in 250 l/ha of water - Bean Plots only	1.7	l/ha
18/02/2015	p	Sprayed Crawler in 200 l/ha of water - Bean plots only	3.5	l/ha
16/04/2015	p	Sprayed Troy 480 in 200 l/ha water - Bean Plots only	3	l/ha
17/04/2015	f	Applied SOP to all arable crops	150	kg/ha
30/05/2015	p	Sprayed San 703 in 131 l/ha water - Beans Only	1.5	l/ha
30/05/2015	p	Sprayed Hallmark with Zeon Technology in 131 l/ha water - Beans Only	75	ml/ha
11/09/2015	a	Combined plots for yield	-	-
11/09/2015	a	Combined O+Es	-	-
25/09/2015	p	Sprayed Firebrand in 150 l/ha water - Arable and 3rd year Leys	1	l/ha
25/09/2015	p	Sprayed Samurai in 150 l/ha water - Arable and 3rd year Leys	4	l/ha
W Wheat				
22/10/2014	f	Applied TSP to all arable plots	127	kg/ha
30/10/2014	a	Ploughed	-	-
24/10/2014	f	Applied MOP as corrective K - Plot 1	500	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 2	420	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 5	480	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 6	390	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 9	310	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 10	290	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 15	190	kg/ha
24/10/2014	f	Applied MOP as corrective K - Plot 16	150	kg/ha
19/11/2014	s	Drilled Winter Wheat cv. Solstice tr Redigo Deter	400	seeds/m^2
16/03/2015	p	Sprayed Samurai to spray off failed wheat plots, Block 1	1.5	l/ha
17/03/2015	s	Drilled Spring Wheat cv Mulika trt Redigo	350	seeds/m^2
17/04/2015	f	Applied SOP to all arable crops	150	kg/ha
20/04/2015	p	Sprayed Hallmark in 200 l/ha water - Wheat Plots only	40	ml/ha
20/04/2015	p	Sprayed Compitox Plus in 200 l/ha water - Wheat Plots only	1	l/ha
28/04/2015	f	Applied Nitro-chalk to ALL Plots in Block 1 Wheat except 013, 023, 033, 044, 053, 062, 073, 083, 093, 101, 114, 124, 133, 144, 151, 164	148	kg/ha
21/05/2015	f	Applied Nitrochalk by hand - Plots in Block 1 Wheat 012, 022, 032, 041, 052, 064, 071, 082, 092, 104, 112, 122, 131, 141, 161, 154	148	kg/ha
26/05/2015	f	Applied Nitrochalk by hand - Plots in Block 1 WHEAT 014, 024, 034, 043, 054, 061, 074, 084, 094, 102, 113, 123, 134, 143, 152, 163	444	kg/ha
27/05/2015	f	Applied Nitrochalk by hand - Plots in Block 1 WHEAT 011, 021, 031, 042, 051, 063, 072, 081, 091, 103, 111, 121, 132, 142, 153, 162	741	kg/ha
30/05/2015	p	Sprayed Refine Max in 200 l/ha water - Wheat Plots Only	75	g/ha

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30/05/2015	p	Sprayed Kingdom in 200 l/ha water - Wheat Plots Only	1.25	l/ha
30/05/2015	p	Sprayed BASF 3C Chlormequat 750 in 200 l/ha water - Wheat Plots Only	2	l/ha
30/05/2015	p	Sprayed Crescent in 200 l/ha water - Wheat Plots Only	0.75	l/ha
11/09/2015	a	Combined plots for yield	-	-
11/09/2015	a	Combined O+Es	-	-
25/09/2015	p	Sprayed Firebrand in 150 l/ha water - Arable and 3rd year Leys	1	l/ha
25/09/2015	p	Sprayed Samurai in 150 l/ha water - Arable and 3rd year Leys	4	l/ha
W Rye				
22/10/2014	f	Applied TSP to all arable plots	127	kg/ha
30/10/2014	a	Ploughed	-	-
19/12/2014	s	Drilled Rye cv. Mephisto trt Redigo Deter	280	seeds/m^2
17/04/2015	f	Applied Nitro-chalk to Rye plots 49,50,51,52,53,54,63 and 64.	370	kg/ha
17/04/2015	f	Applied SOP to all arable crops	150	kg/ha
23/04/2015	p	Sprayed Broadway Star in 200 l/ha water - Rye Plots Only	265	g/ha
23/04/2015	p	Sprayed Kingdom in 200 l/ha water - Rye Plots Only	1.25	l/ha
23/04/2015	p	Sprayed Bravo 500 in 200 l/ha water - Rye Plots Only	1	l/ha
23/04/2015	p	Sprayed BASF 3c in 200 l/ha water - Rye Plots Only	1	l/ha
23/04/2015	p	Sprayed Cogent in 200 l/ha water - Rye Plots Only	1	l/ha
28/04/2015	f	Applied Nitro-chalk - Plots in Block 2 RYE 174, 183, 193, 201, 212, 221, 231, 242, 252, 262, 274, 282, 292, 304, 311, 323	185	kg/ha
28/04/2015	f	Applied Nitro-chalk - Plots in Block 2 RYE 171, 182, 194, 204, 214, 223, 234, 241, 251, 263, 272, 283, 294, 303, 314, 321	370	kg/ha
28/04/2015	f	Applied Nitro-chalk - Plots in Block 2 RYE 172, 184, 191, 202, 211, 222, 232, 243, 254, 261, 273, 281, 291, 301, 313, 324	556	kg/ha
30/05/2015	p	Sprayed Folicur in 200 l/ha water - Rye only	1	l/ha
11/09/2015	a	Combined plots for yield	-	-
11/09/2015	a	Combined O+Es	-	-
25/09/2015	p	Sprayed Firebrand in 150 l/ha water - Arable and 3rd year Leys	1	l/ha
25/09/2015	p	Sprayed Samurai in 150 l/ha water - Arable and 3rd year Leys	4	l/ha
W Oats				
22/10/2014	f	Applied TSP to all arable plots	127	kg/ha
30/10/2014	a	Ploughed	-	-
21/11/2014	s	Drilled Oats cv. Gerald trt Redigo	375	seeds/m^2
13/04/2015	p	Sprayed Absolute in 200 l/ha water - Oat Plots only	0.12	kg/ha
13/04/2015	p	Sprayed Hallmark with Zeon Tec. in 200 l/ha water - Oat Plots only	40	ml/ha

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17/04/2015	f	Applied Nitro-chalk to Oat plots 35,36,39,40,67,68,75 and 76.	370	kg/ha
17/04/2015	f	Applied SOP to all arable crops	150	kg/ha
11/09/2015	a	Combined plots for yield	-	-
11/09/2015	a	Combined O+Es	-	-
25/09/2015	p	Sprayed Firebrand in 150 l/ha water - Arable and 3rd year Leys	1	l/ha
25/09/2015	p	Sprayed Samurai in 150 l/ha water - Arable and 3rd year Leys	4	l/ha

NOTE: Herbage and grain samples were taken for chemical analyses.

LEYS

1ST CUT DRY MATTER TONNES/HECTARE – Plots were cut on 26-June-15.Yield data is missing, presumed lost (Rodger White Pers Comm), but Mean DM% was 29.4.

2ND CUT (09-Dec-15) DRY MATTER TONNES/HECTARE

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

FYM_RES LEY	NONE	FYM	MEAN
LC1	0.77	0.73	0.75
LC2	1.10	0.57	0.83
LC3	0.00	0.00	0.00
LN1	0.05	0.07	0.06
LN2	0.07	0.10	0.09
LN3	0.00	0.00	0.00
(LLC/LC)LC1	0.08	0.52	0.30
(LLC/LC)LC2	1.13	0.77	0.95
(LLC/LC)LC3	0.00	0.00	0.00
(LLN/LN)LN1	0.14	0.15	0.15
(LLN/LN)LN2	0.13	0.13	0.13
(LLN/LN)LN3	0.00	0.00	0.00
MEAN	0.29	0.25	0.27

2ND CUT MEAN DM% 40.7

ARABLE TREATMENT CROPS

WINTER BEANS

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
(AO)Be	1.68	2.30	1.99
(LLn/AO)Be	3.53	2.02	2.77
(LLc/ABe)Be	0.90	0.49	0.70
(ABe)Be	0.42	1.09	0.76
Mean	1.63	1.47	1.55

GRAIN MEAN DM% 83.9

PLOT AREA HARVESTED 0.00413

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15/W/RN/3

OATS

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES	NONE	FYM	Mean
ROTATION			
ABe	5.70	5.35	5.53
AO	5.16	5.81	5.48
LLc/ABe	7.00	5.24	6.12
LLn/AO	6.00	5.68	5.84
Mean	5.97	5.52	5.74

GRAIN MEAN DM% 87.6

PLOT AREA HARVESTED 0.00413

RYE (Extra)

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES	NONE	FYM	Mean
ROTATION			
(ABe)R	5.50	5.63	5.56
(AO)R	4.72	4.65	4.69
(LLn/AO)R	7.31	7.22	7.27
(LLc/ABe)R	6.67	6.46	6.67
Mean	6.10	5.99	6.05

GRAIN MEAN DM% 84.1

PLOT AREA HARVESTED 0.00413

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15/W/RN/3

W. WHEAT

Grain tonnes/hectare

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

FYMRES	none	FYM	Mean
ROTATION			
(AO)W	3.26	2.84	3.05
(ABe)W	3.07	3.01	3.04
(LLn/AO)W	3.45	3.53	3.49
(LLc/ABe)W	3.01	2.76	2.88
(LN)W	3.93	3.71	3.82
(LLN/Ln)W	3.78	3.92	3.85
(LC)W	2.25	2.43	2.34
(LLc/Lc)W	3.32	3.81	3.57
Mean	3.26	3.25	3.25

N	0	80	160	240	Mean
ROTATION					
(AO)W	0.99	3.16	4.14	3.90	3.05
(ABe)W	1.17	3.11	4.35	3.51	3.04
(LLn/AO)W	1.66	3.88	4.12	4.29	3.49
(LLc/ABe)W	1.83	2.99	3.57	3.14	2.88
(LN)W	2.23	4.19	3.73	5.12	3.82
(LLN/Ln)W	3.05	3.56	4.12	4.65	3.85
(LC)W	2.97	2.45	2.18	1.75	2.34
(LLc/Lc)W	3.73	4.07	3.61	2.85	3.57
Mean	2.21	3.43	3.73	3.65	3.25

N	0	80	160	240	Mean
FYMRES					
None	2.29	3.52	3.58	3.65	3.26
FYM	2.12	3.34	3.88	3.66	3.25
Mean	2.21	3.43	3.73	3.65	3.25

N		0	80	160	240
ROTATION	FYMRES				
(AO)W	none	0.95	3.57	4.19	4.33
	FYM	1.03	2.75	4.10	3.47
(ABe)W	none	1.23	3.16	4.43	3.44
	FYM	1.12	3.06	4.26	3.58
(LLn/AO)W	none	1.15	3.89	4.01	4.75
	FYM	2.17	3.88	4.23	3.83
(LLc/ABe)W	none	2.23	2.66	4.36	2.78
	FYM	1.43	3.33	2.78	3.50
(LN)W	none	2.21	4.33	4.06	5.13
	FYM	2.25	4.06	3.40	5.12
(LLN/Ln)W	none	2.73	3.93	3.63	4.82
	FYM	3.37	3.20	4.61	4.48
(LC)W	none	3.77	2.31	1.26	1.65
	FYM	2.17	2.58	3.11	1.85
(LLc/Lc)W	none	4.02	4.30	2.68	2.27
	FYM	3.44	3.84	4.53	3.44

Grain mean DM% 85.38

Plot area harvested 0.00192

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15/W/RN/3

W. RYE

Grain tonnes/hectare

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

FYMRES	none	FYM	Mean
ROTATION			
(AO)R	3.39	2.33	2.86
(ABe)R	2.05	3.02	2.54
(LLn/AO)R	4.99	4.66	4.83
(LLc/ABe)R	3.99	3.77	3.88
(Ln)R	5.53	4.64	5.08
(LLn/Ln)R	4.86	5.06	4.96
(Lc)R	4.74	5.69	5.21
(LLc/Lc)R	6.51	5.86	6.19
Mean	4.51	4.38	4.44

N	0	50	100	150	Mean
ROTATION					
(AO)R	1.28	2.66	4.00	3.49	2.86
(ABe)R	0.82	2.68	2.41	4.23	2.54
(LLn/AO)R	1.83	4.65	5.94	6.89	4.83
(LLc/ABe)R	1.35	3.43	5.47	5.27	3.88
(Ln)R	2.71	5.17	5.61	6.85	5.08
(LLn/Ln)R	2.77	4.17	6.05	6.84	4.96
(Lc)R	2.64	5.25	6.42	6.54	5.21
(LLc/Lc)R	3.21	5.52	7.78	8.24	6.19
Mean	2.08	4.19	5.46	6.05	4.44

N	0	50	100	150	Mean
FYMRES					
none	2.13	4.35	5.27	6.28	4.51
FYM	2.02	4.03	5.65	5.82	4.38
Mean	2.08	4.19	5.46	6.05	4.44

N		0	50	100	150
ROTATION	FYMRES				
(AO)R	none	1.12	3.01	5.05	4.38
	FYM	1.44	2.31	2.96	2.60
(ABe)R	none	0.54	2.61	1.35	3.70
	FYM	1.10	2.75	3.48	4.75
(LLn/AO)R	none	1.83	5.92	4.34	7.87
	FYM	1.82	3.38	7.53	5.92
(LLc/ABe)R	none	1.61	3.43	5.69	5.22
	FYM	1.08	3.44	5.25	5.32
(Ln)R	none	3.23	5.03	5.75	8.11
	FYM	2.18	5.30	5.48	5.60
(LLn/Ln)R	none	2.86	3.92	6.35	6.29
	FYM	2.68	4.42	5.76	7.39
(Lc)R	none	2.41	5.13	5.58	5.82
	FYM	2.88	5.36	7.25	7.26
(LLc/Lc)R	none	3.45	5.73	8.07	8.81
	FYM	2.97	5.31	7.48	7.68

Grain mean DM% 84.54

Plot area harvested 0.00192

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