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# Results of the Classical and Other Long-term Experiments 2022



Results of the  
Classical and other  
Long-Term Experiments  
2022

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## 22/W/RN/3 - Woburn Ley-arable (Stackyard D, Woburn Farm)

### Rothamsted Research

Rothamsted Research (2024) 22/W/RN/3 - Woburn Ley-arable (Stackyard D, Woburn Farm) ; Results Of The Classical And Other Long-Term Experiments 2022, pp 29 - 39

22/W/RN/3 WOBURN LEY-ARABLE (Stackyard D, Woburn Farm)

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

The 85<sup>th</sup> year, leys, winter barley, winter oats, winter wheat, winter rye

For previous years see 'Details' 1967 & 1973 and Yield Books for 74-21/W/RN/3. For a comprehensive guide to the treatments and cropping sequences from 1938, please see <https://doi.org/10.23637/wrn3-cropping1938-2020-02>

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

**Whole plot dimensions:** 8.53 m × 40.7 m

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

### ROTATION

<b>L</b>	Clover/grass ley:	L, L, L, P, W until 1971 then L, L, L, W, B (became <b>Ln3</b> )
<b>Lu</b>	All legume ley:	SA, SA, SA, P, W until 1971 then CL, CL, CL, W, B (became <b>Lc3</b> )
<b>Ar</b>	Arable with roots:	P, R, C, P, W until 1971 then P, B, B, W, B (became <b>AF</b> )
<b>Ah</b>	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, W, B (became <b>AB</b> )

P = potatoes, C = carrots, W = winter wheat, B = spring barley, H = hay, L = clover/grass ley, SA = sainfoin ley (previously lucerne, Lu), 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 every five years with ley rotations.
- From 1973 all the rotations were changed on all phases except for the first and second test crops in 1976:

<b>Ln3</b>	(replaced <b>L</b> ) Ln1, Ln2, Ln3, W, R (this subsequently became <b>LLn8</b> or remained <b>Ln3</b> )
<b>Lc3</b>	(replaced <b>Lu</b> ) Lc1, Lc2, Lc3, W, R (this subsequently became <b>LLc8</b> or remained <b>Lc3</b> )
<b>AF</b>	(replaced <b>Ar</b> ) F, F, BE, W, R (this subsequently became <b>AM</b> )
<b>AB</b>	(replaced <b>Ah</b> ) B, B, BE, W, R (this subsequently became <b>ABe</b> )

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

**AM** (replaced **AF**) R, BE, M, W, R (this subsequently became **AO**)

**ABe** (replaced **AB**) R, M, BE, W, R

**Ln1 to Ln3** = three-year grass ley with N, 1<sup>st</sup> year to 3<sup>rd</sup> year,

**Lc** = clover/grass ley, no N, **BE** = beans (spring oats until 1980), **R** = winter rye, **F** = fallow,

**M** = forage maize

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

**LLn8** (replaced part of **Ln3**) LLn1, LLn2, LLn3, LLn4, LLn5, LLn6, LLn7, LLn8, W, R (this subsequently became **Ln** or **AO**)

**LLc8** (replaced part of **Lc3**) LLc1, LLc2, LLc3, LLc4, LLc5, LLc6, LLc7, LLc8, W, R (this subsequently became **Lc** or **ABe**)

**LLn1 to LLn8** = eight-year grass leys with N, first year to eighth year, similarly for **LLc** – clover/grass ley, no N

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

In 1992 winter rye (R) replaced spring 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 1<sup>st</sup> 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.

<b>LLn/AO</b>	(Previously 1 <sup>st</sup> cycle, 8-yr grass ley)	R, Be, O, W, R
<b>LLc/ABe</b>	(Previously 1 <sup>st</sup> cycle, 8-yr grass/clover ley)	R, O, Be, W, R
<b>LLc/Lc3</b>	(Previously 2 <sup>nd</sup> cycle, 8-yr grass ley)	Lc1, Lc2, Lc3, W, R
<b>LLn/Ln3</b>	(Previously 2 <sup>nd</sup> cycle, 8-yr grass/clover ley)	Ln1, Ln2, Ln3, W, R

From 2009 winter 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 **AO**. The new rotations were fully in phase by 2016.

For 2021, a further change was made to replace winter beans (which had occasionally failed on the experiment) with winter barley (WB), and to synchronise all arable rotations. As a result, treatments **ABe**, **AO**, **LLc/ABe** and **LLn/AO** all follow the same rotation: R, WB, O, W, R.

**Treatments to first test crop winter wheat, all combinations of:**

**Whole plots:**

- ROTATION** Rotations before wheat:

  - Ln 3
  - Lc 3
  - LLc/Lc3
  - LLn/Ln3
  - LLn/AO
  - LLc/ABe
  - AO
  - ABe
- NSPLIT (FYM res)** Farmyard manure residues, last applied 1960s (1/2 plots):  
Split N v single N dressing to wheat, tested 2001-5

  - Nsplit (noFYM; -)
  - Nsingle (FYM; dr)
- N** N fertilizer as split dressings in spring (kg N) as 27% N (Nitrochalk) (1/4 plots):

  - 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 winter rye, all combinations of:**

**Whole plots:**

1. **ROTATION** Rotations before first test crop:  
 Ln 3  
 Lc 3  
 LLc/Lc3  
 LLn/Ln3  
 LLn/AO  
 LLc/ABe  
 AO  
 ABe
2. **NSPLIT (FYM res)** Farmyard manure residues, last applied 1960s (1/2 plots):  
 N split to wheat (no FYM)  
 N single to wheat (FYM)
3. **N** N fertilizer in spring (kg N) as 27% N (Nitrochalk) (1/4 plots):  
 0  
 50  
 100  
 150

Treatments to leys:

**FYM RES** Farmyard manure residues:  
 NONE (-)  
 FYM (dr) 38 t (fresh weight) on each occasion, last applied 1960s.

**NOTE:** Corrective K dressings (kg K<sub>2</sub>O / ha) as muriate of potash, applied where necessary to first test crop winter wheat, applied 2021 (see date below). Note that for 2022, applications were based on rounded means calculated from 2016-2020 data in the absence of more recent data due to the COVID-19 pandemic.

Continuous rotations before wheat	No FYM (-); half plots	FYM Res (dr); half plots
Lc3	Plot 79: 0	Plot 80: 0
LLn/AO	Plot 71: 160	Plot 72: 160
LLn/Ln3	Plot 69: 10	Plot 70: 10
AO	Plot 74: 250	Plot 73: 250
LLc/Lc3	Plot 78: 0	Plot 77: 0
Ln3	Plot 65: 30	Plot 66: 30
ABe	Plot 68: 220	Plot 67: 220
LLc/ABe	Plot 76: 120	Plot 75: 120
None to other plots.		

## Experimental Diary

Date		Application	Rate	Units
<b>W Rye (1<sup>st</sup> year treatment)</b>				
10/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
25/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Block 1, Plots: 1, 2, 5, 6, 9, 10, 15, 16	127	kg/ha
08/10/2021	a	Plough 20 cm, WES Dowdeswell 100 Series Five Furrow Plough, JD6620	-	-
18/10/2021	s	Drilled using WES Accord 4m Tyne Drill, JD6620: Hybrid	350	seeds/m2
31/03/2022	f	Applied using Cascade Spreader, JD6830: Nitram: Block 1, Plots 1, 2, 5, 6, 9, 10, 15, 16	290	kg/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	3	L/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Clayton Prius (18946)	0.7	L/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Stefes CCC 720 (17731)	1.5	L/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Moddus (15151)	0.15	L/ha
05/04/2022	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP)	150	kg/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	2	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Cello (18290)	0.6	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Bugle (17821)	0.7	L/ha
13/08/2022	a	Harvest using None, Haldrup C-85 2m cut (Combine)	-	-
<b>W Barley (2<sup>nd</sup> year treatment)</b>				
10/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
25/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Blocks 2, Plots: 17-22, 27, 28	127	kg/ha
08/10/2021	a	Plough 20 cm, WES Dowdeswell 100 Series Five Furrow Plough, JD6620	-	-
18/10/2021	s	Drilled using WES Accord 4m Tyne Drill, JD6620: Libra	300	seeds/m2
31/03/2022	f	Applied using Cascade Spreader, JD6830: Nitram	290	kg/ha
05/04/2022	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP)	150	kg/ha
11/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	3	L/ha
11/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Stefes CCC 720 (17731)	1	L/ha
11/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Moddus (15151)	0.1	L/ha
11/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Mobius (13395)	0.6	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	2	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Cello (18290)	0.6	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Bugle (17821)	0.7	L/ha

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26/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	1	L/ha
26/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Lentyma XE	1	L/ha
13/08/2022	a	Harvest using None, Haldrup C-85 2m cut (Combine)	-	-
<b>W Oats (3<sup>rd</sup> year treatment)</b>				
10/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
25/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Blocks 4, Plots: 49-54, 63, 64	127	kg/ha
08/10/2021	a	Plough 20 cm, WES Dowdeswell 100 Series Five Furrow Plough, JD6620	-	-
18/10/2021	s	Drilled using Accord Combination Drill No. 4: Miscani	350	seeds/m <sup>2</sup>
31/03/2022	f	Applied using Cascade Spreader, JD6830: Nitram	290	kg/ha
05/04/2022	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP)	150	kg/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	2	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Cello (18290)	0.6	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Presite SX (12291)	60	g/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Hurler (17715)	0.6	L/ha
13/08/2022	a	Harvest using None, Haldrup C-85 2m cut (Combine)	-	-
<b>Grass ley and clover/grass leys (1<sup>st</sup> year treatment)</b>				
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Block 1, Plots: 3,4,7,8,11,12,13,14	213	kg/ha
04/10/2021	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP) : Block 1, Plots: 3,4,7,8, 11,12,13,14.	140	kg/ha
25/11/2021		Mowing, JD6620	-	-
05/04/2022	f	Applied using Cascade Spreader, JD6830: Muriate of Potash (MOP) : Block 1, Plots: 3,4,7,8, 11,12,13,14.	167	kg/ha
06/04/2022	f	Applied using Cascade Spreader, JD6830: Nitram; Grass only Plots 11-12, 13-14	217	kg/ha
13/04/2022	a	Power harrow, Kuhn Powerharrow 3m, JD6620	-	-
13/04/2022	s	Drilled by hand: grass seed	30	kg/ha
13/04/2022	a	Flat roll, WES 6m Rolls JD6620	-	-
24/06/2022	a	First Cut Grass Plots using Amazone Grass Harvester - Flail Mower Collector, JD5070	-	-
28/06/2022	a	Mowed using Amazone Grass Harvester - Flail Mower Collector, JD5070 - Cleared	-	-
29/06/2022	f	Applied using Cascade Spreader, JD6830: Nitram: Plots 11-12, 13-14	217	kg/ha
<b>Grass ley and clover/grass leys (2<sup>nd</sup> and 3<sup>rd</sup> year treatments)</b>				
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Blocks 2 and 4, Plots: 23,24,25,26,29,30,31,32,55-62.	213	kg/ha
04/10/2021	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP) : Block 2 & 4, 2-3 Leys Plots: 23,24,25,26,29,30,31,32, 55-62.	140	kg/ha
25/11/2021		Mowing, JD6620	-	-
05/04/2022	f	Applied using Cascade Spreader, JD6830: Muriate of Potash (MOP) Block 2 & 4, 2-3 Leys Plots: 23,24,25,26,29,30,31,32, 55-62	167	kg/ha

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06/04/2022	f	Applied using Cascade Spreader, JD6830: Nitram; Grass only Plots 25-26, 31-32, 57-58, 61-62	217	kg/ha
24/06/2022	a	Harvest using Amazone Grass Harvester - Flail Mower Collector, JD5070 - 1st Cut	-	-
28/06/2022	a	Mowed using Amazone Grass Harvester - Flail Mower Collector, JD5070 - Cleared	-	-
29/06/2022	f	Applied using Cascade Spreader, JD6830: Nitram: Plots 25-26, 31-32, 57-58, 61-62	217	kg/ha
05/01/2023	a	Harvest using Amazone Grass Harvester - Flail Mower Collector, JD5070 - 2nd Cut (2 <sup>nd</sup> year only; plots 23, 24, 25, 26, 29, 30, 31, 32)	-	-
<b>W Wheat (1<sup>st</sup> year test)</b>				
10/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
25/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Blocks 5, Plots: 65-80	127	kg/ha
05/10/2021	f	Applied using By Hand: Muriate of Potash (MOP): Plots 69, 70	10	kg/ha
05/10/2021	f	Applied using By Hand: Muriate of Potash (MOP): Plots 65, 66	30	kg/ha
05/10/2021	f	Applied using By Hand: Muriate of Potash (MOP): Plots 71, 72	160	kg/ha
05/10/2021	f	Applied using By Hand: Muriate of Potash (MOP): Plots 67, 68	220	kg/ha
05/10/2021	f	Applied using By Hand: Muriate of Potash (MOP): Plots 73, 74	250	kg/ha
06/10/2021	f	Applied using By Hand: Muriate of Potash (MOP): Plots 75, 76	120	kg/ha
08/10/2021	a	Plough 20 cm, WES Dowdeswell 100 Series Five Furrow Plough, JD6620	-	-
08/10/2021	a	Topped using WES Batwing Topper, JD6620; Block 5	-	-
18/10/2021	s	Drilled using WES Accord 4m Tyne Drill: KWS Zyatt	350	seeds/m <sup>2</sup>
25/02/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	3	L/ha
25/02/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Lentyma XE	0.88	L/ha
04/04/2022	f	Applied using By Hand, Pedestrian Operated: Nitrochalk (Block 5, all plots EXCEPT 651, 662, 674, 684, 693, 701, 714, 722, 733, 743, 754, 761, 774, 781, 793, 804)	148	kg/ha
05/04/2022	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP)	150	kg/ha
08/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	3	L/ha
08/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Clayton Prius (18946)	0.7	L/ha
08/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Stefes CCC 720 (17731)	1	L/ha
08/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Moddus (15151)	0.1	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	2	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Cello (18290)	0.6	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Bugle (17821)	0.7	L/ha
16/05/2023	f	Applied using By Hand: Nitrochalk: Plots 654, 661, 671, 683, 691, 703, 712, 723, 734, 741, 752, 764, 773, 784, 794, 801	148	kg/ha
16/05/2023	f	Applied using By Hand: Nitrochalk: Plots 652, 664, 673, 681, 694, 704, 711, 724, 731, 742, 753, 762, 772, 783, 792, 802	444	kg/ha
16/05/2023	f	Applied using By Hand: Nitrochalk: Plots 653, 663, 672, 682, 692, 702, 713, 721, 732, 744, 751, 763, 771, 782, 791, 803	741	kg/ha

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20/06/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	2	L/ha
20/06/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Cello (18290)	0.66	L/ha
13/08/2022	a	Harvest using None, Haldrup C-85 2m cut (Combine); Block 5	-	-
<b>W Rye (2<sup>nd</sup> year test)</b>				
10/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
25/09/2021	a	Power harrow 10 cm, WES Power Harrow JD6620	-	-
04/10/2021	f	Applied using JD6620: Chalk ; Block 3	5	t/ha
04/10/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP) : Block 3, Plots 33-48	127	kg/ha
08/10/2021	a	Plough 20 cm, WES Dowdeswell 100 Series Five Furrow Plough, JD6620	-	-
18/10/2021	s	Drilled using WES Accord 4m Tyne Drill, JD6620: Hybrid	350	seeds/m <sup>2</sup>
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	3	L/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Clayton Prius (18946)	0.7	L/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Stefes CCC 720 (17731)	1.5	L/ha
05/04/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Moddus (15151)	0.15	L/ha
05/04/2022	f	Applied using Cascade Spreader, JD6830: Sulphate of Potash (SOP)	150	kg/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Sprinter	2	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Cello (18290)	0.6	L/ha
04/05/2022	p	Sprayed using WES 12m Knight Sprayer, WES MF6150 - Spraying Tractor: Bugle (17821)	0.7	L/ha
16/05/2023	f	Applied using By Hand: Nitrochalk: Plots 331, 343, 351, 361, 373, 384, 394, 401, 414, 422, 432, 444, 453, 462, 471, 484	185	kg/ha
16/05/2023	f	Applied using By Hand: Nitrochalk: Plots 334, 341, 354, 364, 374, 381, 393, 404, 411, 423, 431, 443, 454, 463, 474, 482	370	kg/ha
16/05/2023	f	Applied using By Hand: Nitrochalk: Plots 333, 344, 352, 362, 371, 382, 391, 402, 413, 421, 433, 442, 451, 464, 473, 481	556	kg/ha
13/08/2022	a	Harvest using None, Haldrup C-85 2m cut (Combine)	-	-

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



**GRASS TREATMENT CROPS**

**LEYS**

**DRY MATTER TONNES/HECTARE**

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

FYM_RES	1 <sup>st</sup> Cut (24/06/2022)			2 <sup>nd</sup> Cut (05/01/2023)			Total of 2 cuts		
	NONE	FYM	MEAN	NONE	FYM	MEAN	NONE	FYM	MEAN
<b>LEY</b>									
Lc1	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0
Lc2	2.23	2.40	2.31	<sup>c</sup> 0.01	<sup>c</sup> 0.01	<sup>c</sup> 0.01	<sup>c</sup> 2.24	<sup>c</sup> 2.41	<sup>c</sup> 2.33
Lc3	2.59	2.73	2.66	b *	b *	b *	b *	b *	b *
Ln1	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0
Ln2	3.73	3.18	3.46	<sup>c</sup> 0.01	<sup>c</sup> 0.03	<sup>c</sup> 0.02	<sup>c</sup> 3.74	<sup>c</sup> 3.21	<sup>c</sup> 3.48
Ln3	2.12	2.23	2.18	b *	b *	b *	b *	b *	b *
(LLc/Lc)Lc1	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0
(LLc/Lc)Lc2	2.00	1.95	1.98	<sup>c</sup> 0.02	<sup>c</sup> 0.01	<sup>c</sup> 0.02	<sup>c</sup> 2.02	<sup>c</sup> 1.97	<sup>c</sup> 1.99
(LLc/Lc)Lc3	3.17	2.90	3.04	b *	b *	b *	b *	b *	b *
(LLn/Ln)Ln1	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0	<sup>a</sup> 0
(LLn/Ln)Ln2	2.41	2.62	2.52	<sup>c</sup> 0.03	<sup>c</sup> 0.04	<sup>c</sup> 0.04	<sup>c</sup> 2.44	<sup>c</sup> 2.67	<sup>c</sup> 2.55
(LLn/Ln)Ln3	1.57	2.24	1.90	b *	b *	b *	b *	b *	b *
<b>MEAN</b>	<b>1.65</b>	<b>1.69</b>	<b>1.67</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>1.31</b>	<b>1.28</b>	<b>1.29</b>
MEAN DM%	40.3			34.3			38.1		

Notes

- \* Missing yield.
- a No 1<sup>st</sup> or 2<sup>nd</sup> cut yields from 1<sup>st</sup> year ley (Block 1) (and no total of 2 cuts consequently) due to crop failure.
- b No 2<sup>nd</sup> cut yields from 3<sup>rd</sup> year ley (Block 4) (and no total of 2 cuts consequently) due to leys having been ploughed in prior to cut.
- c 2<sup>nd</sup> year yields were unable to be recovered from the Farm. It was suspected that files were accidentally overwritten with an empty file of the same name. There was only a very small amount of grass harvested in the 2<sup>nd</sup> cut (in January 2023) from the 2<sup>nd</sup> year leys. This was not likely to have been much more than the samples provided for dry matters. We therefore report total 2<sup>nd</sup> cut yields from the total samples sent for dry matters, with the note that these will be an underestimate of the actual 2<sup>nd</sup> cut yields (and an underestimate of the total of 2 cuts consequently).

General: Since 2014 grass-only leys have not been receiving N after the first cut and in some years K has not been applied after the first cut on both grass-only and grass-clover leys.

**ARABLE TREATMENT CROPS**

**WINTER RYE (1<sup>ST</sup> YEAR)**

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

	FYMRES	NONE	FYM	Mean
<b>ROTATION</b>				
(ABe)R	7.62	7.98	7.80	
(AO)R	7.39	7.97	7.68	
(LLn/AO)R	8.38	8.02	8.20	
(LLc/ABe)R	9.57	7.89	8.73	
<b>Mean</b>	<b>8.24</b>	<b>7.97</b>	<b>8.10</b>	
Grain mean DM%	91.4			
Plot area harvested (ha)	0.00393			

**WINTER BARLEY (2<sup>ND</sup> YEAR)**

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

	FYMRES	NONE	FYM	Mean
<b>ROTATION</b>				
(ABe)WB	4.14	4.20	4.17	
(AO)WB	5.84	5.61	5.72	
(LLn/AO)WB	7.44	7.14	7.29	
(LLc/ABe)WB	5.16	5.02	5.09	
<b>Mean</b>	<b>5.65</b>	<b>5.49</b>	<b>5.57</b>	
Grain mean DM%	92.1			
Plot area harvested (ha)	0.00393			

**WINTER OATS (3<sup>RD</sup> YEAR)**

GRAIN (85% DRY MATTER) TONNES/HECTARE

*Tables of means*

	FYMRES	NONE	FYM	Mean
<b>ROTATION</b>				
(ABe)O	5.73	5.95	5.84	
(AO)O	4.62	5.10	4.86	
(LLc/ABe)O	6.78	6.61	6.70	
(LLn/AO)O	6.82	5.89	6.35	
<b>Mean</b>	<b>5.99</b>	<b>5.89</b>	<b>5.94</b>	
Grain mean DM%	92.2			
Plot area harvested (ha)	0.00393			

ARABLE TEST CROPS

WINTER WHEAT (1<sup>ST</sup> YEAR)

Grain tonnes/hectare

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

<u>ROTATION / FYMRES</u>	<u>none</u>	<u>FYM</u>	<u>Mean</u>		
(AO)W	4.22	3.81	<b>4.02</b>		
(ABe)W	1.28	4.01	<b>2.65</b>		
(LLn/AO)W	4.57	2.94	<b>3.75</b>		
(LLc/ABe)W	1.60	5.56	<b>3.58</b>		
(Ln)W	5.66	6.82	<b>6.24</b>		
(LLn/Ln)W	6.58	7.34	<b>6.96</b>		
(Lc)W	7.95	2.98	<b>5.46</b>		
(LLc/Lc)W	8.02	8.30	<b>8.16</b>		
<b>Mean</b>	<b>4.98</b>	<b>5.22</b>	<b>5.10</b>		

  

<u>ROTATION / N</u>	<u>0</u>	<u>80</u>	<u>160</u>	<u>240</u>	<u>Mean</u>
(AO)W	2.59	4.95	4.79	3.74	<b>4.02</b>
(ABe)W	1.68	4.09	3.08	1.75	<b>2.65</b>
(LLn/AO)W	2.04	5.54	3.28	4.16	<b>3.75</b>
(LLc/ABe)W	2.65	3.55	4.53	3.59	<b>3.58</b>
(Ln)W	5.63	6.73	6.94	5.66	<b>6.24</b>
(LLn/Ln)W	5.43	6.63	8.44	7.33	<b>6.96</b>
(Lc)W	4.47	5.17	4.31	7.90	<b>5.46</b>
(LLc/Lc)W	7.75	8.11	7.99	8.78	<b>8.16</b>
<b>Mean</b>	<b>4.03</b>	<b>5.60</b>	<b>5.42</b>	<b>5.36</b>	<b>5.10</b>

  

<u>FYMRES / N</u>	<u>0</u>	<u>80</u>	<u>160</u>	<u>240</u>	<u>Mean</u>
none	4.41	5.38	5.32	4.83	<b>4.98</b>
FYM	3.65	5.81	5.52	5.90	<b>5.22</b>
<b>Mean</b>	<b>4.03</b>	<b>5.60</b>	<b>5.42</b>	<b>5.36</b>	<b>5.10</b>

  

<u>ROTATION</u>	<u>FYMRES / N</u>	<u>0</u>	<u>80</u>	<u>160</u>	<u>240</u>
(AO)W	none	2.66	4.98	† 5.00	† 4.24
	FYM	2.51	4.91	† 4.58	† 3.24
(ABe)W	none	† 1.02	3.65	† 0.27	† 0.20
	FYM	† 2.33	4.53	5.89	† 3.29
(LLn/AO)W	none	3.05	5.24	5.20	† 4.77
	FYM	† 1.02	5.83	† 1.35	† 3.55
(LLc/ABe)W	none	† 2.50	† 1.61	† 1.89	† 0.40
	FYM	2.79	5.48	7.18	6.77
(Ln)W	none	4.52	6.49	7.04	4.57
	FYM	6.74	6.96	6.84	6.75
(LLn/Ln)W	none	5.32	6.21	8.00	6.80
	FYM	5.54	7.05	8.89	7.87
(Lc)W	none	8.22	6.87	7.72	8.98
	FYM	† 0.71	† 3.48	† 0.89	† 6.82
(LLc/Lc)W	none	7.94	7.98	7.44	8.70
	FYM	7.56	8.24	8.55	8.86
<b>Mean</b>		<b>4.03</b>	<b>5.60</b>	<b>5.42</b>	<b>5.36</b>

Grain mean DM% 92.07  
 Plot area harvested (ha) 0.00183

Notes

† Block 5, Plots 672, 674, 681, 682, 683, 684, 713, 721, 722, 724, 731, 732, 742, 744, 761, 762, 763, 764, 801, 802, 803, 804 - all heavily damaged by deer.

**WINTER RYE (2<sup>ND</sup> YEAR)**

Grain tonnes/hectare

Tables of means

<u>ROTATION / FYMRES</u>	<u>none</u>	<u>FYM</u>	<u>Mean</u>
(AO)R	4.38	5.39	<b>4.89</b>
(ABe)R	5.31	6.34	<b>5.83</b>
(LLn/AO)R	6.04	6.89	<b>6.46</b>
(LLc/ABe)R	6.45	5.39	<b>5.92</b>
(Ln)R	7.36	6.08	<b>6.72</b>
(LLn/Ln)R	7.46	7.61	<b>7.53</b>
(Lc)R	7.50	6.80	<b>7.15</b>
(LLc/Lc)R	7.48	8.03	<b>7.76</b>
<b>Mean</b>	<b>6.50</b>	<b>6.57</b>	<b>6.53</b>

<u>ROTATION / N</u>	<u>0</u>	<u>50</u>	<u>100</u>	<u>150</u>	<u>Mean</u>
(AO)R	4.30	4.91	5.10	5.24	<b>4.89</b>
(ABe)R	4.65	5.97	5.96	6.73	<b>5.83</b>
(LLn/AO)R	5.11	6.73	6.61	7.40	<b>6.46</b>
(LLc/ABe)R	5.23	5.65	5.68	7.11	<b>5.92</b>
(Ln)R	6.21	6.36	7.73	6.58	<b>6.72</b>
(LLn/Ln)R	6.98	8.18	7.68	7.29	<b>7.53</b>
(Lc)R	7.11	7.01	7.15	7.33	<b>7.15</b>
(LLc/Lc)R	7.46	8.48	7.52	7.57	<b>7.76</b>
<b>Mean</b>	<b>5.88</b>	<b>6.66</b>	<b>6.68</b>	<b>6.91</b>	<b>6.53</b>

<u>FYMRES / N</u>	<u>0</u>	<u>50</u>	<u>100</u>	<u>150</u>	<u>Mean</u>
None	5.93	6.78	6.48	6.79	<b>6.50</b>
FYM	5.83	6.54	6.88	7.02	<b>6.57</b>
<b>Mean</b>	<b>5.88</b>	<b>6.66</b>	<b>6.68</b>	<b>6.91</b>	<b>6.53</b>

<u>ROTATION</u>	<u>FYMRES / N</u>	<u>0</u>	<u>50</u>	<u>100</u>	<u>150</u>
(AO)R	none	3.74	4.54	4.69	4.56
	FYM	4.85	5.28	5.51	5.91
(ABe)R	none	4.58	5.34	5.57	5.76
	FYM	4.71	6.61	6.35	7.70
(LLn/AO)R	none	4.62	7.27	5.57	6.68
	FYM	5.60	6.18	7.65	8.11
(LLc/ABe)R	none	5.63	7.00	5.99	7.16
	FYM	4.84	4.31	5.36	7.05
(Ln)R	none	6.86	7.34	7.55	7.69
	FYM	5.57	5.38	7.91	5.47
(LLn/Ln)R	none	7.26	7.70	7.80	7.07
	FYM	6.71	8.66	7.55	7.51
(Lc)R	none	7.79	6.86	7.58	7.79
	FYM	6.43	7.17	6.72	6.87
(LLc/Lc)R	none	6.95	8.24	7.09	7.63
	FYM	7.96	8.72	7.96	7.50
	<b>Mean</b>	<b>5.88</b>	<b>6.66</b>	<b>6.68</b>	<b>6.91</b>

Grain mean DM% 91.56  
Plot area harvested (ha) 0.00183