Results of the Classical and Other Long-term Experiments 2021

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

Rothamsted Research

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21/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 84th year, leys, winter beans, winter wheat, winter rye

For previous years see 'Details' 1967 & 1973 and Yield Books for 74-20/W/RN/3.

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

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, WINTER
A	Arable with roots:	P, R, C, P, W until 1971 then P, B, B, P, WINTER
A H	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, WINTER

P = potatoes, R = winter rye, C = carrots, W= winter wheat, B = spring 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 every 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:

Ln3	(Previous LEY) LN1, LN2, LN3, W, R
Lc3	(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 (spring 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 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 (2nd 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.

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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 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:

1. **ROTATION** Rotations before wheat:
   Ln 3
   Lc 3
   LLc/Lc3
   LLn/Ln3
   LLn/AO
   LLc/ABe
   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:

3. **N** N fertilizer as split dressings in spring (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

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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

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

Treatments to leys:

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

NOTE: Corrective K dressings (kg K_2O) as muriate of potash, applied where necessary to first test crop winter wheat, applied 2020 (see date below). Note that for 2021, applications were based on rounded means calculated from 2016-2020 data in the absence of current data due to the COVID-19 pandemic.

Continuous rotations Before wheat	No FYM Half plots	FYM Res Half plots
Lc3	Plot 34: 0	Plot 33: 0
LLn/AO	Plot 36: 160	Plot 35: 160
LLn/Ln3	Plot 37: 10	Plot 38: 10
AO	Plot 40: 250	Plot 39: 250
LLc/Lc3	Plot 41: 0	Plot 42: 0
Ln3	Plot 43: 30	Plot 44: 30
ABe	Plot 45: 220	Plot 46: 220
LLc/ABe	Plot 47: 120	Plot 48: 120

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Experimental Diary

Date		Application	Rate	Units
ALL				
25/10/2020	P	Sprayed using WES 12m Knight Sprayer, WES MF6150: Samurai (16238):	2.5	L/ha
26/10/2020	a	Topping; Topper 9, JD6620		
04/11/2020	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Samurai (16238): Block 3 - Grass only	2.5	L/ha
05/11/2020	a	Topping; Topper 9, JD6620		
11/11/2020	a	Ploughed Tillage 20 cm in Stackyard Woburn; WES Dowdeswell 100 Series Five Furrow Plough, JD6620		
13/11/2020	a	Power Harrow; WES Power Harrow, JD6620.		
24/02/2021	a	Topping; Topper 9, JD6620	-	-
24/02/2021	a	Topping; Topper 9, JD6620	-	-
02/09/2021	a	Topping; Topper 9, JD6620	-	-
08/09/2021	a	Topping paths; Kilworth Topper, Iseki ISTH4335	-	-
05/10/2021	a	Applied Muriate of Potash (MOP) by hand: Block 2 - Plots 23, 24, 25, 26, 29, 30, 31, 32	0	
25/11/2021	a	Topping; Topper 9, JD6620		
Grass ley and clover/grass leys (1st year leys)				
26/10/2020	a	Topping using Topper 9, JD6620		
09/11/2020	f	Applied Triple Superphosphate (TSP): Block 2 - Plots 23, 24, 25, 26, 29, 30, 31, 32	213	kg/ha
09/11/2020	f	Applied Sulphate of Potash (SOP): Block 2 - Plots 23, 24, 25, 26, 29, 30, 31, 32	140	kg/ha
22/04/2021	f	Applied Nitram: Block 2 - Plots 25, 26, 31, 32	217	kg/ha
22/04/2021	f	Applied Muriate of Potash (MOP): Block 2 - Plots 23, 24, 25, 26, 29, 30, 31, 32	167	kg/ha
22/11/2021	a	Harvest using Amazone Grass Harvester - Flail Mower Collector, JD5070: 2nd Cut	-	-
Grass ley and clover/grass leys (2nd and 3rd year leys)				
09/11/2020	F	Applied Muriate of Potash (MOP): Block 4 - Plots 55, 56, 57, 58, 59, 60, 61, 62; Block 5 - Plots 65, 66, 69, 70, 77, 78, 79, 80	0	kg/ha
09/11/2020	f	Applied Triple Superphosphate (TSP): Block 4 - Plots 55, 56, 57, 58, 59, 60, 61, 62; Block 5 - Plots 65, 66, 69, 70, 77, 78, 79, 80	213	kg/ha
09/11/2020	f	Applied Sulphate of Potash (SOP): Block 4 - Plots 55, 56, 57, 58, 59, 60, 61, 62; Block 5 - Plots 65, 66, 69, 70, 77, 78, 79, 80	140	kg/ha
22/04/2021	f	Applied Nitram: Block 4 - Plots 57, 58, 61, 62; Block 5 - 65, 66, 69, 70	217	kg/ha
22/04/2021	f	Applied Muriate of Potash (MOP): Block 4 - Plots 55, 56, 57, 58, 59, 60, 61, 62; Block 5 – Plots 65, 66, 69, 70, 77 to 80	167	kg/ha
23/06/2021	a	Harvest using Amazone Grass Harvester - Flail Mower Collector JD5070: 1st Cut	-	-
30/06/2021	a	Mowing using JD6620, Mower-Unifarm CM166	-	-
30/06/2021	a	Baling Grass using Claas Baler, JD6620	-	-
22/11/2021	a	Harvest using Amazone Grass Harvester - Flail Mower Collector, JD5070: 2nd Cut	-	-
25/11/2021	a	Baling using Claas Baler, JD6620	-	-

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W Wheat (test crop 1)

09/11/2020	f	Applied Triple Superphosphate (TSP) using Cascade Spreader, JD6930 : Block 3 - All Plots	127	kg/ha
09/11/2020		Applied MOP as corrective K: Plots 37, 38	10	kg/ha
09/11/2020		Applied MOP as corrective K: Plots 43, 44	30	kg/ha
09/11/2020		Applied MOP as corrective K: Plots 47, 48	120	kg/ha
09/11/2020		Applied MOP as corrective K: Plots 35, 36	160	kg/ha
09/11/2020		Applied MOP as corrective K: Plots 45, 46	220	kg/ha
09/11/2020		Applied MOP as corrective K: Plots 39, 40	250	kg/ha
11/11/2020	a	Ploughed Tillage 20 cm in Stackyard Woburn using WES Dowdeswell 100 Series Five Furrow Plough, JD6620		
13/11/2020	a	Minimum Tillage 10 cm in Stackyard Woburn using WES Power Harrow, JD6620		
24/11/2020	s	Drilled using WES Accord 4m Tyne Drill JD6620: KWS Zyatt - Wheat	400	seeds/m^2
20/04/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Sprinter - ????	3	L/ha
20/04/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Ally Max SX (18768)	42	g/ha
20/04/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Starane HI-Load HL (16557)	0.6	L/ha
21/04/2021	f	Applied Sulphate of Potash (SOP): Block 3 - All Plots	150	kg/ha
06/05/2021	f	Applied Nitrochalk (27% N): Block 3 - Plots 331, 351, 361, 343, 373, 384, 394, 401, 414, 422, 432, 444, 453, 462, 471, 484	148	kg/ha
06/05/2021	f	Applied Nitrochalk (27% N): Block 3 - Plots 334, 341, 354, 364, 381, 374, 393, 404, 411, 423, 431, 443, 454, 463, 474, 482	444	kg/ha
06/05/2021	f	Applied Nitrochalk (27% N): Block 3 - Plots 333, 344, 352, 362, 371, 382, 391, 402, 413, 421, 433, 442, 451, 481, 464, 473	741	kg/ha
14/05/2021	P	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	2	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Lentyma XE (19301),	1	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Retengo 200 (19551)	0.4	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Stefes CCC 720 (17731)	1.5	L/ha
25/08/2021	a	Harvesting using Haldrup C-85 2m cut	-	-
02/09/2021	a	Baling using Claas Baler	-	-

W Rye (test crop 2)

09/11/2020	f	Applied Triple Superphosphate (TSP) using Cascade Spreader, JD6930: Block 1 - All Plots	127	kg/ha
10/11/2020	f	Applied Chalk: Block 1 – all plots	5	t/ha
02/12/2020	s	Drilled using WES Accord 4m Tyne Drill, JD6620: Miscani - Oats	400	seeds/m^2
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	3	L/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Ally Max SX (18768)	42	g/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Starane HI-Load HL (16557)	0.6	L/ha
21/04/2021	f	Applied Sulphate of Potash (SOP) using Cascade Spreader, JD6930: Block 1 - All Plots	150	kg/ha

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06/05/2021	f	Applied Nitrochalk (27% N): Block 1 - Plots 014, 021, 034, 043, 054, 061, 074, 084, 094, 102, 113, 123, 134, 143, 152, 163	185	kg/ha
06/05/2021	f	Applied Nitrochalk (27% N): Block 1 - Plots 011, 023, 031, 042, 051, 063, 072, 081, 091, 103, 111, 121, 132, 142, 153, 162	370	kg/ha
06/05/2021	f	Applied Nitrochalk (27% N): Block 1 - Plots 013, 022, 033, 044, 053, 062, 073, 083, 093, 101, 114, 124, 133, 144, 151, 164	556	kg/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	3	L/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Ally Max SX (18768)	42	g/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Starane HI-Load HL (16557)	0.6	L/ha
14/05/2021	P	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	2	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Cello (18290)	1	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Stefes CCC 720 (17731)	1.5	L/ha
25/08/2021	a	Harvesting using Haldrup C-85 2m cut	-	-
02/09/2021	a	Baling using Claas Baler	-	-

Rye (treatment crop)

09/11/2020	f	Applied Triple Superphosphate (TSP) using Cascade Spreader, JD6930: Block 2 - Plots 17, 18, 19, 20, 21, 22, 27, 28	127	kg/ha
02/12/2020	s	Drilled using WES Accord 4m Tyne Drill	400	seeds/m^2
21/04/2021	f	Applied Sulphate of Potash (SOP) using Cascade Spreader, JD6930: Block 2 - Plots 17, 18, 19, 20, 21, 22, 27, 28	150	kg/ha
22/04/2022	f	Applied Nitram (34.5% N) using Cascade Spreader, JD6930: Block 2 – Plots 17, 18, 19, 20, 21, 22, 27, 28	290	kg/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	3	L/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Ally Max SX (18768)	42	g/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Starane HI-Load HL (16557)	0.6	L/ha
14/05/2021	P	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	2	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Cello (18290)	1	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Stefes CCC 720 (17731)	1.5	L/ha
25/08/2021	a	Harvesting using Haldrup C-85 2m cut	-	-
02/09/2021	a	Baling using Claas Baler	-	-

W Oats

09/11/2020	f	Applied Triple Superphosphate (TSP) using Cascade Spreader, JD6930: Block 5 - Plots 67, 68, 71, 72, 73, 74, 75, 76	127	kg/ha
24/11/2020	s	Drilled using WES Accord 4m Tyne Drill JD6620: Mephisto - RYE	350	seeds/m^2
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	3	L/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Ally Max SX (18768)	42	g/ha
20/04/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Starane HI-Load HL (16557)	0.6	L/ha
21/04/2021	f	Applied Sulphate of Potash (SOP) using Cascade Spreader, JD6930: Block 5 - 67, 68, 71, 72, 73, 74, 75, 76	150	kg/ha

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22/04/2021	f	Applied Nitram (34.5% N) using Cascade Spreader, JD6930: Plots 67, 68, 71, 72, 73, 74, 75, 76	290	kg/ha
14/05/2021	P	Sprayed using WES 12m Knight Sprayer, WES MF6150: Sprinter - ????	2	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Cello (18290)	1	L/ha
14/05/2021	p	Sprayed using WES 12m Knight Sprayer, WES MF6150: Stefes CCC 720 (17731)	1.5	L/ha
25/08/2021	a	Harvesting using Haldrup C-85 2m cut	-	-
25/08/2021	a	Harvesting using Haldrup C-85 2m cut	-	-
02/09/2021	a	Baling using Claas Baler	-	-
W Barley				
09/11/2020	f	Applied Triple Superphosphate (TSP) using Cascade Spreader, JD6930: Block 4 - Plots 49, 50, 51, 52, 53, 54, 63, 64	127	kg/ha
24/11/2020	s	Drilled Libra - Barley	400	seeds/m^2
21/04/2021	f	Applied Sulphate of Potash (SOP) using Cascade Spreader, JD6930: Block 4 - Plots 49, 50, 51, 52, 53, 54, 63, 64	150	kg/ha
22/04/2021	f	Applied Nitram (34.5% N) using Cascade Spreader, JD6930: Plots 49, 50, 51, 52, 53, 54, 63, 64	290	kg/ha
24/11/2020	s	Drilled using WES Accord 4m Tyne Drill JD6620: Libra - Barley	400	seeds/m^2
21/04/2021	f	Applied Sulphate of Potash (SOP) using Cascade Spreader, JD6930: Block 4 - Plots 49, 50, 51, 52, 53, 54, 63, 64	150	kg/ha
25/08/2021	a	Harvesting using Haldrup C-85 2m cut	-	-
02/09/2021	a	Baling using Claas Baler	-	-

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

Yield Error Note: It was found that the FYM notation (dr) for some plots on Block 5 was incorrect in the 2020 field plan, and for several previous years (2003-2006, 2009). Consequently, the yield and plans for 2020 were corrected, but earlier printed yield books contain an error in some of the mean yields for FYM and NONE treatments.

GRASS TREATMENT CROP

LEYS

1ST CUT (30 JUN 2020) DRY MATTER TONNES/HECTARE

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

FYM_RES			
LEY	NONE	FYM	MEAN
Lc1	0.00	0.00	0.00
Lc2	4.33	3.69	4.01
Lc3	5.39	5.29	5.34
Ln1	0.00	0.00	0.00
Ln2	7.75	7.05	7.40
Ln3	7.77	6.67	7.22
(LLc/Lc)Lc1	0.00	0.00	0.00
(LLc/Lc)Lc2	3.61	3.80	3.70
(LLc/Lc)Lc3	4.45	4.11	4.28
(LLn/Ln)Ln1	0.00	0.00	0.00

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(LLn/Ln)Ln2	7.15	6.74	6.95
(LLn/Ln)Ln3	6.82	7.14	6.98
MEAN	3.94	3.71	3.82
1ST CUT MEAN DM%	21.80		

2ND CUT (30 JUN 2020) DRY MATTER TONNES/HECTARE

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

FYM_RES			
LEY	NONE	FYM	MEAN
Lc1	0.51	1.18	0.85
Lc2	1.11	1.18	1.15
Lc3	0.00	0.00	0.00
Ln1	2.55	2.91	2.73
Ln2	1.04	1.53	1.29
Ln3	0.00	0.00	0.00
(LLc/Lc)Lc1	1.75	1.86	1.81
(LLc/Lc)Lc2	1.20	0.93	1.07
(LLc/Lc)Lc3	0.00	0.00	0.00
(LLn/Ln)Ln1	1.62	1.78	1.70
(LLn/Ln)Ln2	1.21	1.19	1.20
(LLn/Ln)Ln3	0.00	0.00	0.00
MEAN	0.92	1.05	0.98
2ND CUT MEAN DM%	32.90		

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

FYM_RES			
LEY	NONE	FYM	MEAN
Lc1	0.51	1.18	0.85
Lc2	5.44	4.87	5.16
Lc3	5.39	5.29	5.34
Ln1	2.55	2.91	2.73
Ln2	8.79	8.57	8.68
Ln3	7.77	6.67	7.22
(LLc/Lc)Lc1	1.75	1.86	1.81
(LLc/Lc)Lc2	4.81	4.73	4.77
(LLc/Lc)Lc3	4.45	4.11	4.28
(LLn/Ln)Ln1	1.62	1.78	1.70
(LLn/Ln)Ln2	8.36	7.93	8.15
(LLn/Ln)Ln3	6.82	7.14	6.98
MEAN	4.86	4.75	4.80
TOTAL CUT MEAN DM%	26.20		

Note 2: 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.

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ARABLE TREATMENT CROPS

RYE

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
(ABe)R	4.41	5.28	4.85
(AO)R	5.72	5.23	5.48
(LLn/AO)R	5.54	5.63	5.58
(LLc/ABe)R	3.88	4.53	4.21
Mean	4.89	5.17	5.03
Grain mean DM%	79.90		
Plot area harvested (ha)	0.00393		

WINTER BARLEY

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
(ABe)WB	2.50	2.46	2.48
(AO)WB	2.16	2.19	2.18
(LLn/AO)WB	2.43	2.19	2.31
(LLc/ABe)WB	1.86	2.35	2.11
Mean	2.24	2.30	2.27
Grain mean DM%	81.90		
Plot area harvested (ha)	0.00393		

WINTER OATS

GRAIN (85% DRY MATTER) TONNES/HECTARE

Tables of means

FYMRES ROTATION	NONE	FYM	Mean
ABe	2.84	3.25	3.04
AO	3.44	3.19	3.32
LLc/ABe	3.00	3.75	3.38
LLn/AO	3.32	2.83	3.07
Mean	3.15	3.26	3.20
Grain mean DM%	81.30		
Plot area harvested (ha)	0.00393		

ARABLE TEST CROPS

WINTER WHEAT

Grain tonnes/hectare

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

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FYMRES	none	FYM	Mean
ROTATION			
(AO)W	2.36	4.36	3.36
(ABe)W	3.50	4.19	3.84
(LLn/AO)W	2.19	3.51	2.85
(LLc/ABe)W	4.60	2.55	3.57
(Ln)W	4.50	3.06	3.78
(LLn/Ln)W	4.58	5.33	4.95
(Lc)W	3.85	3.36	3.61
(LLc/Lc)W	4.36	5.22	4.79
Mean	3.74	3.95	3.84

N	0	80	160	240	Mean
ROTATION					
(AO)W	1.45	3.20	4.11	4.65	3.36
((ABe)W	1.99	3.30	5.39	4.69	3.84
(LLn/AO)W	1.89	3.02	3.89	2.59	2.85
(LLc/ABe)W	1.86	3.23	4.17	5.03	3.57
(Ln)W	3.45	3.05	4.08	4.54	3.78
(LLn/Ln)W	3.54	4.54	6.26	5.48	4.95
(Lc)W	1.95	3.57	4.64	4.28	3.61
(LLc/Lc)W	2.93	4.62	5.50	6.11	4.79
Mean	2.38	3.57	4.76	4.67	3.84

N	0	80	160	240	Mean
FYMRES					
none	2.18	3.66	4.57	4.56	3.74
FYM	2.58	3.48	4.94	4.78	3.95
Mean	2.38	3.57	4.76	4.67	3.84

N		0	80	160	240
ROTATION	FYMRES				
(AO)W	none	1.34	2.85	2.16	3.07
	FYM	1.56	3.56	6.06	6.24
(ABe)W	none	1.83	3.06	5.45	3.66
	FYM	2.14	3.53	5.34	5.73
(LLn/AO)W	none	1.46	2.56	2.59	2.15
	FYM	2.33	3.49	5.19	3.02
(LLc/ABe)W	none	2.29	4.62	5.45	6.04
	FYM	1.42	1.85	2.90	4.03
(Ln)W	none	2.71	3.85	5.61	5.82
	FYM	4.19	2.24	2.54	3.26
(LLn/Ln)W	none	3.10	3.77	6.12	5.32
	FYM	3.98	5.30	6.40	5.64
(Lc)W	none	1.88	4.23	4.53	4.78
	FYM	2.02	2.91	4.75	3.77
(LLc/Lc)W	none	2.84	4.33	4.63	5.64
	FYM	3.02	4.92	6.38	6.57
Mean		2.38	3.57	4.76	4.67

Grain mean DM%	79.20
Plot area harvested (ha)	0.00183

WINTER RYE

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Grain tonnes/hectare

Tables of means

FYMRES	none	FYM	Mean
ROTATION			
(AO)R	4.91	4.81	4.86
(ABe)R	4.95	4.65	4.80
(LLn/AO)R	4.75	5.95	5.35
(LLc/ABe)R	5.48	4.70	5.09
(Ln)R	6.32	6.13	6.24
(LLn/Ln)R	7.83	5.72	6.78
(Lc)R	6.05	4.86	5.46
(LLc/Lc)R	6.51	5.52	6.01
Mean	5.85	5.27	5.56

N	0	50	100	150	Mean
ROTATION					
(AO)R	2.56	4.74	5.44	6.70	4.86
(ABe)R	2.53	4.69	5.53	6.46	4.80
(LLn/AO)R	4.81	5.89	5.90	4.82	5.35
(LLc/ABe)R	3.14	5.34	5.69	6.18	5.09
(Ln)R	5.38	6.29	7.23	6.56	6.24
(LLn/Ln)R	4.28	8.65	7.46	6.71	6.78
(Lc)R	3.50	5.41	6.13	6.78	5.46
(LLc/Lc)R	3.68	5.93	7.00	7.44	6.01
Mean	3.74	5.87	6.23	6.45	5.56

N	0	50	100	150	Mean
FYMRES					
none	3.35	6.62	6.62	6.81	5.85
FYM	4.12	5.11	5.80	6.10	5.27
Mean	3.74	5.87	6.23	6.45	5.56

ROTATION	FYMRES/N	0	50	100	150
(AO)R	none	2.69	4.54	5.35	7.06
	FYM	2.44	4.94	5.53	6.33
(ABe)R	none	2.43	4.66	5.71	7.00
	FYM	2.63	4.71	5.34	5.92
(LLn/AO)R	none	3.08	6.22	6.45	3.26
	FYM	6.53	5.56	5.34	6.38
(LLc/ABe)R	none	3.06	5.17	6.40	7.29
	FYM	3.23	5.52	4.98	5.07
(Ln)R	none	3.97	6.42	7.23	7.66
	FYM	6.78	6.16	-	5.46
(LLn/Ln)R	none	3.93	13.84	7.18	6.35
	FYM	4.64	3.45	7.73	7.08
(Lc)R	none	3.72	5.53	7.24	7.70
	FYM	3.27	5.30	5.02	5.87
(LLc/Lc)R	none	3.92	6.60	7.37	8.15
	FYM	3.45	5.27	6.63	6.73
	Mean	3.74	5.87	6.23	6.45
Grain mean DM%	79.44				
Plot area harvested (ha)	0.00183				

Plot 132 [(Ln)R, FYM, 100 kg N] lost due to combine driver error.

Plots 021-024 [(ABe)R, none] received the same mis-applied N rates as in 2020 (1 3 2 0, rather than 2 0 3 1 that they should have been).

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