Results of the Classical and Other Long-term Experiments 2022

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22/R/EX/4 - Exhaustion Land (Hoosfield)

Rothamsted Research

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22/R/EX/4 EXHAUSTION LAND (Hoosfield)

Object: To study the residual effects of manures applied 1856 - 1901, and of additional phosphate applied since 1986 (P test) and of additional potassium since 2007 (K test); on the yield of continuous spring barley up to 1991, winter wheat since – Hoosfield.

The 167th year, winter wheat.

For previous years see 'Details' 1977, 1973 and Yield Books for 74-21/R/EX/4

Treatments: All combinations of:

Whole plots (P test)

1.	**OLD RES**	Residues of manures applied annually 1876 – 1901:

Main plot

01	O	None
03	D	Farmyard manure at 35 t (fresh weight)
05	N	96 kg N as ammonium salts
09	P	34 kg P as superphosphate
07	NPKNaMg	N and P as above plus 137 kg K as sulphate of potash, 16 kg Na as sulphate of soda, 11 kg Mg as sulphate of magnesia

2.	P	Maintenance P (20 kg P) applied annually from 2000

to maintain existing levels of available P In the soil. In 2009 maintenance P applications were changed from 20 kg P/ha to 15 kg P/ha. This was not recorded in the yield books for 2009-13. (P1) (P2) and (P3) are residues of P applied annually. From 2016 onward P was withheld from the P(P1) sub-plots.

1986–1992:

	1986-1992	2000-2008	2009-2015	2016-
O	None	None	None	None
P (P1)	44 kg P	20 kg P	15 kg P	None
P (P2)	87 kg P	20 kg P	15 kg P	15 kg P
P (P3)	131 kg P	20 kg P	15 kg P	15 kg P

NOTE: P treatments were applied at 61.5 kg P in error in 2000.

Plus

Whole plots (K test, previously N test until 1991)

1.	**OLD RES**	Residues of manures applied annually 1876 – 1901:

Main Plot

02	O	None
04	D	Farmyard manure at 35 t (fresh weight)
06	N*	96 kg N as nitrate of soda
10	PK	34 kg P as superphosphate, 137 kg K as sulphate of potash
08	N*PK	N, P and K as above

2. K Potassium applied annually from 2007 as muriate of potash

O	None (2 sub-plots within each treatment strip)
K1	75 kg K_2O (62.2 kg K)
K2	150 kg K_2O (124.5 kg K)

Whole plots

Nitrogen: 50 kg N as ammonium sulphate (21% N, 24% S; to supply sufficient S) during first two weeks in March, 200 kg N as ammonium nitrate (34.5% N) at GS31/mid-April (whichever comes first) and 50 kg N as ammonium nitrate (34.5% N) at GS37 (not later than mid-May).

Experimental Diary

Date		Application	Rate	Unit
08/09/2021	f	Applied using Cascade Spreader, JD6830: Triple Superphosphate (TSP); Plots 021-024, 041-044, 061-064, 081-084, 101-104, 011-012, 031-032, 051-052, 071-072, 091-092.	75	kg/ha
09/09/2021	f	Applied using Cascade Spreader, JD6830: Muriate of Potash (MOP); Plots 023, 043, 063, 083, 103	125	kg/ha
09/09/2021	f	Applied using Cascade Spreader, JD6830: Muriate of Potash (MOP); Plots 011-014, 031-034, 051-054, 071-074, 091-094, 024, 044, 064, 084, 104	250	kg/ha
09/09/2021	a	Ploughed using KV Five Furrow Plough, JD6145R Premium	-	-
16/09/2021	a	Ploughed using KV Five Furrow Plough, JD6145R Premium	-	-
16/09/2021	s	Drilled using Accord Combination Drill No. 4, JD6830: KWS Zyatt	350	seeds/m2
18/09/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Pontos (17811)	1	L/ha
18/09/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Firestarter (18422)	0.3	L/ha
18/09/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Velomax (A0831)	0.4	L/ha
11/10/2021	p	Sprayed using Knight 24m Sprayer, NH T6030: Hallmark with Zeon Technology (12629)	50	mL/ha
22/03/2022	f	Applied using Cascade Spreader, JD6830: Sulphate of Ammonia; All Plots	238	kg/ha
29/03/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Stefes CCC 720 (17731)	1	L/ha
29/03/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Moddus (15151)	0.1	L/ha
29/03/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Clayton Prius (18946)	1	L/ha
20/04/2022	f	Applied using Cascade Spreader, JD6830: Kieserite; All Plots	80	kg/ha
25/04/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Bugle (17821)	0.8	L/ha
25/04/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Cello (18290)	0.7	L/ha
27/04/2022	f	Applied using Cascade Spreader, JD6830: Nitram	580	kg/ha
16/05/2022	f	Applied using Cascade Spreader, JD6830: Nitram	145	kg/ha
07/06/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Cello (18290)	0.8	L/ha
28/07/2022	a	Harvest plots using Haldrup C-85 2m cut	-	-
29/07/2022	a	Topped using Kilworth Topper, Iseki ISTH4335	-	-
30/07/2022	a	Bailed discards using McHale Fusion 2 Baler, JD6145R Premium	-	-
04/08/2022	a	Bailed using McHale Fusion 2 Baler, JD6145R Premium	-	-
31/08/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Samurai (16238)	3	L/ha
31/08/2022	p	Sprayed using Knight 24m Sprayer, NH T6030: Buffalo Elite (16238)	1	L/ha

Yields

P TEST

Grain Yield, tonnes/hectare

Tables of means

P_RES current OLD_RES	O P0	(P1) P0	(P2) P	(P3) P	Mean
O	0.97	2.28	5.77	7.37	4.10
D	1.19	5.06	9.41	9.34	6.25
N	0.45	2.09	6.60	7.78	4.23
P	1.12	4.57	9.44	9.23	6.09
NPKNAMG	0.80	4.49	9.10	9.30	5.92
Mean	**0.91**	**3.70**	**8.06**	**8.60**	**5.32**
Grain mean DM%	88.9				

Straw Yield, tonnes/hectare

Tables of means

P_RES current OLD_RES	O P0	(P1) P0	(P2) P	(P3) P	Mean
O	0.44	0.56	3.27	4.51	2.20
D	0.36	2.75	4.03	3.54	2.67
N	0.04	1.10	1.59	3.39	1.53
P	1.61	1.80	3.39	3.57	2.59
NPKNAMG	1.18	2.68	3.14	3.44	2.61
Mean	**0.72**	**1.78**	**3.08**	**3.69**	**2.32**
Straw mean DM%	85.9				

Plot area harvested 0.00512 ha.

K TEST

Grain Yield, tonnes/hectare

Tables of means

K_Test OLD_RES	K0	K1	K2	Mean
O	7.22	9.16	9.16	8.19
D	7.83	10.65	9.77	9.02
N*	7.79	8.19	7.77	7.88
PK	9.18	9.59	9.81	9.44
N*PK	8.28	9.17	9.61	8.83
Mean	**8.06**	**9.35**	**9.23**	**8.67**
Grain mean DM%	89.3			

Straw Yield, tonnes/hectare

Tables of means

K_Test OLD_RES	K0	K1	K2	Mean
O	3.20	4.81	3.53	3.69
D	2.82	4.40	3.68	3.43
N*	3.27	3.28	2.61	3.11
PK	4.27	3.72	5.49	4.44
N*PK	4.10	3.50	4.76	4.12
Mean	**3.53**	**3.94**	**4.01**	**3.75**
Straw mean DM%	86.4			

Plot area harvested 0.00512 ha