Results of the Classical and Other Long-term Experiments 2022

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22/R/BK/1 - Broadbalk Winter Wheat

Rothamsted Research

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22/R/BK/1 BROADBALK WINTER WHEAT

Object: To study the effects of organic manures and inorganic fertilisers on continuous winter wheat and wheat in rotation. From 1968 two three-year rotations were included: potatoes, beans, winter wheat and fallow, winter wheat, winter wheat. In 1979 the first rotation was changed to fallow, potatoes, winter wheat. In 1980 the second rotation reverted to continuous winter wheat. Since 1985 part of the second rotation was added to the first to extend the rotation to fallow, potatoes, winter wheat, winter wheat, winter wheat. In 1996 the fallow was replaced by winter oats and potatoes replaced by maize in 1997. In 2018 (175th year) winter beans (Be) replaced maize on the rotational sections and the rotation was changed to wheat, wheat, oats, wheat, beans. The new rotation includes two first wheats each year. Previously, only one first wheat was included in the rotation. This change has resulted in additional harvest sampling and analysis, to include both first wheats and the beans.

2022 was the 179th year of the experiment, for previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231; Station Report for 1968, Part 2; Station Report for 1982, Part 2, pp 5-44 and Yield Books for 74-21/R/BK/1

Areas harvested [a]:

Crop	Section	ha
Wheat:	0	0.00305
	1	0.00561
	4,5,6 and 7	0.00463
	8, 9	0.00488
Oats:	2	0.00463
Beans:	3	0.00463

[a] The current Haldrup combine has a smaller cut width (2.0 m) than the previous Sampo combine (2.1 m). Consequently, from 2017 cereal yields are based on a 2.0 m cut width.

Treatments:

From 2021 crop, some of the treatments were changed. The treatments are now:

PLOT	TREATMENT
01	N4
2.1	FYM N3
2.2	FYM
03	None
05	(P) K Mg
06	N1 (P) K Mg
07	N2 (P) K Mg
08	N3 (P) K Mg
09	N4 (P) K Mg
10	N4
11	N4 (P) Mg
12	N1+3+1 (P) K Mg
13	N4 (P) K
14	N4 (P) K* (Mg*)
15	N5 (P) K Mg
16	N6 (P) K Mg
17	N1+4+1 P K Mg
18	N1+2+1 P K Mg
19	N1+1+1 K Mg
20	N4 K Mg

Winter wheat – single N to wheat

N1, N2, N3, N4, N5, N6: 48, 96, 144, 192, 240, 288 kg N as 34.5% N; to be applied at the same time as the second dressings in the split N plots for wheat.

– Split N to wheat

N1+1+1, 1+2+1 etc: Rates as above, but in 3 splits. Timings: first two weeks of March, GS31 or mid-April (whichever comes first) and GS37/mid-May.

Winter oats – single N application

½ N1, ½ N2, ½ N3, ½ N4, ½ N5, ½ N6: 24, 48, 72, 96, 120, 144 kg N as 34.5%N; applied at half the rate for wheat in a single application in mid-April. Oats received no N or FYM from 1996 to 2017.

Winter Beans (Be) NO N APPLIED.

All crops P, K, Mg & FYM applications as shown below:-

P: 35 kg P as triple superphosphate

(P): none since 2001 or 2020 (under review)

K: 90 kg K as potassium sulphate

K*: 90 kg K as potassium chloride

Mg: 12 kg Mg as kieserite

(Mg*): none since 2001 (under review)

FYM: Farmyard manure at 35 t (fresh weight); NO FYM APPLIED TO W. BEANS

Previous treatment:

Whole plots

PLOT		Fertilizers and organic manures:-			
	Plot	Treatments until 1967	Treatments from 1968	Treatments from 1985 – 2000	Treatments from 2001-2020
01 DN4PK	01	-	D N2 P K	D N4 P K	N4
2.1 DN2	21	D	D N2	D N2	FYM N3 (1)
2.2 D	22	D	D	D	FYM
03 0	03	None	None	None	None
05 F	05	P K Na Mg	P K (Na) Mg	PK Mg	(P) K Mg
06 N1F	06	N1 P K Na Mg	N1 P K (Na) Mg	N1 P K Mg	N1 (P) K Mg
07 N2F	07	N2 P K Na Mg	N2 P K (Na) Mg	N2 P K Mg	N2 (P) K Mg
08 N3F	08	N3 P K Na Mg	N3 P K (Na) Mg	N3 P K Mg	N3 (P) K Mg
09 N4F	09	N*1 P K Na Mg	N4 P K (Na) Mg	N4 P K Mg	N4 (P) K Mg
10 N2	10	N2	N2	N2	N4
11 N2P	11	N2 P	N2 P	N2 P	N4 P Mg
12 N2PNA	12	N2 P Na	N2 P Na	N2 P Na	N1+3+1 (P) K Mg (2)
13 N2PK	13	N2 P K	N2 P K	N2 P K	N4 P K
14 N2PKMG	14	N2 P Mg	N2 P K Mg	N2 P K Mg	N4 P K* (Mg*)
15 N5F	15	N2 P K Na Mg	N3 P K(Na) Mg	N5 P K Mg	N5 (P) K Mg
16 N6F	16	N*2 P K Na Mg	N2 P K (Na) Mg	N6 P K Mg	N6 (P) K Mg
17 N1+3FH	17	N2 (A)	N2 ½[P K (Na) Mg]	N1+3 ½[P K Mg] (A)+	N1+4+1 P K Mg
18 N0+3FH	18	P K Na Mg (A)	N2 ½[P K (Na) Mg]	N0+3 ½[P K Mg] (A)+	N1+2+1 P K Mg
19 (C)	19	C	C	(C) (since 1989)	N1+1+1 K Mg
20 N2KMG	20	N2 K Na Mg	N2 K (Na) Mg	N2 K Mg	N4 K Mg

(1) N2 2001-2004

(2) N1+3+1 (P) K2 Mg2 2001-2005

(A) Alternating each year

+ This change since 1980. Treatments shown are those to winter wheat; autumn N alternates. Maize received N3 ½[PK Mg] on both plots 17 and 18. These treatments shown incorrectly in 1999-2002 Yield books.

Winter oats: N and FYM were not applied 1996-2017.

N1, N2, N3, N4, N5, N6:	48, 96, 144, 192, 240, 288 kg N as sulphate of ammonia until 1967, except N* which was nitrate of soda. All as 'Nitro-Chalk' in spring from 1968 to 1985, as 34.5% N since 1986.
N0+3; N1+3:	None in autumn + 144 kg N in spring; 48 kg N in autumn + 144 kg N in spring.
P:	35 kg P as triple superphosphate in 1974 and since 1988, single superphosphate in other years
K:	90 kg K as sulphate of potash
K2:	180 kg K as potassium sulphate (plus 450 kg K autumn 2000 only)
Na:	55 kg Na as sulphate of soda
(Na):	16 kg Na as sulphate of soda until 1973
Mg:	30 kg Mg annually to Plot 14 (applied at 26 kg 1990 to 2000), 35 kg Mg every third year to other plots since 1974 (applied at 30 kg in 1991, 1994, 1997 and 2000 and at 15 kg on half rate treatments). All as kieserite since 1974, previously as sulphate of magnesia annually.
Mg2:	24 kg Mg as kieserite (plus 60 kg Mg, autumn 2000 only)
D:	Farmyard manure at 35 t (fresh weight)
(C):	Castor meal to supply 96 kg N until 1988, none since
F:	Full rate P K (Na) Mg as above
H:	Half rate of above.

Strips of sub-plots: Until 1967 wheat was grown continuously on the experiment, with bare fallowing (1 year in 5) from the 1920s. From 1968, the experiment was divided into 10 sections with the following cropping:

SECTION

Section	**1**	**9**	**0***	**8+**	**6****	**5**	**3**	**7**	**4**	**2**
Year										
1968	W	W	W	W	F	W	W	P	W	BE
1969	W	W	W	W	W	F	W	BE	P	W
1970	W	W	W	W	W	W	F	W	BE	P
1971	W	W	W	W	F	W	W	P	W	BE
1972	W	W	W	F	W	F	W	BE	P	W
1973	W	W	W	W	W	W	F	W	BE	P
1974	W	W	W	W	F	W	W	P	W	BE
1975	W	W	W	W	W	F	W	BE	P	W
1976	W	W	W	W	W	W	F	W	BE	P
1977	W	W	W	W	F	W	W	P	W	BE
1978	W	W	W	W	W	F	W	BE	P	W
1979	W	W	W	W	W	W	F	W	P	F
1980	W	W	W	W	W	W	W	F	W	P
1981	W	W	W	F	W	W	W	P	F	W
1982	W	W	W	W	W	W	W	W	P	F
1983	W	W	W	W	W	W	W	F	W	P
1984	W	W	W	W	W	W	W	P	F	W
1985	W	W	W	W	W	F	W	W	P	W
1986	W	W	W	W	W	P	F	W	W	W
1987	W	W	W	W	W	W	P	W	W	F
1988	W	W	W	F	W	W	W	F	W	P
1989	W	W	W	W	W	W	W	P	F	W
1990	W	W	W	W	W	F	W	W	P	W
1991	W	W	W	W	W	P	F	W	W	W
1992	W	W	W	W	W	W	P	W	W	F
1993	W	W	W	W	W	W	W	F	W	P
1994	W	W	W	F	W	W	W	P	F	W
1995	W	W	W	W	W	F	W	W	P	W

Section	1	9	0*	8+	6**	5	3	7	4	2
Year										
1996	W	W	W	W	W	P	O	W	W	W
1997	W	W	W	W	W	W	M	W	W	O
1998	W	W	W	W	W	W	W	O	W	M
1999	W	W	W	W	W	W	W	M	O	W
2000	W	W	W	W	W	O	W	W	M	W
2001†	W	W	W	F	W	M	O	W	W	W
2002	W	W	W	W	W	W	M	W	W	O
2003	W	W	F	W	W	W	W	O	W	M
2004	W	W	F	W	W	W	W	M	O	W
2005	W	W	W	W	W	O	W	W	M	W
2006	W	W	W	W	W	M	O	W	W	W
2007	W	W	W	W	W	W	M	W	W	O
2008	W	W	W	F	W	W	W	O	W	M
2009	W	W	W	W	W	W	W	M	O	W
2010	W	W	W	W	W	O	W	W	M	W
2011	W	W	W	W	W	M	O	W	W	W
2012	W	W	W	W	W	W	M	W	W	O
2013	W	W	W	W	W	W	W	O	W	M
2014	W	W	W	W	W	W	W	M	O	W
2015++	W	W	W	F	W	O	W	W	M	W
2016	W	W	W	F	W	M	O	W	W	W
2017	W	W	W	W	W	W	M	W	W	O
2018	W	W	W	W	W	W	W	Be	O	W
2019	W	W	W	W	W	O	W	W	W	Be
2020++,†	W	W	W	W	W	W	O	W	Be	W
2021	W	W	W	W	W	Be	W	O	W	W
2022	W	W	W	F	W	W	Be	W	W	O

W = winter wheat, O = winter oats, P = potatoes, BE = spring beans, F = fallow, M = forage maize, Be = Winter Beans

* Straw incorporated since autumn 1986. ** No sprays except herbicides since 1985.

\+ No herbicides.

++ Spring Wheat in 2015, 2020

† Spring Oats in 2001, 2020

NOTES:

(1) For a fuller record of treatments see 'Details' etc.

(2) From autumn 1975 to autumn 1986, chalk was applied at 2.9 t/ha each autumn to all plots in sets of Sections on a three-year cycle: Year 1: Sections 1, 2, 3; Year 2: Sections 6, 7, 8, 9; Year 3: Sections 0, 4, 5. From autumn 1988 until autumn 1992 a five-year cycle was used: Year 1: Sections 1, 3; Year 2: Sections 2, 8; Year 3: Sections 7, 9; Year 4: Sections 4, 6; Year 5: Sections 0, 5 (omitted). No chalk was applied after autumn 1991 until autumn 2007 when differential amounts were applied to selected plots (see "Results 2008"). Chalk was applied again to selected plots in autumn 2013 and 2018, see 14/R/BK/1 and 19/R/BK/1 diary information.

(3) In 2003 and 2004 Section 0 was used for an experiment (CS/595) investigating different herbicides to control *Equisetum arvense*.

(4) In 2013 the wheat variety changed from Hereward to Crusoe, but it was sown very late (22 February 2013) because of the very wet autumn and winter of 2012-2013.

(5) Spring wheat (var Mulika) and winter oats (var Gerald) were sown in March 2015, instead of in autumn/winter 2014, because the very wet soil conditions in autumn 2014 prevented sowing of a winter crop. The whole site was spring-tine cultivated in March 2015 instead of being ploughed. Spring wheat (var Tybalt) was sown in March 2020 because the wet autumn and winter of 2019-2020 prevented sowing of a winter crop.

(6) Section 8 was left in bare fallow in 2015 & 2016 and had two in-season cultivations (inversion ploughing) each year to control weeds.

(7) No Triple Superphosphate applied to Strips 11, 13 and 14: After reviewing amounts of available P in soil it was decided not to apply TSP from 2021 crop onwards (under review).

22/R/BK/1 Experimental Diary:

Date		Application	Rate	Unit
All Sections				
09/09/2021	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader, JD6830; Section 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Strips 17, 18 only	171	kg/ha
09/09/2021	f	Applied: Muriate of Potash (MOP) using Cascade Spreader, JD6830; Section 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Strip 14 only	181	kg/ha
15/09/2021	f	Applied: Farmyard Manure (FYM) using Muck spreader - international, Tym T503; Section 0, 1, 2, 4, 5, 6, 7, 8, 9; Strips 2.1, 2.2 only	35	t/ha
16/09/2021	a	Plough 20 cm using KV Five Furrow Plough, JD6145R Premium; Section 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; soil thrown N	-	-
21/09/2021	a	Cultivate/level 10 cm using Philip Watkins Press, JD6830; Section 0, 1, 2, 3, 4, 5, 6, 7, 8, 9	-	-
23/09/2021	a	Rolling using 6m Flexicoil Cambridge Roll, JD6230; Section 0, 1, 2, 3, 4, 5, 6, 7, 8, 9	-	-
23/10/2021	p	Sprayed: Solitaire (15792) using Knight 24m Sprayer, NH T6030;	2.1	L/ha
23/10/2021	p	Sprayed: Nirvana (14256) using Knight 24m Sprayer, NH T6030;	4	L/ha
23/10/2021	p	Sprayed: Velomax (A0831) using Knight 24m Sprayer, NH T6030;	0.4	L/ha
20/04/2022	f	Applied: SOP fertiliser using Cascade Spreader, JD6830; Strips 5, 6, 7, 8, 9, 12, 13, 15, 16, 17, 18, 19, 20; all Sections	217	kg/ha
20/04/2022	f	Applied: Kieserite fertiliser using Cascade Spreader, JD6830; Strips 5, 6, 7, 8, 9, 11, 12, 15, 16, 17, 18, 19, 20; all Sections	80	kg/ha
07/06/2022	p	Sprayed: Samurai (16238) using Micron shrouded plot end sprayer, JD5620; Section 0, 1, 2, 3, 4, 5, 6, 7, 9	3	L/ha
07/06/2022	p	Sprayed: Buffalo Elite using Micron shrouded plot end sprayer, JD5620; Section 0, 1, 2, 3, 4, 5, 6, 7, 9	1	L/ha
13/07/2022		Wild oat count	-	-
05/08/2022	a	Baling using McHale Fusion 2 Baler, JD6145R Premium; Sections 1, 2, 3, 4, 5, 6, 7, 9	-	-
W Wheat				
22/09/2021	s	Drilling: Winter Wheat (KWS Zyatt) dr. Beret Gold (16430) using Accord Combination Drill No. 4, JD6830	350	seeds/m2
28/09/2021	p	Sprayed: Pontos (17811) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 8, 9	1	L/ha
28/09/2021	p	Sprayed: Firestarter (18422) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 8, 9	0.3	L/ha
28/09/2021	p	Sprayed: Velomax (A0831) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 8, 9	0.4	L/ha
23/10/2021	p	Sprayed: Hallmark with Zeon Technology (12629) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 8, 9	50	mL/ha
05/11/2021	p	Sprayed: Thor (15239) using Knight 24m Sprayer, NH T6030; Section 5	10	g/ha
21/03/2022	f	Applied: Nitram using Cascade Spreader, JD6830; Strips 12, 17, 18, 19 ; Sections 0, 1, 4, 5, 6, 7, 9	139	kg/ha
28/03/2022	p	Sprayed: Stefes CCC 720 (17731) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 9	1	L/ha

28/03/2022	p	Sprayed: Moddus (15151) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 9	0.1	L/ha
28/03/2022	p	Sprayed: Clayton Prius (18946) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 7, 9	1	L/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 06, 19; Sections 0, 1, 4, 5, 6, 7, 9	139	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 07, 18; Sections 0, 1, 4, 5, 6, 7, 9	278	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 2.1, 08, 12; Sections 0, 1, 4, 5, 6, 7, 9	417	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 01, 09, 10, 11, 13, 14, 17, 20; Sections 0, 1, 4, 5, 6, 7, 9	556	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 15; Sections 0, 1, 4, 5, 6, 7, 9	696	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 16; Sections 0, 1, 4, 5, 6, 7, 9	835	kg/ha
03/05/2022	p	Sprayed: Presite SX (18776) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 6, 7, 9	60	g/ha
03/05/2022	p	Sprayed: Bugle (17821) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 7, 9	0.8	L/ha
03/05/2022	p	Sprayed: Cello (18290) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 7, 9	0.7	L/ha
16/05/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 12, 17, 18, 19; Sections 0, 1, 4, 5, 6, 7, 9	139	kg/ha
17/05/2022	p	Sprayed: Lentyma XE (19301) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 7, 9	1	L/ha
07/06/2022	p	Sprayed: Cello (18290) using Knight 24m Sprayer, NH T6030; Section 0, 1, 4, 5, 7, 9	0.8	L/ha
01/07/2022	a	Power harrow using Kuhn Powerharrow 3m, JD6230; Section 8 (fallow, no fungicides)	-	-
27/07/2022	a	Harvest (Combine)using Haldrup C-85 2m cut; Sections 0, 1, 4, 5, 6, 7, 9	-	-
02/08/2022	a	Straw Weights - Harvest (Trailer and Bale Weights) using Amazone Grass Harvester - Flail Mower Collector, JD5070; Sections 1, 5, 7	-	-
04/08/2022	a	Power harrow using Kuhn Powerharrow 3m, JD6230; Section 8 (fallow, no fungicides)	-	-
W Oats				
22/09/2021	s	Drilling: Winter Oats (Mascani) dr. Redigo Pro (15145) using Accord Combination Drill No. 4, JD6830	350	seeds/m2
26/10/2021	p	Sprayed: Hallmark with Zeon Technology (12629) using Knight 24m Sprayer, NH T6030	50	mL/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 06	70	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 07	139	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 2.1, 08, 19	209	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 01, 09, 10, 11, 13, 14, 18	278	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 12, 15	348	kg/ha
28/04/2022	f	Applied: Nitram using JD6830, Cascade Spreader; Strip 16, 17	417	kg/ha
12/05/2022	p	Sprayed: Presite SX (18776) using Knight 24m Sprayer, NH T6030	60	g/ha
12/05/2022	p	Sprayed: Cello (18290) using Knight 24m Sprayer, NH T6030	0.7	L/ha

12/05/2022	p	Sprayed: Stefes CCC 720 (17731) using Knight 24m Sprayer, NH T6030	2	L/ha
12/05/2022	p	Sprayed: Hurler (17715) using Knight 24m Sprayer, NH T6030	0.6	L/ha
07/06/2022	p	Sprayed: Cello (18290) using Tecnoma 12m Sprayer, Tym T503	0.8	L/ha
13/07/2022		Hand weeding on plot 092	-	-
23/07/2022	a	Harvest (Combine) using Haldrup C-85 2m cut	-	-
23/07/2022	a	Straw Weights - Harvest (Trailer and Bale Weights) using Amazone Grass Harvester - Flail Mower Collector, JD5070	-	-
W Beans				
14/10/2021	s	Drilling: Winter Beans (Tundra) using Accord Combination Drill No. 4, JD6830	25	seeds/m2
05/05/2022	p	Sprayed: Tacanza Era (19217) using Knight 24m Sprayer, NH T6030	0.5	L/ha
01/06/2022	p	Sprayed: Aphox (17401) using Knight 24m Sprayer, NH T6030	0.28	kg/ha
01/06/2022	p	Sprayed: Clayton Tebucon 250 EW (17823) using Knight 24m Sprayer, NH T6030	0.5	L/ha
01/06/2022	p	Sprayed: Azoxystar (17407) using Knight 24m Sprayer, NH T6030	0.5	L/ha
29/07/2022	a	Harvest (Combine) using Haldrup C-85 2m cut	-	-
02/08/2022	a	Straw Weights - Harvest (Trailer and Bale Weights) using Amazone Grass Harvester - Flail Mower Collector, JD5070	-	-
WILDERNESS				
17/12/2021	a	Topped 'Stubbed' area using Kilworth Topper; Iseki ISTH4335	-	-
28/04/2022	a	Mowed 'Mown' area using Kilworth Topper; Iseki ISTH4335	-	-

NOTE: Samples of grain and straw were taken for chemical analysis. Unground grain and straw samples from selected treatments were archived.

YIELDS

WINTER WHEAT

Grain Tonnes/Hectare (85% DM)

Tables of means

SECTION PLOT	5/W1	7/W1	4/W2	6/W45	0/W18	1/W56	9/W64	Mean
01(FYM)N4	10.91	8.64	10.07	5.11	-	-	-	**8.68**
2.1FYMN3	12.16	11.20	12.22	6.95	8.35	9.18	8.45	**9.79**
2.2FYM	10.10	7.60	8.32	7.15	6.44	7.44	7.15	**7.74**
03Nil	3.53	0.79	1.51	1.14	1.05	1.02	0.63	**1.38**
05(P)KMg	4.67	2.12	2.09	1.10	1.71	1.58	1.48	**2.11**
06N1(P)KMg	8.02	4.49	5.39	3.06	3.30	3.27	3.43	**4.42**
07N2(P)KMg	9.26	5.86	7.43	4.10	4.11	5.31	4.41	**5.78**
08N3(P)KMg	10.13	6.67	7.37	4.46	4.61	5.71	5.14	**6.30**
09N4(P)KMg	10.36	6.12	8.04	4.38	6.38	5.50	5.99	**6.68**
10N4	7.24	3.31	2.25	1.21	2.06	1.61	1.66	**2.76**
11N4(P)Mg	8.28	5.44	7.35	3.58	6.04	6.31	6.93	**6.27**
12N1+3+1(P)KMg	11.26	8.98	8.51	4.62	7.60	7.51	8.51	**8.14**
13N4(P)K	10.53	6.50	6.74	4.68	5.65	5.61	6.72	**6.63**
14N4(P)K-(Mg-)	8.99	6.48	6.12	5.64	5.04	3.95	6.88	**6.16**
15N5(P)KMg	11.08	7.40	10.72	4.92	7.39	7.20	7.73	**8.06**
16N6(P)KMg	10.81	8.88	9.74	5.21	6.78	8.25	8.94	**8.37**
17N1+4+1PKMg	11.32	10.36	11.44	5.05	8.82	6.78	10.05	**9.12**
18N1+2+1PKMg	11.68	9.72	10.52	5.74	7.74	6.40	8.86	**8.67**
19N1+1+1KMg	9.44	8.85	6.98	4.99	6.25	5.33	8.25	**7.16**
20N4KMg	-	-	-	-	2.18	0.88	-	**1.53**
Mean	**9.46**	**6.81**	**7.52**	**4.37**	**5.34**	**5.20**	**6.18**	**6.41**

Grain Mean DM% 88.6

Notes

Section 8 was in Bare Fallow for 2022 (**NO YIELDS**)

Straw Tonnes/Hectare

Tables of means

SECTION PLOT	5/W1	7/W1	4/W2	6/W45	0/W18	1/W56	9/W64	Mean
01(FYM)N4	3.82	3.07	-	-	-	-	-	**3.44**
2.1FYMN3	5.77	4.54	-	-	-	3.64	-	**4.65**
2.2FYM	4.70	4.90	-	-	-	3.34	-	**4.31**
03Nil	0.52	1.12	-	-	-	0.23	-	**0.63**
05(P)KMg	2.49	1.51	-	-	-	0.97	-	**1.66**
06N1(P)KMg	3.07	1.03	-	-	-	2.05	-	**2.05**
07N2(P)KMg	1.84	2.53	-	-	-	1.44	-	**1.94**
08N3(P)KMg	2.79	1.31	-	-	-	0.81	-	**1.64**
09N4(P)KMg	2.00	2.63	-	-	-	0.67	-	**1.76**
10N4	2.15	0.46	-	-	-	1.04	-	**1.22**
11N4(P)Mg	1.55	2.32	-	-	-	1.49	-	**1.78**
12N1+3+1(P)KMg	3.18	2.85	-	-	-	2.75	-	**2.93**
13N4(P)K	3.16	1.92	-	-	-	1.74	-	**2.27**
14N4(P)K-(Mg-)	3.45	0.97	-	-	-	2.39	-	**2.27**
15N5(P)KMg	3.28	2.92	-	-	-	2.44	-	**2.88**
16N6(P)KMg	3.55	1.93	-	-	-	2.58	-	**2.68**
17N1+4+1PKMg	4.29	3.92	-	-	-	2.95	-	**3.72**
18N1+2+1PKMg	4.59	3.02	-	-	-	2.31	-	**3.30**
19N1+1+1KMg	3.46	2.72	-	-	-	2.82	-	**3.00**
20N4KMg	-	-	-	-	-	0.35	-	**0.35**
Mean	**3.14**	**2.4**	**-**	**-**	**-**	**1.89**	**-**	**2.48**

Straw Mean DM% 89.6

Notes

Section 8 was in Bare Fallow for 2022 (**NO YIELDS**)

WINTER OATS

Tonnes/Hectare (85% DM)

Table of means

Plot	Treatment	Grain	Straw
012	01 (FYM)1/2N4	8.21	1.64
212	2.1 FYM1/2N3	9.26	3.54
222	2.2 FYM	6.97	2.08
032	03 Nil	1.32	0.02
052	05 (P)KMg	1.44	0.94
062	06 1/2N1(P)KMg	4.38	0.11
072	07 1/2N2(P)KMg	6.31	1.26
082	08 1/2N3(P)KMg	8.14	2.01
092	09 1/2N4(P)KMg	8.19	0.84
102	10 1/2N4	4.03	1.15
112	11 1/2N4(P*)Mg	9.88	3.06
122	12 1/2N5(P)KMg	8.78	1.88
132	13 1/2N4(P*)K	8.66	3.17
142	14 1/2N4(P*)K*(Mg*)	4.64	1.39
152	15 1/2N5(P)KMg	9.09	3.09
162	16 1/2N6(P)KMg	9.90	2.76
172	17 1/2N6PKMg	9.93	1.96
182	18 1/2N4PKMg	8.20	1.54
192	19 1/2N3KMg	6.58	1.48
	Mean	**7.05**	**1.79**
Mean DM%		87.5	73.9
Plot Area Harvested (ha)	0.00463		

WINTER BEANS

TONNES/HECTARE (85% DM)

Tables of means

Plot	Treatment	Grain	Straw
013	01 (FYM) [N4]	5.74	1.60
213	2.1 [FYMN3]	6.15	1.93
223	2.2 [FYM]	6.36	3.57
033	03 Nil	1.41	0.35
053	05 (P)KMg	4.58	1.16
063	06 [N1](P)KMg	5.38	0.74
073	07 [N2](P)KMg	5.38	2.19
083	08 [N3](P)KMg	5.62	2.27
093	09 [N4](P)KMg	5.34	0.58
103	10 [N4]	1.22	1.15
113	11 [N4](P*)Mg	0.24	0.22
123	12 [N1+3+1](P)KMg	5.20	2.57
133	13 [N4](P*)K	5.52	1.25
143	14 [N4](P*)K*(Mg*)	4.61	0.89
153	15 [N5](P)KMg	5.41	1.64
163	16 [N6](P)KMg	5.64	1.93
173	17 [N1+4+1]PKMg	5.70	1.30
183	18 [N1+2+1]PKMg	5.64	2.62
193	19 [N1+1+1]KMg	4.58	0.24
	MEAN	**4.72**	**1.48**
Mean DM%		89.80	89.70
PLOT AREA HARVESTED (ha)		0.00463	