



**ROTHAMSTED
RESEARCH**

Rothamsted Long-Term Experiments

**Farm Diary and Yields of the Classical
and other Long-Term Experiments**

Weather Summaries

2023

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The information and data contained in this book is correct to the best of our knowledge. Any subsequent change will be made in the electronic version and listed on the next page. Printed copies of this Yield Book should therefore be checked against the electronic version by checking the version date.

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Changes since initial version (18 March 2025)

<u>Date</u>	<u>Change</u>	<u>Page</u>
	No changes	

Conventions

For each experiment the current treatments are shown with the factor and level names which are used in the tables.

For each experiment references are given to previous years. These refer to the '(Numerical) (Results)' previous editions of 'Yields of the Field Experiments'.

For the Classical and some Long-Term Experiments, reference is made to 'Details' – separate publications, giving full descriptions of treatments until 1977 & 1973, with full titles 'Details of the Classical and Long-Term Experiments up to 1977' and 'Details of the Classical and Long-Term Experiments up to 1973'.

The following conventions are observed unless otherwise stated.

- All areas are in hectares (ha) and all plot dimensions are in metres (m).
- All rates of application of fertilizers, sprays etc. are per hectare (/ha).
- All yields are per hectare (/ha).
- For any other crop, details of abbreviations are given as necessary.

FERTILIZERS, ORGANICS AND CHALK

Anaerobic digestate (AD)	
Chalk (lime)	
Compost	
Epsom Salts (magnesium sulphate)	MgSO ₄ ·7H ₂ O; 16% MgO (9% Mg); 33% SO ₃ (13% S)
Extran (ammonium nitrate)	NH ₄ NO ₃ ; 33.5% N
Farmyard manure (FYM)	from bullocks
Headland Manganese 500	500 g/L, 27.5% w/w MnCO ₃
Kieserite (magnesium sulphate)	MgSO ₄ ·H ₂ O; 25% MgO (15% Mg); 50% SO ₃ (20% S)
Manganese sulphate	Mn ₂ (SO ₄) ₃ ; 27% Mn; 24% S
Manganese and Dinitrate	14% w/w; 7.2% w/w nitric nitrogen
Muriate of potash (MOP; potassium chloride)	KCl; 60% K ₂ O (50% K)
Nitrate of soda (sodium nitrate)	NaNO ₃ ; 16% N; 27% Na
Nitro-Chalk (calcium ammonium nitrate)	27% N
Poultry manure (PM)	pelleted
Silicate of soda	Na ₂ SiO ₃ ; 37% Na; 23% Si
Sodium sulphate	35% Na
Straw	
Sulphate of ammonia	(NH ₄) ₂ SO ₄ ; 21% N; 60% SO ₃ (24% S)
Sulphate of potash (SOP)	K ₂ SO ₄ ; 50% K ₂ O (41.5% K); 45% SO ₃ (18% S)
Sulphur-N (Sulphan)	26% N; 35% SO ₃ (14% S)
Sulphur-N-equivalent blend	26% N; 35% SO ₃
Triple superphosphate (TSP)	47% P ₂ O ₅ (20% P)

Cereal straw is removed unless otherwise stated.

Abbreviations

GS: growth stage
tr: seed dressing

PESTICIDES USED

The following list of pesticides is based on the HSE Pesticide Product Register (<https://secure.pesticides.gov.uk/pestreg/ProdSearch.asp>) and Adjuvant Product Register (<https://secure.pesticides.gov.uk/adjuvants/Search.aspx>); The UK Pesticides Guide, CAB International and The British Crop Protection Council. CABI Publishing.

Trade Name (MAPP or ADJ number)	Function	Active ingredient
Aphox (17401)	i	500 g/kg pirimicarb
Arizona (15318)	f	500 g/L folpet
Azoxystar (17407)	f	250 g/L azoxystrobin
Basagran SG (08360)	h	870 g/kg bentazone
Beret Gold (16430)	tr	25 g/L fludioxonil
Biopower (A0617)	ad	A soluble concentrate formulation containing 276.5 g/L alkyl ether sulphates, sodium salts (EAC 1)
Buffalo Elite	water conditioner	ammonium sulphate (40% w/w), water conditioner
Bugle (17821)	f	59.4 g/L fluxapyroxad
Eagle (old 16490; new 18902, 20708)	h	75% w/w amidosulfuron
Firestarter (18422)	h	100 g/L diflufenican and 400 g/L flufenacet
Hallmark with Zeon Technology (12629)	i	100 g/L lambda-cyhalothrin
Horus (16216)	h	2 g/L iodosulfuron-methyl-sodium and 10 g/L mesosulfuron-methyl
Hurler (17715)	h	200 g/L fluroxypyr
Kanaster (20008)	h	60 g/L pinoxaden
Kerb Flo 500	h	500 g/L propyzamide
Lentyma XE (19301)	f	66.7 g/L fluxapyroxad and 70 g/L Mefentrifluconazole
Moddus (15151)	gr	250 g/L trinexapac-ethyl
Moraine (19608)	h	2000 g/L fluroxypyr
Oraso Pro (19321)	f	125 g/L prothioconazole and 125 g/L tebuconazole
Orius P (18994)	f	267 g/L prochloraz and 133 g/L tebuconazole
Paramount Max (18751)	h	200 g/kg florasulam and 600 g/kg tribenuron-methyl
Pontos (17811)	h	240 g/L flufenacet and 1000 g/L picolinafen
Presite SX (18776)	h	67 g/kg metsulfuron-methyl and 333 g/kg thifensulfuron-methyl
Ranco i-Mix (19847)	tr	50 g/L imazalil and 20 g/L ipconazole
Raxil Star (17805)	tr	20 g/L Fluopyram, 100 g/L prothioconazole and 60 g/L tebuconazole
Samurai (16238)	h	360 g/L glyphosate
Simveris (19619)	f	90 g/L metconazole
Sprinter	f	Water soluble manganese (Mn) 14 w/w and Nitric Nitrogen (N) 7.2% w/w in 10 L of product.
Stefes CCC 720 (17731)	gr	720 g/L chlormequat
Stomp Aqua (14664)	h	455 g/L pendimethalin
Tacanza Era (19217)	f	75 g/L benzovindiflupyr and 150 g/L prothioconazole
Velomax (A0831)	ad	86.8% w/w oil (rapeseed fatty acid esters), 5.2% w/w alkoxylated alcohols, 2.5% w/w oil (tall oil fatty acids)
Vibrance Duo (17838)	tr	25.000 g / l fludioxonil and 25.000 g / l Sedaxane
Zarado (A0516)	ad	70% w/w oil (rapeseed fatty acid esters)

Abbreviations

ad: adjuvant d: desiccant f: fungicide gr: growth regulator h: herbicide
i: insecticide m: molluscicide n: nematocide tr: seed treatment

MACHINERY REFERRED TO IN THE DIARY NOTES

Cultivators	Manufacturer	Width (m)	Description
Plough	Kverneland	1.5	5 Furrow reversible, 25 cm Furrows.
Plough	Dowdeswell		4 Furrow
Powerharrow	Kilworth	1.3	Mainly used for Paths.
Spring Tines	Cousins		
Roller	Unknown	6	WES 6M Roll
Cambridge Roll	Flexicoil	6	
Drills	Manufacturer	Width (m)	Description
Accord Combination Drill No. 4	Kverneland	3	Power-harrow mounted pneumatic drill with Suffolk coulters 12.5 cm apart.
Accord Tine Drill	Kverneland	4	Suffolk Coulters with 3-point linkage (WES)
Chemical Applicators	Manufacturer	Width (m)	Description
Cascade	Horstine	12	Tractor mounted pneumatic boom fertiliser spreader
Lift-o-matic / Exact-o-matic Fertiliser box	Ransome Nordsten	3.8	Tractor mounted – Fert Applications.
Muck Spreader	International	1.5	Trailed – FYM Applications.
Fertiliser spreader	Quickpass		Tractor mounted – Fert Applications.
Fertiliser box (GSA 300)	Nordsten	3	Tractor mounted – Fert Applications.
Sprayer	Knight	24	Tractor mounted boom sprayer – Chemical Application.
Agribuggy2 AB30	McConnell	12	Self-propelled sprayer – can be used at 12m or 24m, has automatic section control and GPS autosteer. Also has a slug pellet applicator on the front
Harvesters	Manufacturer	Width (m)	Description
Tucano 430	Claas	6	Commercial combine used for harvesting discards after plot yields.
Grass harvester – Flail Mower	Amazone	1.01	Used for grass ley and herbage yields mainly but also for straw weights
Mower	Unifarm	1.83	
Pro Glide R3100 – Mower/Conditioner	McHale	3.05	Commercial mower used to mow discards on PG/5.
Plot Combine	Haldrup	2	Cereal plot combine harvester used 2017 onwards with a 2.0 m cut width (the previous Sampo combine had a 2.1 m cut).
Other	Manufacturer	Width (m)	Description
Cambridge Ring Rolls	Flexicoil	6	Ring rolls for covering seed post drilling.
Windrower	Claas	-	Rowing up for baling
Tedder (Fanex 524)	Vicon	-	Turning and rowing up of grass for hay making (W/RN/3 and 12, R/PG/5).
Topper 9	McConnell	2.72	Topper used for topping stubbles and grass areas.
Fusion 2 Baler	McHale	-	Used for baling and wrapping clearing leftover straw/grass from experiments after harvest removed.
Tractors	Manufacturer	Weight(t)	Description
ISTH4335	Iseki	1.71	Small Machinery Tractor

JD5070	John Deere	5.85	Wide Wheeled Tractor
JD5620	John Deere	5.46	Drilling Tractor
JD6145R	John Deere	11.25	Cultivations Tractor
JD6230	John Deere	6.10	Yard Tractor
JD6620	John Deere	5.2	Tractor (Woburn)
JD6830	John Deere	5.7	Fertiliser Tractor
MF3070	Massey Ferguson	4.4	Hedge Cutting Tractor

Application code used to identify the kind of application:

- a: application (cultivations, harvest, etc.)
- p: pesticide
- f: fertilizer
- s: seed

2023/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. 2023 was the 180th 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 1974-2022/R/BK/1

Areas harvested

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

Current treatments

Strip	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

Current treatment codes

<u>Winter wheat</u>	
N1, N2, N3, N4, N5, N6	48, 96, 144, 192, 240, 288 kg N as ammonium nitrate (33.5% N) applied at GS31 or mid-April
N1+1+1, N1+2+1, N1+3+1, N1+4+1	Rates as above, but in 3 splits: (1) first two weeks of March, (2) GS31 or mid-April (whichever comes first), and (3) GS37/mid-May
<u>Winter oats</u>	
½ N1, ½ N2, ½ N3, ½ N4, ½ N5, ½ N6	24, 48, 72, 96, 120, 144 kg N (i.e., half-rate of wheat) as ammonium nitrate (34.5% N) applied at GS31 or mid-April (oats received no N 1996-2017)
<u>Winter beans</u>	No N applied
<u>All crops</u>	
P	35 kg P as triple superphosphate
(P)	(no P since 2001 or 2020 - under review)
K	90 kg K as potassium sulphate
K*	90 kg K as muriate of potash (potassium chloride)
Mg	12 kg Mg as kieserite (magnesium sulphate)
(Mg*)	(no Mg since 2001 - under review)
FYM	Farmyard manure at 35 t (fresh weight); no FYM applied to beans (oats received no FYM 1996-2017)

Previous treatments

Strip	Treatments until 1967	Treatments from 1968	Treatments 1985-2000	Treatments 2001-2020
01	-	D N2 P K	D N4 P K	N4
2.1	D	D N2	D N2	FYM N3 ^(A)
2.2	D	D	D	FYM
03	None	None	None	None
05	P K Na Mg	P K (Na) Mg	PK Mg	(P) K Mg
06	N1 P K Na Mg	N1 P K (Na) Mg	N1 P K Mg	N1 (P) K Mg
07	N2 P K Na Mg	N2 P K (Na) Mg	N2 P K Mg	N2 (P) K Mg
08	N3 P K Na Mg	N3 P K (Na) Mg	N3 P K Mg	N3 (P) K Mg
09	N*1 P K Na Mg	N4 P K (Na) Mg	N4 P K Mg	N4 (P) K Mg
10	N2	N2	N2	N4
11	N2 P	N2 P	N2 P	N4 P Mg
12	N2 P Na	N2 P Na	N2 P Na	N1+3+1 (P) K Mg ^(B)
13	N2 P K	N2 P K	N2 P K	N4 P K
14	N2 P Mg	N2 P K Mg	N2 P K Mg	N4 P K* (Mg*)
15	N2 P K Na Mg	N3 P K (Na) Mg	N5 P K Mg	N5 (P) K Mg
16	N*2 P K Na Mg	N2 P K (Na) Mg	N6 P K Mg	N6 (P) K Mg
17	N2 ^(E)	N2 ½[P K (Na) Mg]	N1+3 ½[P K Mg] ^(E)	N1+4+1 P K Mg
18	P K Na Mg ^(E)	N2 ½[P K (Na) Mg]	N0+3 ½[P K Mg] ^(E)	N1+2+1 P K Mg
19	C	C	(C) (since 1989)	N1+1+1 K Mg
20	N2 K Na Mg	N2 K (Na) Mg	N2 K Mg	N4 K Mg

Notes:

(A) N2 2001-2004

(B) 24 kg Mg as kieserite 2001-2005 (plus 60 kg Mg in autumn 2000 only)

(E) Treatments to strips 17 and 18 alternated; from 1968 both received N2 and ½-rate; PK(Na)Mg; from 1980 wheat received N1+3 (N1 in autumn in alternate years + N3 in spring); maize received N3 ½[PK Mg] 1996-2017 (treatments shown incorrectly in 1999-2002 Yield Books
Oats received no N or FYM 1996-2017.

Previous treatment codes

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), calcium ammonium nitrate (Nitro-chalk; c. 26%N) in spring (1968-1985), and ammonium nitrate (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 strip 14 (applied at 26 kg 1990-2000), 35 kg Mg every third year to other strips 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.
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.

Cropping

Continuous winter wheat until 1967, with bare fallowing one year in five from the 1920s. From 1968, the experiment was divided into 10 sections with crop rotations introduced alongside retained continuous winter wheat.

Cropping since 1968

Section Year	1	9	0*	8+	6**	5	3	7	4	2
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

Section Year	1	9	0*	8+	6**	5	3	7	4	2
1995	W	W	W	W	W	F	W	W	P	W
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
2023	W	W	W	W	W	W	W	Be	O	W

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 (i.e., no fungicides) except herbicides since 1985.

+ No herbicides

++ spring wheat in 2015 and 2020

† spring oats in 2001 and 2020

Notes

- For a fuller record of treatments see 'Details' etc.
- 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 has been applied again on a five-year cycle from the 2013 crop (amounts applied being dependent on soil pH).
- In 2003 and 2004 Section 0 was used for an experiment (CS/595) investigating different herbicides to control *Equisetum arvense* L.
- Spring wheat was sown for the 2015 and 2020 crops (and spring oats in 2020) due to a preceding wet autumn and winter.
- Section 8 (no herbicides) was in bare fallow in 2015, 2016, and 2022 with two in-season cultivations (inversion ploughing) each year to control weeds.
- Triple superphosphate has been withheld from most strips since the 2001 (05-09, 12, 15-16) or 2021 (11, 13-14) crops, as soil P is not limiting currently and there is an objective to reduce soil P concentrations. This is being kept under review through monitoring soil P concentrations. The expectation is that as soon as one strip (that would normally receive P) requires P fertilisation, so all similar strips will re-start receiving P.

FARM DIARY

Date		Application	Rate	Unit
All Sections				
12/09/2023	f	Applied: Triple Superphosphate (TSP) using Exactomatic with JD5070; Strip 17, 18	171	kg/ha
12/09/2022	f	Applied: Muriate of Potash (MOP) using Exactomatic with JD5070: Strip 14	181	kg/ha
14/09/2022	a	Rolled using 6m Flexicoil Cambridge Roll with JD5620: Strip 1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13	-	-
15/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 (all Sections except Section 8).	1	L/ha
15/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 (all Sections except Section 8).	4	L/ha
28/09/2022	a	Plough using KV Five Furrow Plough with JD6145R	-	-
26/09/2022	f	Applied: Farmyard manure (FYM) using Muck spreader international with Tym T503: Strip 2.1, 2.2 (all Sections except Section 7).	35	t/ha
27/03/2023	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830: Strip 5, 6, 7, 8, 9, 12, 13, 15, 16, 17, 18, 19, 20	217	kg/ha
04/04/2023	f	Applied: Kieserite using Cascade Spreader with JD6830: Strip 5, 6, 7, 8, 9, 11, 12, 15, 16, 17, 18, 19, 20	80	kg/ha
01/06/2023	a	Power harrow paths using Kilworth Power Harrow 1.3 m with Iseki ISTH4335	-	-
10/07/2023	a	Hand weeding by Hand (11 wild oats pulled, 1 from plot 063 and 10 from plot 108): Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	-	-
10/08/2023	a	Combine harvest using Claas Tucano 430	-	-
11/08/2023	a	Baling (straw) using McHale Fusion 2 Baler with JD6145R Premium: Plot surrounds baled off	-	-
25/08/2023	a	Baling (straw) using Amazone Grass Harvester - Flail Mower Collector with JD5070: straw pickup and weigh	-	-
W. Wheat				
16/09/2022 to 21/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 012, 015, 017, 2.10, 2.15, 2.17, 2.26, 2.27, 058, 061, 067, 068, 069, 070, 077, 078, 079, 082, 083, 087, 088, 089, 097, 098, 099, 100, 104, 106, 107, 112, 113, 114, 118, 121, 123, 130, 141, 142, 147, 157, 160, 162, 163, 167, 168, 177, 187, 188, 189, 190, 199	2	t/ha
16/09/2022 to 21/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 016, 2.16, 066, 071, 075, 076, 080, 081, 085, 086, 095, 096, 101, 105, 108, 110, 111, 117, 119, 120, 124, 127, 128, 129, 134, 137, 138, 139, 140, 148, 149, 150, 153, 155, 156, 158, 159, 161, 164, 165, 166, 169, 174, 175, 178, 179, 181, 195, 196, 197	4	t/ha
21/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 109, 115, 116, 125, 126, 135, 136, 144, 145, 146, 151, 154	6	t/ha
12/10/2022	s	Drilled: w. wheat (Zyatt) tr. Beret Gold (16430) using Accord Combination Drill No. 4 with JD6830: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 6, 8, 9	350	seeds/m ²
19/10/2022	p	Sprayed: Pontos (17811) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 6, 9 (not Section 8).	1.0	L/ha

19/10/2022	p	Sprayed: Firestarter (18422) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 6, 9 (not Section 8).	0.3	L/ha
19/10/2022	p	Sprayed: Velomax (A0831) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 6, 9 (not Section 8).	0.4	L/ha
22/11/2022	p	Sprayed: Hallmark with Zeon Technology (12629) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 6, 8, 9	50	mL/ha
27/03/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 12, 17, 18, 19; Section 0, 1, 2, 3, 5, 6, 8, 9	143	kg/ha
11/04/2023	p	Sprayed: Orius P (18994) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 8, 9 (not Section 6)	1	L/ha
11/04/2023	p	Sprayed: Moddus (15151) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 8, 9 (not Section 6)	0.2	L/ha
11/04/2023	p	Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 8, 9 (not Section 6)	1.3	L/ha
17/04/2023	p	Sprayed: Moddus (15151) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 6	0.2	L/ha
17/04/2023	p	Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 6	1.3	L/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 6, 19; Section 0, 1, 2, 3, 5, 6, 8, 9	143	kg/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 7, 18; Section 0, 1, 2, 3, 5, 6, 8, 9	287	kg/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 8, 12; Section 0, 1, 2, 3, 5, 6, 8, 9	430	kg/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Exactomatic with MF3070: Strip 2.1; Section 0, 1, 2, 3, 5, 6, 8, 9	430	kg/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 1, 9, 10, 11, 13, 14, 17, 20; Section 0, 1, 2, 3, 5, 6, 8, 9	573	kg/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 15; Section 0, 1, 2, 3, 5, 6, 8, 9	716	kg/ha
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 16; Section 0, 1, 2, 3, 5, 6, 8, 9	860	kg/ha
25/04/2023	p	Sprayed: Presite SX (18776) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 6	60	g/ha
03/05/2023	p	Sprayed: Presite SX (18776) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 9	60	g/ha
03/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 9	0.8	L/ha
03/05/2023	p	Sprayed: Arizona (15318) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22; Section 0, 1, 2, 3, 5, 9	1.5	L/ha
11/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30: Strip 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 8	0.8	L/ha
11/05/2023	p	Sprayed: Arizona (15318) using Agribuggy2 AB30: Strip 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 8	1.5	L/ha
11/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30: Strip 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 8	0.8	L/ha
16/05/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 12, 17, 18, 19; Section 0, 1, 2, 3, 5, 6, 8, 9	143	kg/ha

23/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 8, 9 (not Section 6)	0.9	L/ha
10/06/2023	p	Sprayed: Oraso Pro (19321) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; Section 0, 1, 2, 3, 5, 8, 9 (not Section 6)	0.9	L/ha
01/08/2023	a	Topping using Topper 9 with JD6230: Boundary of Section 8 (herbicide-free)	-	-
W. Oats				
20/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 104, 114	2	t/ha
16/09/2022 to 20/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 124, 134, 164, 174	4	t/ha
21/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 144, 154	6	t/ha
14/11/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 4	1	L/ha
14/11/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 4	2	L/ha
23/11/2022	s	Drilled: Winter Oats (Mascani) dr. Raxil star (17805) using Accord Combination Drill No. 4 with JD6830: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 4	350	seeds/m ²
18/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 8, 19; Section 4	215	kg/ha
19/04/2023	f	Applied: Yara Bela Extran (33.5% N): Strip 6; Section 4	72	kg/ha
19/04/2023	f	Applied: Yara Bela Extran (33.5% N): Strip 7; Section 4	143	kg/ha
19/04/2023	f	Applied: Yara Bela Extran (33.5% N): Strip 12, 15; Section 4	358	kg/ha
19/04/2023	f	Applied: Yara Bela Extran (33.5% N): Strip 16, 17; Section 4	430	kg/ha
20/04/2023	f	Applied: Yara Bela Extran (33.5% N) by Hand: Strip 2.1; Section 4	215	kg/ha
20/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: Strip 1, 9, 10, 11, 13, 14, 18; Section 4	287	kg/ha
22/05/2023	p	Sprayed: Paramount Max (18751) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 4	25	g/ha
22/05/2023	p	Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 4	1.5	L/ha
22/05/2023	p	Sprayed: Bugle (17821) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 4	0.7	L/ha
W. Beans				
16/09/2022 to 20/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 017, 2.17, 2.27, 067, 077, 087, 097, 107, 147, 157, 167, 177, 187	2	t/ha
16/09/2022 to 20/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plots 117, 127, 137, 197	4	t/ha
10/10/2022	s	Drilled: Winter Beans (Tundra) using Accord Combination Drill No. 4 with JD6830: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	25	seeds/m ²
19/10/2022	p	Sprayed: Kerb Flo 500 (15586) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	1.7	L/ha
19/10/2022	p	Sprayed: Stomp Aqua (14664) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	2.9	L/ha

19/10/2022	p	Sprayed: Velomax (A0831) using Knight 24m Sprayer with NH T6030: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	0.4	L/ha
20/04/2023	p	Sprayed: Basagran SG (08360) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	1.1	kg/ha
20/04/2023	p	Sprayed: Zarado (A0516) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	1.0	L/ha
11/05/2023	p	Sprayed: Tacanza Era (19217) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	0.7	L/ha
07/06/2023	p	Sprayed: Simveris (19619) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	0.8	L/ha
07/06/2023	p	Sprayed: Azoxystar (17407) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22; Section 7	0.5	L/ha
13/06/2023	p	Sprayed: Aphox (18562) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	0.3	kg/ha
26/07/2023	p	Sprayed: Samurai (16238) using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	3.0	L/ha
26/07/2023	p	Sprayed: Buffalo Elite using Agribuggy2 AB30: Strip 1, 2.1, 2.2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19; Section 7	1.0	L/ha
Wilderness				
13/06/2023		Mowing on Mown area: Kilworth Topper with ISEKI ISTH4335	-	-

Notes

- Samples of grain and straw were taken for chemical analysis. Unground grain and straw samples from selected treatments were archived.
- Grain quality analyses completed on selected samples.
- Soil sampling for chemical analysis and archiving: Section 5 (all plots); 0-23 cm depth; 25/08/2023.

YIELDS**WINTER WHEAT: GRAIN YIELD (t/ha; 85% DM)**

Continuous/Rotation		C	C	C	C		C	R	R	R	Mean
Section		0	1	6	8		9	2	3	5	
Wheat crop (year)		19	57	46	1	1 ^(clean)	65	1	1	2	
Strip	Treatment										
01	(FYM)N4	-	-	4.50	-	-	-	7.27	8.37	8.70	7.21
2.1	FYMN3	6.95	7.50	5.50	3.30	2.85	7.95	8.67	9.80	10.07	7.47
2.2	FYM	4.95	5.70	5.76	3.83	3.28	6.06	6.67	8.10	7.44	6.06
03	Nil	0.67	0.60	0.87	2.30	2.03	0.22	0.57	2.42	1.85	1.19
05	(P)KMg	0.76	0.95	1.05	3.39	2.84	0.72	0.83	2.81	2.27	1.60
06	N1(P)KMg	3.85	4.12	3.38	3.08	2.61	3.81	4.36	5.73	5.09	4.18
07	N2(P)KMg	5.57	5.86	4.31	4.20	3.68	5.43	6.12	7.38	7.02	5.74
08	N3(P)KMg	5.76	6.67	3.98	5.17	4.75	6.60	7.39	8.47	7.68	6.46
09	N4(P)KMg	6.69	7.19	3.60	5.84	5.41	7.31	7.13	8.38	7.68	6.73
10	N4	1.29	2.68	1.94	4.58	4.26	2.17	2.74	4.97	5.84	3.27
11	N4(P-)Mg	6.55	6.43	2.48	4.56	4.21	4.59	6.36	7.12	6.61	5.59
12	N1+3+1(P)KMg	7.77	7.97	3.40	5.24	4.90	7.78	8.43	9.18	9.16	7.37
13	N4(P-)K	7.38	7.44	3.98	5.27	4.93	6.59	8.09	8.82	7.72	6.91
14	N4(P)K*(Mg*)	5.68	4.28	3.36	6.03	5.43	5.32	4.76	6.64	5.58	5.21
15	N5(P)KMg	7.02	7.02	4.04	5.38	4.53	6.53	7.77	9.00	8.20	6.87
16	N6(P)KMg	7.00	7.64	3.50	5.42	5.12	6.94	8.24	8.88	8.02	6.95
17	N1+4+1PKMg	8.13	8.63	4.09	4.27	3.81	8.36	9.25	9.52	9.54	7.73
18	N1+2+1PKMg	7.61	7.67	4.44	3.33	2.98	7.51	8.64	9.17	9.02	7.18
19	N1+1+1KMg	6.79	6.32	4.79	3.94	3.48	6.68	6.84	7.83	7.96	6.40
20	N4KMg	2.27	0.35	-	-	-	-	-	-	-	1.31
Mean		5.41	5.53	3.63	4.40	3.95	5.59	6.32	7.50	7.13	5.70
Grain mean DM%		87.0									

Notes

- Clean grain (2.0-3.5 mm) yield, after removing weed seed (<2-mm) as was the practice prior to 2012.
- Overall treatment means based on original (not clean) grain yield of Section 8.
- Plot 142 (N4(P)K*(Mg*)) had message: 'Grain tank is full!'. Weight recorded was assumed to be correct.

WINTER WHEAT: STRAW YIELD (t/ha; 85% DM)

Continuous/Rotation		C	C	C	C	C	R	R	R	Mean
Section		0	1	6	8	9	2	3	5	
Wheat crop (year)		19	57	46	1	65	1	1	2	
Strip	Treatment									
01	(FYM)N4	-	-	-	-	-	3.40	4.08	-	3.74
2.1	FYMN3	-	4.04	-	1.53	-	4.39	4.96	-	3.73
2.2	FYM	-	2.39	-	3.66	-	2.18	5.28	-	3.38
03	Nil	-	0.07	-	1.58	-	0.64	0.81	-	0.77
05	(P)KMg	-	0.05	-	2.19	-	0.22	0.79	-	0.81
06	N1(P)KMg	-	1.07	-	2.46	-	1.49	1.80	-	1.70
07	N2(P)KMg	-	1.43	-	3.20	-	1.99	2.90	-	2.38
08	N3(P)KMg	-	1.70	-	3.24	-	2.55	2.72	-	2.55
09	N4(P)KMg	-	2.73	-	3.29	-	2.51	2.78	-	2.83
10	N4	-	1.32	-	1.90	-	0.74	1.91	-	1.47
11	N4(P-)Mg	-	2.60	-	3.23	-	2.49	3.02	-	2.84
12	N1+3+1(P)KMg	-	3.31	-	2.03	-	2.41	5.42	-	3.29
13	N4(P-)K	-	3.96	-	0.62	-	2.80	2.23	-	2.40
14	N4(P)K*(Mg*)	-	1.43	-	2.02	-	1.16	2.64	-	1.81
15	N5(P)KMg	-	2.46	-	4.08	-	2.77	3.28	-	3.15
16	N6(P)KMg	-	2.64	-	3.02	-	1.69	3.77	-	2.78
17	N1+4+1PKMg	-	2.72	-	4.71	-	3.25	4.40	-	3.77
18	N1+2+1PKMg	-	2.26	-	4.44	-	2.84	2.87	-	3.11
19	N1+1+1KMg	-	2.31	-	3.85	-	3.78	3.99	-	3.48
20	N4KMg	-	0.17	-	-	-	-	-	-	0.17
Mean		-	2.04	-	2.84	-	3.40	4.08		2.57
Straw mean DM%		90.6								

Notes

- Plot 051 ((P)KMg) had no straw yield data; full sample sent for Sample Processing was assumed to be the yield (248.4 g).

WINTER OATS AND WINTER BEANS: GRAIN AND STRAW YIELD (t/ha; 85% DM)

Winter Oats (Section 4)			
Plot	Treat	Grain	Straw
014	(FYM)½N4	3.92	3.34
214	FYM½N3	5.23	4.03
224	FYM	4.37	2.53
034	Nil	0.63	0.38
054	(P)KMg	0.90	0.30
064	½N1(P)KMg	2.03	0.69
074	½N2(P)KMg	2.98	1.83
084	½N3(P)KMg	3.68	1.61
094	½N4(P)KMg	5.28	1.94
104	½N4	2.26	0.98
114	½N4(P)Mg	5.45	2.68
124	½N5(P)KMg	3.88	2.82
134	½N4(P)K	3.53	-
144	½N4(P)K*(Mg*)	2.40	1.42
154	½N5(P)KMg	3.94	1.19
164	½N6(P)KMg	3.59	1.97
174	½N6PKMg	6.19	2.56
184	½N4PKMg	3.61	2.59
194	½N3KMg	3.51	1.86
Mean		3.55	1.93
DM(%)		87.1	86.8

Winter Beans (Section 7)			
Plot	Treat	Grain	Straw
017	(FYM) [N4]	4.02	1.45
217	[FYMN3]	3.44	4.56
227	[FYM]	3.65	3.23
037	Nil	1.08	0.63
057	(P)KMg	3.93	3.42
067	[N1](P)KMg	3.83	-
077	[N2](P)KMg	3.45	2.64
087	[N3](P)KMg	3.72	5.05
097	[N4](P)KMg	3.73	1.25
107	[N4]	1.45	1.03
117	[N4](P)Mg	0.09	-
127	[N1+3+1](P)KMg	3.55	-
137	[N4](P)K	3.33	3.05
147	[N4](P)K*(Mg*)	3.24	0.40
157	[N5](P)KMg	3.63	3.83
167	[N6](P)KMg	3.28	1.19
177	[N1+4+1]PKMg	3.82	2.58
187	[N1+2+1]PKMg	3.67	3.58
197	[N1+1+1]KMg	3.15	-
Mean		3.16	2.53
DM(%)		86.8	90.4

Notes

- Note from Farm on 13/10/2022 to report a mistake in drilling northern half of plot 134 (½N4(P*)K) with w. wheat when it should have been w. oats. The plan was to wait a week for the wheat to emerge, then spray it off and drill Section 4 with w. oats.
- No w. oat straw from plot 134 (½N4(P*)K).
- No w. bean straw from plots 067 ([N1](P)KMg), 117 ([N4](P)Mg), 127 ([N1+3+1](P)KMg), and 197 ([N1+1+1]KMg).

2023/R/HB/2 HOOSFIELD SPRING BARLEY

Object: To study the effects of organic manures and inorganic fertilizers on continuous spring barley. From 1968 to 1978 a rotation of potatoes, beans and spring barley was practised on parts of the experiment. The rotation was discontinued in 1979 and the whole experiment reverted to continuous spring barley. The experiment was modified for 2003. The Main plots continue as previously. The Silicate (Si)-Test plots continue but are not split to test rates of N (basal N is applied). The remaining plots are used to study the effect on yield of P residues (basal N applied), known as the Phosphorus (P)-Test plots.

The 172nd year, spring barley. For previous years see 'Details' 1967 and 1973, Station Report for 1966 and Yield Books for 1974-2022/R/HB/2.

Main Plots**Current and Previous treatments**

Plot	Treatment	N treatments 1852-1967	N treatments since 1968	Other treatments 1852-2002	Treatments since 2003
11	---	None	N	-	-
21	-P-	None	N	P	(P)
31	--K	None	N	K (Na) Mg	K (Mg)
41	-PK	None	N	P K (Na) Mg	(P) K (Mg)
12	A--	A	N	-	-
22	AP-	A	N	P	(P)
32	A-K	A	N	K (Na) Mg	K (Mg)
42	APK	A	N	P K (Na) Mg	(P) K (Mg)
61	-	None	N	-	-
71	(FYM)	None	N	(FYM)	(FYM)
62	(Ashes)	None	N	(Ashes)	(Ashes)
72	FYM 1852	None	N	FYM	FYM
63	P2KMg		N	P2 K Mg	P2 K Mg
73	FYM 2001		N	FYM	FYM

Notes

Plots 63 and 73 established in 2001.

Current and Previous treatment codes

Current	
N	Plots split into 4 Sub-Plots for N0, N1, N2, N3: N as calcium ammonium sulphate (27%N; Nitro-Chalk) at 0, 48, 96, 144 kg N, cycling annually since 1974 (N3>N2>N1>N0>N3...) (applied cumulatively 1968-1973)
P2	44 kg P as triple superphosphate (plot 63 only; since 2001)
K	90 kg K as sulphate of potash
Mg	35 kg Mg as kieserite (plot 63 only; since 2001)
FYM	Farmyard manure at 35 t (fresh weight)
Previous	
A	48 kg N as sulphate of ammonia (1852-1967)
P	35 kg P as triple superphosphate in 1974 and 1988-2002, single superphosphate in other years
(P)	P withheld since 2003 - under review
Mg	35 kg Mg as kieserite every third year since 1974 (applied at 30 kg in 1992, 1995 and 1998) (sulphate of magnesia annually until 1973)
(Mg)	Mg withheld since 2003 - under review
(Na)	16 kg Na as sulphate of soda until 1973
(FYM)	Farmyard manure at 35 t (fresh weight) 1852-1871 only
(Ashes)	Weed ash 1852-1916, furnace ash 1917-1932, none since

Silicate-Test Plots**Current and Previous treatments**

Plot	Treatment	N treatments 1852-1967	N treatments 1968-2002	Other treatments 1852-1979	Treatments 1980-2002	Treatments since 2003
131	AA----	AA	N	-	N	N3
231	AAP---	AA	N	-P	N P	N3 (P)
331	AA-K--	AA	N	- K (Na) Mg	N K (Na) Mg	N3 K (Mg)
431	AAPK--	AA	N	- P K (Na) Mg	N P K (Na) Mg	N3 (P) K (Mg)
132	AA---S	AA	N	-	N Si	N3 Si
232	AAP--S	AA	N	- P	N P Si	N3 (P) Si
332	AA-K-S	AA	N	- K (Na) Mg	N K (Na) Mg Si	N3 K (Mg) Si
432	AAPK-S	AA	N	- P K (Na) Mg	N P K (Na) Mg Si	N3 (P) K (Mg) Si
133	AA--SS	AA	N	- Si	N Si	N3 Si
233	AAP-SS	AA	N	- P Si	N P Si	N3 (P) Si
333	AA-KSS	AA	N	- K (Na) Mg Si	N K (Na) Mg Si	N3 K (Mg) Si
433	AAPKSS	AA	N	- P K (Na) Mg Si	N P K (Na) Mg Si	N3 (P) K (Mg) Si
134	AA—S-	AA	N	- Si	N (Si)	N3 (Si)
234	AAP-S-	AA	N	- P Si	N P (Si)	N3 (P) (Si)
334	AA-KS-	AA	N	- K (Na) Mg Si	N K (Na) Mg (Si)	N3 K (Mg) (Si)
434	AAPKS-	AA	N	- P K (Na) Mg Si	N P K (Na) Mg (Si)	N3 (P) K (Mg) (Si)

Current and Previous treatment codes

Current	
N3	N as calcium ammonium nitrate (27% Nitro-chalk) at 144 kg since 2003
Si	Silicate of soda at 450 kg (S also refers to silicate of soda)
Previous	
AA	48 kg N as sodium nitrate (1852-1967)
(Si)	Silicate of soda at 450 kg (S also refers to silicate of soda) until 1979

Notes

N, P, (P), K, Mg, (Mg), (Na) as listed above in Main Plots Current and Previous treatment codes

Phosphorus-Test Plots

Since 2003 the remaining plots [ex-Castor meal plots 14, 24, 34 & 44) and those testing combinations of NPK with and without Mg (Strip 5 plots 55, 56, 57 & 58)] have been used to study the effect of P residues on yield. Previous treatments have resulted in different levels of available P in the soil. Large dressings of K were applied to some plots to increase levels of exchangeable K in the soil such that K should not limit yield; plots 141 and 241 were sacrificed and used as discard areas so that the K application did not encroach on adjacent no K plots on the Silicate Test. Other plots received the normal rate of K. The level of exchangeable Mg in the soil is such that Mg should not limit yield.

Treatments

Plots	Treatment since 2003
142, 143, 144	N3 K*
242, 243, 244	N3 K*
341, 342, 343, 344	N3 K
441, 442, 443, 444	N3 K

Plots	Treatment since 2003
551, 552	N3 K
561, 562	N3 K
571, 572	N3 K*
581, 582	N3 K*

Notes

K* 450 kg K as sulphate of potash 2003-2004, then 90 kg K since

N3, K as listed above in Main Plots and Si-Test Current and Previous treatment codes

FARM DIARY

Date		Application	Rate	Units
26/10/2022	f	Applied: Triple Superphosphate (TSP) by Hand: Plots 631-634	215	kg/ha
26/10/2022	f	Applied: Kieserite by Hand: Plots 631-634	233	kg/ha
27/10/2022	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader using JD6830: Plots 141-144, 241-244, 311-314, 321-324, 331-334, 341-344, 411-414, 421-424, 431-434, 441-444, 551-552, 561-562, 571-572, 581-582, 631-634	217	kg/ha
31/10/2022	f	Applied: Silicate of Soda by Hand: Plots 132-133, 232-233, 332-333, 432-433	450	kg/ha
08/11/2022	f	Applied: Farmyard Manure (FYM) using Muck spreader - international using Tym T503: Plots 721-724, 731-734	35	t/ha
13/02/2023	a	Cultivate/level using Cousins Spring Tines using JD6620: all plots	-	-
13/02/2023	s	Drilled: Spring Barley (Diablo) tr. Ranco i-Mix (19847) using Accord Combition Drill No. 4 using JD6830: all plots	350	seeds/m ²
15/02/2023	a	Cambridge/Ring roll using 6m Flexicoil Cambridge Roll using JD5070: all plots	-	-
04/05/2023	f	Applied: Nitrochalk by Hand; Plots 114, 122, 213, 224, 312, 323, 411, 424, 612, 622, 632, 714, 723, 733	177	kg/ha
04/05/2023	f	Applied: Nitrochalk by Hand; Plots 111, 121, 214, 221, 311, 322, 413, 423, 614, 623, 633, 713, 724, 734	355	kg/ha
04/05/2023	f	Applied: Nitrochalk by Hand; Plots 113, 124, 211, 222, 313, 321, 412, 421, 611, 621, 631, 712, 721, 732	532	kg/ha
17/05/2023	p	Sprayed Presite SX (18776) using Agribuggy2 AB30 using Agribuggy2 AB30	75	g/ha
17/05/2023	p	Sprayed Mobius (13395) using Agribuggy2 AB30 using Agribuggy2 AB30	0.6	L/ha
17/05/2023	p	Sprayed Hurler (17715) using Agribuggy2 AB30 using Agribuggy2 AB30	0.75	L/ha
17/05/2023	p	Sprayed Kaster (20008) using Agribuggy2 AB30 using Agribuggy2 AB30	0.75	L/ha
11/06/2023	f	Applied: Yara Bela Extran using Cascade Spreader using JD6830: Plots 131-134, 141-144, 231-234, 241-244, 331-334, 341-344, 431-434, 441-444, 551-552, 561-562, 571-572, 581-582	430	kg/ha
21/06/2023	a	Power harrow using Kilworth Power Harrow 1.3 m using Iseki ISTH4335	-	-
03/08/2023	p	Sprayed Samurai (16238) using Agribuggy2 AB30 using Agribuggy2 AB30	2	L/ha
03/08/2023	p	Sprayed Buffalo Elite using Agribuggy2 AB30 using Agribuggy2 AB30	1	L/ha
25/08/2023	a	Harvest (Combine) using Claas Tucano 430; all Plots	-	-
07/09/2023	a	Harvest (Combine) Straw Yields using Amazone Grass Harvester - Flail Mower Collector with JD5070: Plots 111-114, 121-124, 211-214, 221-224, 311-314, 321-324, 411-414, 421-424, 611-614, 621-624, 631-634, 711-714, 721-724, 731-734	-	-

Notes

- Samples of grain and straw were taken for chemical analysis. Unground grain and straw samples from selected treatments were archived.
- Grain quality analyses completed on all grain samples.
- Soil sampling for chemical analysis and archiving: Main Plots (all plots); 0-23 cm depth; 19/09/2023.

YIELDS**MAIN PLOTS: SPRING BARLEY: GRAIN YIELD (t/ha; 85% DM)**

Treatment	N (kg)				Mean
	0	48	96	144	
---	0.74	0.76	1.01	0.83	0.83
-P-	0.31	0.95	1.11	1.45	0.96
--K	0.07	0.50	1.11	0.78	0.62
-PK	0.12	0.44	1.25	1.20	0.75
A--	0.46	0.84	0.77	0.81	0.72
AP-	0.84	2.06	1.03	1.08	1.25
A-K	0.49	0.89	0.57	0.39	0.58
APK	0.36	0.68	0.70	0.66	0.60
FYM 1852	3.27	2.90	3.16	2.58	2.98
(FYM)	0.15	1.41	1.02	1.19	0.94
(Ashes)	0.40	0.49	0.77	0.60	0.57
-	0.17	0.54	0.55	0.33	0.40
FYM 2001	1.68	2.43	3.58	3.60	2.82
P2KMg	0.32	1.03	1.39	1.72	1.12
Mean	0.67	1.14	1.29	1.23	1.08
Grain mean DM%					92.5

Notes

- Dry matter, and hence yield, missing for plot 623 ((Ashes) N2). Yield estimated by ANOVA as 0.77 t/ha in yield table. Means for treatment factors (A), N2, and the grand mean, were based on the estimated value.

MAIN PLOTS: SPRING BARLEY: STRAW YIELD (t/ha; 85% DM)

Treatment	N (kg)				Mean
	0	48	96	144	
---	0.98	1.21	1.05	1.16	1.10
-P-	0.64	0.82	0.25	1.49	0.80
--K	0.40	0.71	0.94	0.82	0.72
-PK	0.35	0.63	0.83	0.99	0.70
A--	0.63	0.65	0.87	0.30	0.61
AP-	1.52	0.35	0.34	1.56	0.94
A-K	0.96	0.88	0.80	0.44	0.77
APK	0.32	0.47	1.66	0.79	0.81
FYM 1852	2.61	1.34	2.48	2.58	2.25
(FYM)	0.44	1.32	2.25	0.54	1.14
(Ashes)	1.55	0.14	0.65	0.59	0.73
-	0.58	1.03	0.81	1.16	0.89
FYM 2001	1.97	1.22	2.30	2.80	2.07
P2KMg	0.68	1.29	1.08	2.06	1.28
Mean	0.97	0.86	1.17	1.23	1.06
Straw mean DM%					88.2

SILICATE-TEST PLOTS: SPRING BARLEY: GRAIN YIELD (t/ha; 85% DM)

Silicate treatment	NPKMg treatment				Mean
	N3--	N3(P)-	N3-K(Mg)	N3(P)K(Mg)	
(-)-	0.79	1.74	0.47	0.35	0.84
(Si)-	0.26	0.72	0.50	0.65	0.53
(-)Si	1.01	1.38	0.35	0.44	0.79
(Si)Si	1.19	1.22	0.43	0.49	0.84
Mean	0.81	1.27	0.44	0.48	0.75
Grain Mean DM%					88.3

PHOSPHORUS-TEST PLOTS: SPRING BARLEY: GRAIN YIELD (t/ha; 85% DM)

Plot	
142	0.47
143	0.59
144	0.39
242	0.80
243	0.66
244	0.54
341	0.49
342	0.43
343	0.28
344	0.35
441	0.26
442	0.54
443	0.47
444	0.39

551	0.37
552	0.27
561	0.33
562	0.26
571	0.35
572	0.31
581	0.28
582	0.23

Mean	0.41
Grain Mean DM%	88.4

2023/R/WF/3 WHEAT AND FALLOW (Hoosfield)

Object: To maintain a low plant available P site – Hoosfield.

Whole plot dimensions: 9 m × 221 m

Treatments

Two plots, one sown to winter wheat, one fallow; alternating in successive years. From 2016 this experiment was converted to continuous wheat on both plots, with no yields or samples taken at harvest. Nevertheless, the experiment is in its 168th year. For previous years see 'Details' 1967, 1973 and Yield Books for 1974-2022/R/WF/3.

FARM DIARY

Date		Application	Rate	Units
16/09/2022	f	Applied: Chalk using Quick Pass with JD5070 to west half of both Plots 1 and 2	2	t/ha
03/10/2022	a	Plough thrown: N using KV Five Furrow Plough with JD6145R Premium	-	-
11/10/2022	s	Drilled: Winter Wheat (Zyatt) tr. Beret Gold (16430) using Accord Combination Drill No. 4 with JD6830	350	seeds/m ²
13/10/2022	p	Sprayed: Pontos (17811) using Knight 24m Sprayer with NH T6030	1	L/ha
13/10/2022	p	Sprayed: Velomax (A0831) using Knight 24m Sprayer with NH T6030	0.4	L/ha
10/11/2022	p	Sprayed: Hallmark with Zeon Technology (12629) using Knight 24m Sprayer with NH T6030	50	mL/ha
05/04/2023	p	Sprayed: Orius P (18994) using Agribuggy2 AB30	1	L/ha
05/04/2023	p	Sprayed: Moddus (15151) using Agribuggy2 AB30	0.15	L/ha
05/04/2023	p	Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30	1.25	L/ha
13/04/2023	f	Sprayed: Yara Bela Extran using Cascade Spreader with JD6830	149	kg/ha
30/04/2023	p	Sprayed: Presite SX (18776) using Agribuggy2 AB30	60	g/ha
30/04/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30	0.8	L/ha
30/04/2023	p	Sprayed: Arizona (15318) using Agribuggy2 AB30	1.5	L/ha
25/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30	0.9	L/ha
25/05/2023	p	Sprayed: Hurler (17715) using Agribuggy2 AB30	0.75	L/ha
10/06/2023	p	Sprayed: Oraso Pro (19321) using Agribuggy2 AB30	0.85	L/ha
10/08/2023	a	Harvest: using Claas Tucano 430	-	-
04/10/2023	p	Sprayed: Pontos (17811) using Agribuggy2 AB30	1	L/ha
04/10/2023	p	Sprayed: Velomax (A0831) using Agribuggy2 AB30	0.4	L/ha

2023/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 168th year, winter wheat. For previous years see 'Details' 1977, 1973 and Yield Books for 1974-2022/R/EX/4.

Current treatments

P-Test Plots

Current treatments (since 1986)

Plot	Treatments 1986-1992	Treatments 2000-2008 ⁽¹⁾	Treatments 2009-2015 ⁽²⁾	Treatments since 2016
011, 031, 051, 071, 091	N P3 K2 Mg	N P* K2 Mg	N P K2 Mg	
012, 032, 052, 072, 092	N P2 K2 Mg	N P* K2 Mg	N P K2 Mg	
013, 033, 053, 073, 093	N P1 K2 Mg	N P* K2 Mg	N P K2 Mg	N K2 Mg
014, 034, 054, 074, 094	N K2 Mg			

Notes

- (1) P treatments were applied at 61.5 kg P in error in 2000
- (2) In 2009 maintenance P applications were changed to 15 kg P/ha, but this was not recorded in the Yield Books for 2009-2013.

K-Test Plots

Current treatments (since 2007)

Plot	Treatments since 2007
021, 041, 061, 081, 101, 022, 042, 062, 082, 102	N P Mg
023, 043, 063, 083, 103	N P K1 Mg
024, 044, 064, 084, 104	N P K2 Mg

Notes

The K-Test was previously an N-Test until 1991

Current treatments (since 1986) codes

N	300 kg N: 50 kg N as ammonium sulphate (21% N) during first two weeks in March + 200 kg N as ammonium nitrate (34.5% N) at GS31/mid-April (whichever comes first) + 50 kg N as ammonium nitrate (34.5% N) at GS37 (not later than mid-May)
P	15 kg P as triple superphosphate since 2009
P*	20 kg P as triple superphosphate 2000-2008
P1	44 kg P as triple superphosphate 1986-1992
P2	87 kg P as triple superphosphate 1986-1992
P3	131 kg P as triple superphosphate 1986-1992
K1	62.2 kg K as muriate of potash (potassium chloride)
K2	124.5 kg K as muriate of potash (potassium chloride)
Mg	12 kg Mg as kieserite (magnesium sulphate)

Previous treatments (1876-1901): All Plots

Plot	Treatment (1876-1901)
01	-
03	FYM
05	N--
07	NPKNaMg
09	-P-

Plot	Treatment (1876-1901)
02	-
04	FYM
06	*N--
08	*NPK
10	-PK

Previous treatment (1876-1901) codes

-	none
N	96 kg N as ammonium sulphate
*N	96 kg N as sodium nitrate
P	34 kg P as superphosphate
K	137 kg K as sulphate of potash
Na	16 kg Na as sulphate of soda
Mg	11 kg Mg as sulphate of magnesia
FYM	farmyard manure at 35 t (fresh weight)

FARM DIARY

Date		Application	Rate	Unit
12/09/2022	f	Applied: Muriate of Potash (MOP) using Exactomatic with JD5070: Plot 023, 043, 063, 083, 103	125	kg/ha
12/09/2022	f	Applied: Muriate of Potash (MOP) using Exactomatic with JD5070: Plot 011-014, 024, 031-034, 044, 051-054, 064, 071-074, 084, 091-094, 104	250	kg/ha
14/09/2022	f	Applied: Triple Superphosphate (TSP) using Ransomes Nordsten Lift-o-matic Fertiliser Box with JD5070: Plot 011-012, 021-024, 031-032, 041-044, 051-052, 061-064, 071-072, 081-084, 091-092, 101-104	75	kg/ha
15/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plot 012, 013, 034, 041, 043, 051, 053, 093	2	t/ha
15/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plot 011, 014, 031, 042, 044, 052, 054, 072, 081, 094, 104	4	t/ha
15/09/2022	f	Applied: Chalk using Quick Pass with JD5070: Plot 021, 022, 023, 024, 061, 062, 063, 064, 071, 073, 074, 082, 083, 084, 091, 101, 102, 103	6	t/ha
03/10/2022	a	Ploughed: thrown N using KV Five Furrow Plough with JD6145R Premium		
11/10/2022	s	Drilled: Winter Wheat (Zyatt) tr. Beret Gold (16430) using Accord Combination Drill No. 4 with JD6830	350	seeds/m ²
13/10/2022	p	Sprayed: Pontos (17811) using Knight 24m Sprayer with NH T6030	1	L/ha
13/10/2022	p	Sprayed: Velomax (A0831) using Knight 24m Sprayer with NH T6030	0.4	L/ha
10/11/2022	p	Sprayed: Hallmark with Zeon Technology (12629) using Knight 24m Sprayer with NH T6030	50	mL/ha
17/03/2023	f	Applied: Sulphate of Ammonia using Cascade Spreader with JD6830: all Plots	238	kg/ha
04/04/2023	f	Applied: Kieserite using Cascade Spreader with JD6830: all Plots	80	kg/ha
05/04/2023	p	Sprayed: Orius P (18994) using Agribuggy2 AB30	1	L/ha
05/04/2023	p	Sprayed: Moddus (15151) using Agribuggy2 AB30	0.15	L/ha
05/04/2023	p	Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30	1.25	L/ha
13/04/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: all Plots	597	kg/ha
30/04/2023	p	Sprayed: Presite SX (18776) using Agribuggy2 AB30	60	g/ha
30/04/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30	0.8	L/ha
30/04/2023	p	Sprayed: Arizona (15318) using Agribuggy2 AB30	1.5	L/ha
16/05/2023	f	Applied: Yara Bela Extran (33.5% N) using Cascade Spreader with JD6830: all Plots	149	kg/ha
25/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30	0.9	L/ha
25/05/2023	p	Sprayed: Hurler (17715) using Agribuggy2 AB30	0.75	L/ha
10/06/2023	p	Sprayed: Oraso Pro (19321) using Agribuggy2 AB30	0.85	L/ha
10/08/2023	a	Harvest: Claas Tucano 430: Plot Additional notes: O + E	-	-
10/08/2023	a	Harvest: Haldrup C-85 2m cut	-	-
24/08/2023	a	Harvest: Amazone Grass Harvester - Flail Mower Collector with JD5070: Straw Yields	-	-
04/10/2023	p	Sprayed: Pontos (17811) using Agribuggy2 AB30	1	L/ha
04/10/2023	p	Sprayed: Velomax (A0831) using Agribuggy2 AB30	0.4	L/ha

Notes

- Samples of grain and straw were taken for chemical analysis.
- Grain quality analyses completed on all grain samples.
- Soil sampling for chemical analysis and archiving: all plots; 0-23 cm depth; 04/09/2023.

YIELDS**P-TEST PLOTS: WINTER WHEAT: GRAIN YIELD (t/ha; 85% DM)**

Old residue (1876-1901)	P residue (1986-1992)				Mean
	0	(P1)	(P2)	(P3)	
	P current				
	0	0	P	P	
(-)	5.21	8.09	8.77	7.81	7.47
(FYM)	7.79	10.19	9.29	8.56	8.96
(N)	5.50	8.89	9.81	9.25	8.36
(P)	5.19	9.63	10.63	9.25	8.67
(NPKNaMg)	6.98	9.69	9.75	9.52	8.98
Mean	6.14	9.30	9.65	8.88	8.49
Grain mean DM%					88.3

P-TEST PLOTS: WINTER WHEAT: STRAW YIELD (t/ha; 85% DM)

Old residue (1876-1901)	P residue (1986-1992)				Mean
	0	(P1)	(P2)	(P3)	
	P current				
	0	0	P	P	
(-)	1.76	4.14	4.45	4.03	3.60
(FYM)	3.32	5.53	3.72	4.28	4.21
(N)	1.86	2.45	5.79	5.05	3.79
(P)	2.99	2.48	4.99	5.41	3.97
(NPKNaMg)	2.30	3.80	3.97	3.51	3.39
Mean	2.45	3.68	4.59	4.46	3.79
Grain mean DM%					91.6

K-TEST PLOTS: WINTER WHEAT: GRAIN YIELD (t/ha; 85% DM)

Old residue (1876-1901)	K current			Mean
	0	K1	K2	
(-)	6.76	8.07	8.13	7.43
(FYM)	7.02	8.97	8.73	7.94
(*N)	6.70	8.64	8.90	7.73
(PK)	7.67	8.39	8.76	8.12
(*NPK)	7.21	8.62	9.12	8.04
Mean	7.07	8.54	8.73	7.85
Grain mean DM%				86.9

K-TEST PLOTS: WINTER WHEAT: STRAW YIELD (t/ha; 85% DM)

Old residue (1876-1901)	K current			Mean
	0	K1	K2	
(-)	3.36	3.86	4.04	3.66
(FYM)	3.52	4.56	5.25	4.22
(*N)	3.19	3.94	5.00	3.83
(PK)	3.83	3.97	2.62	3.56
(*NPK)	2.66	4.08	4.19	3.40
Mean	3.31	4.08	4.22	3.73
Grain mean DM%				91.8

2023/R/PG/5 PARK GRASS

Object: To study the effects of organic manures and inorganic fertilisers and lime on old grass for hay. The original objective focus on nutrients began to be compromised when it was discovered that use of one of the N fertilisers caused acidification of the soil. A small amount of chalk was applied to all plots during tests in the 1880s and 1890s to correct this. A regular test of liming was started in 1903 when most plots were divided in two with 4 t/ha CaCO_3 applied every four years to the southern half (L) with the northern half remaining unlimed (U). In 1965, most plots were divided into four: sub-plots “a” and “b” on the previously limed southern half (L) and sub-plots “c” and “d” on the unlimed northern half (U). Sub-plots “a”, “b” and “c” now receive bespoke amounts of chalk, when necessary, to achieve or maintain soil pH (0-23 cm) at 7, 6 and 5, respectively. Sub-plot “d” remains unlimed and its pH reflects inputs from the various treatments and the atmosphere. A separate scheme of liming was introduced on plots 18, 19 and 20 in 1920; sub-plots /1, /2 and /3 received no lime, “high” lime and “light” lime respectively every 4 years. Since 1965 plot 18-1 has been split into two for treatments “c” and “d” as above and plot 18-3 split into two for treatments “a” and “b”. Plots 19 and 20 received no further chalk after 1968; plot 18/2 received no further chalk after 1972. Chalk was last applied in 2021; the tenth application in a triennial scheme of soil pH analysis and remedial chalk applications. This note was occasionally incorrect in earlier Yield Book entries. 2023 was the 168th year, hay. The grass is cut twice annually: June (for making hay) and October (second cut). For previous years see ‘Details’ 1977 and 1973 and Yield Books for 1974-2022/R/PG/5.

Treatments**Main Plots**

Plot	Current treatment	Previous treatments, where different
1	N1	
2/1	K	As 2/2 until 1995; K since 1996 (Plot 2 split into 2/1 and 2/2 from 1996)
2/2	None	FYM until 1863 (Plot 2 split into 2/1 and 2/2 from 1996)
3	None	
4/1	P	
4/2	N2P	
6	N1PKNaMg	
7/1	(P)KNaMg	Included P until 2012 (Plot 7 split into 7/1 and 7/2 from 2013)
7/2	PKNaMg	Plot 7 split into 7/1 and 7/2 from 2013
8	PNaMg	
9/1	(N2)PKNaMg	Included N2 until 1989
9/2	N2PKNaMg	
10	N2PNaMg	
11/1	N3PKNaMg	
11/2	N3PKNaMgSi	
12	None	
13/1	(FYM/F)	FYM/F until 1993/1995 (none since 1996)
13/2	FYM/PM	FYM/F until 1999
14/1	(N*2)PKNaMg	Included N*2 until 1989
14/2	N*2PKNaMg	
15	N*3PKNaMg	N*2 until 1875; P K Na Mg 1876-2012
16	N*1PKNaMg	
17	N*1	
18	N2KNaMg	
19	FYM	
20	FYM/N*P*K*	

Current and Previous treatment codes

N1, N2, N3	48, 96, 144 kg N as sulphate of ammonia (21% N; 24% S)
N*1, N*2, N*3	48, 96, 144 kg N as nitrate of soda (16% N; 27% Na)
N*	30 kg N as nitrate of soda (16% N; 27% Na) to Plot 20 in years when it does not receive FYM
P	17 kg P applied as triple superphosphate since 2017; 35 kg P as triple superphosphate in 1974 and since 1987; single superphosphate in other years
P*	15 kg N as triple superphosphate to Plot 20 in years when it does not receive FYM; 15 kg P as triple superphosphate in 1974 and since 1987; single superphosphate in other years
K	225 kg K as sulphate of potash
K*	45 kg K as sulphate of potash to Plot 20 in years when it does not receive FYM
Na	15 kg Na as sulphate of soda
Mg	10 kg Mg as sulphate of magnesia (Epsom Salts)
Si	104 kg Si as silicate of soda
FYM	Farmyard manure at 35 t (fresh weight) every fourth year; last applied 2021
PM	Pelleted poultry manure at 2 t (fresh weight), every fourth year since 2003 (to supply 63 kg N); applied in 2023
(F)	Fishmeal every fourth year until 1999 (to supply 63 kg N)

Sub-Plots

Sub-Plot	Liming
a	Ground chalk applied every 3 years as necessary to achieve pH7
b	Ground chalk applied every 3 years as necessary to achieve pH6
c	Ground chalk applied every 3 years as necessary to achieve pH5
d	Unlimed

Notes

Main Plots 1-18 divided into a, b, c, d (i.e., all plots except 18/2, 19 and 20).

FARM DIARY

Date		Application	Rate	Units
31/01/2023	f	Applied Triple Superphosphate (TSP) using Nordsten 3m fertiliser box with JD5070; Plots: 4/1, 4/2, 6, 7/2, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15, 16	84.7	kg/ha
01/02/2023	f	Applied Triple Superphosphate (TSP) by Hand: Plots: 20/1, 20/2, 20/3	74.7	kg/ha
07/02/2023	f	Applied: Sulphate of Soda using Quick Pass with JD5070: Plots: 6, 7/1, 7/2, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15, 16, 18, 18/2	43	kg/ha
07/02/2023	f	Applied: Sulphate of Magnesia (Epsom Salts) using Quick Pass with JD5070: Plots: 6, 7/1, 7/2, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15, 16, 18, 18/2	111	kg/ha
07/02/2023	f	Applied: Sulphate of Potash (SOP) using Quick Pass with JD5070: Plots: 2/1, 6, 7/1, 7/2, 9/1, 9/2, 11/1, 11/2, 14/1, 14/2, 15, 16, 18, 18/2	542	kg/ha
08/02/2023	f	Applied: Sulphate of Potash (SOP) using By Hand with Pedestrian Operated: Plots: 20/1, 20/2, 20/3	108	kg/ha
08/02/2023	f	Applied Silicate of Soda: Plot 11/2	450	kg/ha
08/02/2023	f	Applied: Poultry Manure by Hand; Plot 13/2	2	t/ha
02/05/2023	f	Applied: Sulphate of Ammonia using Exactomatic with JD5070: Plots: 9/2, 10	459	kg/ha
02/05/2023	f	Applied: Sulphate of Ammonia using Exactomatic with JD5070: Plots: 11/1, 11/2	686	kg/ha
03/05/2023	f	Applied: Sulphate of Ammonia using Exactomatic with JD5070: Plots - 1, 6a, 6b	229	kg/ha
03/05/2023	f	Applied: Sulphate of Ammonia using Exactomatic with JD5070: Plots: 4/2, 9/2, 10, 18, 18/2	459	kg/ha
02/05/2023	f	Applied: Sodium Nitrate by Hand; Plots 16, 17	300	kg/ha
02/05/2023	f	Applied: Sodium Nitrate by Hand; Plot 14/2	600	kg/ha
02/05/2023	f	Applied: Sodium Nitrate by Hand; Plot 15	900	kg/ha
02/05/2023	f	Applied: Sodium Nitrate by Hand; Plots 20/1, 20/2, 20/3	188	kg/ha
22/06/2023	a	Park Grass (1st Cut): Amazone Grass Harvester - Flail Mower Collector with JD5070	-	-
24/06/2023	a	Tedding/Spreading grass: Tedder with JD6145R Premium	-	-
27/06/2023	a	Rowing up: Claas Windrower with JD6230	-	-
27/06/2023	a	Harvest (Bale Weights): McHale Fusion 2 Baler with JD6145R Premium	-	-
25/10/2023	a	Park Grass (2nd CUT): Amazone Grass Harvester - Flail Mower Collector with JD5070	-	-
06/11/2023	a	Mowing: McHale Pro Glide R3100 with JD6145R	-	-
07/11/2023	a	Harvest (Bale Weights): McHale Fusion 2 Baler with JD6145R Premium	-	-
07/11/2023	a	Rowing up: Claas Windrower with JD6230	-	-

Notes

- TSP applications of 84.7 and 74.7 kg/ha were as close as possible to target rates (83 and 73 kg/ha, respectively) based on calibration of spreader.
- Sulphate of Ammonia application of 459 kg/ha was as close as possible to target rate (457 kg/ha, respectively) based on calibration of spreader.
- Samples of herbage (1st and 2nd Cut) were taken for chemical analysis. Unground herbage samples from all plots were archived.
- Soil sampling for chemical analysis and archiving:
 - all plots; 0-23 cm depth; 06-07/03/2023
 - some 'd' sub-plots: 1d, 4/2d, 9/1d, 9/2d, 10d, 11/1d, 11/2d, 18d; 0-4 cm 'mat' and 4-23 cm 'mineral' depths; 07/03/2023

YIELDS**GRASS HERBAGE: 1st CUT (22-23/06/2023): DRY MATTER YIELD (t/ha)**

Plot	Treatment	Lime				Mean
		a	b	c	d	
1	N1	1.96	2.29	1.37	0.66	1.57
2/1	K	3.65	2.49	1.96	1.40	2.38
2/2	None	3.80	2.01	1.64	1.26	2.18
3	None	2.46	2.49	1.69	1.18	1.96
4/1	P	3.91	3.72	2.49	2.50	3.16
4/2	N2P	4.31	4.65	4.47	2.29	3.93
6	N1PKNaMg	7.77	7.68	-	-	7.73
7/1	(P)KNaMg	6.50	7.55	3.82	2.37	5.06
7/2	PKNaMg	7.19	6.75	3.98	2.83	5.19
8	PNaMg	3.86	4.39	2.80	2.37	3.35
9/1	(N2)PKNaMg	6.57	6.48	5.54	1.43	5.00
9/2	N2PKNaMg	7.33	7.65	7.39	3.73	6.53
10	N2PNaMg	4.70	5.67	5.70	3.20	4.82
11/1	N3PKNaMg	7.27	7.08	6.95	1.48	5.69
11/2	N3PKNaMgSi	7.86	7.87	7.88	3.31	6.73
12	None	3.69	2.57	2.92	2.45	2.91
13/1	(FYM/F)	3.87	4.59	4.94	4.68	4.52
13/2	FYM/PM	3.05	5.88	5.60	7.00	5.38
14/1	(N*2)PKNaMg	7.71	5.36	4.31	5.72	5.78
14/2	N*2PKNaMg	8.93	5.90	6.96	8.29	7.52
15	N*3PKNaMg	7.83	6.70	9.29	7.07	7.72
16	N*1PKNaMg	6.77	5.78	4.51	5.04	5.53
17	N*1	2.90	2.66	2.29	2.44	2.57
18	N2KNaMg	4.25	3.59	2.54	2.03	3.10
18/2	N2KNaMg					3.93
19/1	FYM					6.01
19/2						6.32
19/3						6.88
20/1	FYM/N*P*K*					5.91
20/2						6.08
20/3						6.45
Mean						4.62
1st cut mean DM%						34.2

Notes

- Plots 11/1d and 11/2d brown. Suspected cause was that plants are already under stress because of the extreme acid conditions (a treatment effect) which has been exaggerated by the extreme weather (drought, snow, etc). A similar observation has been made in earlier years. Aerial photographs were taken by drone on 04/05/2023. However, yield recovered.
- Plot 19/3, cut strip 1 error message "Jam no good"; yield excluded.

GRASS HERBAGE: 2ND CUT (25-26/10/2023): DRY MATTER YIELD (t/ha)

Plot	Treatment	Lime				Mean
		a	b	c	d	
1	N1	1.60	1.85	2.10	1.16	1.68
2/1	K	2.01	2.22	1.81	1.77	1.95
2/2	None	2.12	1.45	2.84	1.80	2.05
3	None	1.82	2.06	2.46	1.54	1.97
4/1	P	1.79	2.29	2.72	2.32	2.28
4/2	N2P	2.56	2.65	3.01	2.48	2.68
6	N1PKNaMg	1.55	1.57	-	-	1.56
7/1	(P)KNaMg	2.12	2.27	2.42	1.36	2.05
7/2	PKNaMg	1.73	1.85	2.42	1.74	1.93
8	PNaMg	1.93	1.93	2.51	2.27	2.16
9/1	(N2)PKNaMg	0.86	1.61	2.01	0.97	1.36
9/2	N2PKNaMg	2.43	3.04	2.78	3.27	2.88
10	N2PNaMg	3.05	2.97	2.78	3.11	2.98
11/1	N3PKNaMg	3.00	2.54	2.71	2.77	2.76
11/2	N3PKNaMgSi	3.57	1.50	2.49	4.99	3.14
12	None	2.07	1.85	2.67	2.27	2.22
13/1	(FYM/F)	1.85	3.01	3.36	3.06	2.82
13/2	FYM/PM	1.72	3.14	3.29	2.22	2.59
14/1	(N*2)PKNaMg	2.51	3.14	3.64	2.61	2.97
14/2	N*2PKNaMg	3.34	3.08	3.11	3.84	3.34
15	N*3PKNaMg	3.08	3.26	3.49	2.87	3.18
16	N*1PKNaMg	3.02	3.15	3.21	2.67	3.01
17	N*1	2.28	2.91	3.80	2.97	2.99
18	N2KNaMg	2.81	2.72	1.96	1.80	2.32
18/2	N2KNaMg					3.06
19/1	FYM					3.16
19/2						3.64
19/3						2.67
20/1	FYM/N*P*K*					2.60
20/2						0.97
20/3						1.29
Mean						2.47
2 nd cut mean DM%						23.1

Notes

- Plots 11/1d and 11/2d brown. Suspected cause was that plants are already under stress because of the extreme acid conditions (a treatment effect) which has been exaggerated by the extreme weather (drought, snow, etc). A similar observation has been made in earlier years. Aerial photographs were taken by drone on 04/05/2023. However, yield recovered.
- Cut 2: 4 missing (excluded) yield strips due to blockage in mower from grass being too wet: plot 9/2b, cut strip 2 (10.27); 11/2b, cut strip 1 (8.789); plot 11/2d, cut strip 2 (11.59); plot 13/2c, cut strip 1 (1.5). Also, only one strip for plot 20/1 - probably an issue with a blockage in the mower but no notes made.

GRASS HERBAGE: TOTAL OF 2 CUTS: DRY MATTER YIELD (t/ha)

Plot	Treatment	Lime				Mean
		a	b	c	d	
1	N1	3.56	4.14	3.47	1.82	3.25
2/1	K	5.66	4.71	3.78	3.17	4.33
2/2	None	5.92	3.46	4.48	3.06	4.23
3	None	4.28	4.55	4.15	2.71	3.92
4/1	P	5.70	6.02	5.20	4.83	5.44
4/2	N2P	6.86	7.30	7.48	4.76	6.60
6	N1PKNaMg	9.32	9.26	-	-	9.29
7/1	(P)KNaMg	8.62	9.83	6.25	3.73	7.11
7/2	PKNaMg	8.92	8.60	6.40	4.57	7.12
8	PNaMg	5.78	6.31	5.31	4.64	5.51
9/1	(N2)PKNaMg	7.43	8.10	7.55	2.39	6.37
9/2	N2PKNaMg	9.76	10.69	10.17	7.00	9.41
10	N2PNaMg	7.75	8.65	8.48	6.31	7.80
11/1	N3PKNaMg	10.28	9.62	9.66	4.25	8.45
11/2	N3PKNaMgSi	11.43	9.37	10.37	8.30	9.87
12	None	5.76	4.42	5.59	4.73	5.12
13/1	(FYM/F)	5.73	7.60	8.30	7.74	7.34
13/2	FYM/PM	4.78	9.03	8.89	9.22	7.98
14/1	(N*2)PKNaMg	10.22	8.50	7.95	8.33	8.75
14/2	N*2PKNaMg	12.27	8.98	10.07	12.13	10.86
15	N*3PKNaMg	10.91	9.96	12.78	9.94	10.90
16	N*1PKNaMg	9.79	8.93	7.72	7.71	8.54
17	N*1	5.18	5.57	6.09	5.41	5.56
18	N2KNaMg	7.06	6.30	4.49	3.83	5.42
18/2	N2KNaMg					6.99
19/1	FYM					9.17
19/2						9.96
19/3						9.55
20/1	FYM/N*P*K*					8.51
20/2						7.05
20/3						7.74
Mean						7.09
2 nd cut mean DM%						28.6

Notes

- Plots 11/1d and 11/2d brown. Suspected cause was that plants are already under stress because of the extreme acid conditions (a treatment effect) which has been exaggerated by the extreme weather (drought, snow, etc). A similar observation has been made in earlier years. Aerial photographs were taken by drone on 04/05/2023. However, yield recovered.
- Plot 19/3, 1st cut, cut strip 1 error message "Jam no good"; yield excluded.
- 2nd cut: 4 missing (excluded) yield strips due to blockage in mower from grass being too wet: plot 9/2b, cut strip 2 (10.27); 11/2b, cut strip 1 (8.789); plot 11/2d, cut strip 2 (11.59); plot 13/2c, cut strip 1 (1.5). Also, only one strip for plot 20/1 - probably an issue with a blockage in the mower but no notes made.

2023/R/BN/7 BARNFIELD

Object: Effects of fertilizers and organic manures on root crops, arable crops and grass & clover. Barnfield was the first of the Classical Experiments, with treatments applied in spring 1843 for a crop of turnips sown in July. The treatments and cropping, although mainly roots, differed until 1876 when a period of continuous cropping with mangolds was started that lasted until 1959 (sugar beet were also grown, on half-plots, from 1946). Treatments during the first two years were on long narrow plots, as on Broadbalk. After various modification, the design was settled in 1856 when the strips testing minerals and FYM, including FYM + PK, were crossed at right angles by series comparing no N fertilizer with both inorganic and organic forms of N supplying 96 kg/ha. Before 1968 this was the only Classical in which N was applied with both FYM and FYM + PK fertilizer. Because yields of continuous roots were declining, perhaps because of increasing numbers of cyst nematodes (*Heterodera schachtii*), the cropping has been progressively modified since 1959 and has included a range of arable crops, with an increased range of N dressings, and grass. From 1977 to 1983 the series that had never received N fertilizer was kept fallow. It was sown to a grass-clover ley in 1984. The remainder has been in grass since 1975.

No treatments have been applied and no yields taken since 2001, although the site is currently still available. Recently soil from the site was used in a study investigating the response of wheat roots to soil P supply (Yuan et al, 2016).

FARM DIARY

No Farm records for 2023, but grass would have been cut at least twice. Grass is mown, turned, baled and removed by contractors.

2023/R/GC/8 GARDEN CLOVER (Manor Garden)

Object: To study yields and pathogens of red clover grown continuously on a rich garden soil - Manor Garden. A series of treatments have been applied, including fertilisers and various treatments to counter pests and diseases, including formalin (1956-1972), aldicarb (1976-1988), and the most recent application of benomyl (a fungicide; 1980-1990). The 170th year, red clover. For previous years see 'Details' 1967 and 1973, and Yield books for 1974-2022/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.00 m × 1.40 m.

Treatments

Treatment	Most recent fungicide residues to control <i>Sclerotinia trifoliorum</i> (1980-1990)
None	None
Benomyl	Benomyl (last applied November 1989)

FARM DIARY

Date		Application	Rate	Unit
05/01/2023	f	Applied: Chalk by Hand	1250	kg/ha
05/01/2023	f	Applied: Sulphate of Potash (SOP) by Hand	300	kg/ha
05/01/2023	f	Applied: Triple Superphosphate (TSP) by Hand	159	kg/ha
05/01/2023	f	Applied: Magnesium sulphate (Epsom Salts) by Hand	521	kg/ha
18/04/2023	a	Hand Weeding of plots	-	-
05/06/2023	a	Hand Harvest - 1 st Cut	-	-
21/08/2023	a	Hand Harvest - 2 nd Cut	-	-

Notes

- Samples of clover were taken for chemical analysis.

YIELDS**RED CLOVER: 2 CUTS (05/06/2023, 21/08/2023): DRY MATTER YIELD (t/ha) (Means)**

Date	Cut	Fungicide residue		Mean	Mean DM%
		None	Benomyl		
05/06/2023	1 st	1.03	0.95	0.99	20.7
21/08/2023	2 nd	1.72	1.60	1.66	28.5
Total of 2 cuts		2.75	2.55	2.65	24.6

Notes

- Two cuts were completed in 2023.

2023/R/RN/1-2 HIGHFIELD AND FOSTERS LEY-ARABLE

Object: To study the effects of various three-year leys on the fertility of the soil as measured by a sequence of three arable test crops. Highfield was originally permanent grassland since 1838 (>100 years) and Fosters was originally long-term arable (>100 years). Both experiments started with being sown in 1948 and the first harvest year was 1949. Some plots stayed in permanent grass, others went into continuous arable cropping and some alternated between leys and arable. The main comparisons have been of four rotations, each of six years duration. The arable with ley rotation includes a one-year ley cut for hay. The other three have had three-year leys of different species and different management, followed by three arable crops and are referred to as 'test crops'. Permanent bare fallow treatments were introduced in 2008.

Yields are no longer measured (since 1990) but SOM continues to be measured. Available P and K in soil have been measured periodically.

FARM DIARY

Date		Application	Rate	Unit
11/10/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030; R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	1	L/ha
11/10/2022	p	Sprayed: Samurai using Knight 24m Sprayer with NH T6030; R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	3	L/ha
31/01/2023	a	Ploughed using Dowdeswell 4 Furrow Plough with JD6620: R/RN/1 Plots 17\18, 21\22, 29\30, 35\36, 37\38, 43\44, 45\46; soil thrown E	-	-
01/02/2023	a	Ploughed using Dowdeswell 4 Furrow Plough with JD6620: R/RN/1 Plots 03\04, 07\08, 11\12; soil thrown E; R/RN/2 Plots 01\02, 03\04, 05\06, 09\10, 11\12, 15\16; soil thrown S	-	-
02/02/2023	a	Plough: R/RN/2 Plots 21\22, 23\24, 25\26, 27\28, 31\32, 39\40; soil thrown S	-	-
03/02/2023	a	Drilled: Winter Wheat (KWS Zyatt) tr Beret Gold (16430) using Accord Combination Drill No. 4 with JD6830: R/RN/1 plots 3\4, 11\12, 37\38, 45\46; R/RN/2 plots 1\2, 3\4, 5\6, 21\22, 25\26, 27\28	400	seeds/m2
03/02/2023	a	Drilled: Spring Oats (Isabel) tr Vibrance Duo (17838) using Accord Combination Drill No. 4 with JD6830R/RN/1 plots 21\22, 35\36; R/RN/2 plots 15\16, 39\40	350	seeds/m2
15/03/2023	f	Applied: Sulphur-N using Cascade Spreader with JD6830: R/RN/1 Plots 21\22, 35\36	154	kg/ha
18/04/2023	f	Applied: YaraBela Extran using Cascade Spreader with JD6830: R/RN/1 Plots 21\22, 35\36	149	kg/ha
03/05/2023	p	Sprayed: Presite SX using Agribuggy2 AB30: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	60	g/ha
03/05/2023	p	Sprayed: Topik using Agribuggy2 AB30: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	0.2	L/ha
03/05/2023	p	Sprayed: Moraine using Agribuggy2 AB30: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	0.6	L/ha
03/05/2023	p	Sprayed: Zarado using Agribuggy2 AB30: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	1	L/ha
15/05/2023	a	Power harrowed using Kuhn Power harrow 3m with JD6230: R/RN/2 Plots 09\10, 11\12, 23\24, 31\32	-	-
15/05/2023	f	Applied: Sulphur-N using Cascade Spreader with JD6830: R/RN/2 Plots 15\16, 39\40	154	kg/ha
16/05/2023	p	Power harrowed using Kuhn Power harrow 3m with JD6230: R/RN/1 Plots 07\08, 17\18, 29\30, 43\44	-	-
16/05/2023	f	Applied: YaraBela Extran using Cascade Spreader with JD6830: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46	209	

17/05/2023	p	Sprayed: Lentyma XE using Agribuggy2 AB30: R/RN/1 Plot 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	0.75	L/ha
17/05/2023	p	Sprayed: Stefes CCC 720 using Agribuggy2 AB30: R/RN/1 Plot 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	1.5	L/ha
22/05/2023	p	Sprayed: Paramount Max using Agribuggy2 AB30: R/RN/1 Plots 21\22, 35\36; R/RN/2 Plots 15\16, 39\40	25	g/ha
22/05/2023	p	Sprayed: Stefes CCC 720 using Agribuggy2 AB30: R/RN/1 Plots 21\22, 35\36; R/RN/2 Plots 15\16, 39\40	1.5	L/ha
22/05/2023	p	Sprayed: Bugle using Agribuggy2 AB30: R/RN/1 Plots 21\22, 35\36; R/RN/2 Plots 15\16, 39\40	0.7	L/ha
22/06/2023	a	Mowed using McHale Pro Glide R3100 with JD6145R Premium: R/RN/1 Plots 01\02, 23\24, 33\34, 47\48; R/RN/2 Plots 07\08, 13\14, 29\30, 37\38	-	-
26/07/2023	p	Sprayed: Buffalo Elite (ad) using Agribuggy2 AB30: R/RN/1 Plots 15\16, 25\26; R/RN/2 Plots 17\18, 19\20, 33\34, 35\36	1	L/ha
26/07/2023	p	Sprayed: Samurai using Agribuggy2 AB30: R/RN/1 Plots 15\16, 25\26; R/RN/2 Plots 17\18, 19\20, 33\34, 35\36	3	L/ha
15/08/2023	p	Sprayed: Buffalo Elite (ad) using Agribuggy2 AB30: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	1	L/ha
15/08/2023	p	Sprayed: Samurai using Agribuggy2 AB30: R/RN/1 Plots 03\04, 11\12, 37\38, 45\46; R/RN/2 Plots 01\02, 03\04, 05\06, 21\22, 25\26, 27\28	3	L/ha
22/08/2023	a	Harvest: R/RN/2 using Claas Tucano 430	-	-
29/08/2023	a	Harvest: R/RN/1 using Claas Tucano 430	-	-

Notes

- Missing drilling dates.
- Soil sampling for chemical analysis and archiving: All R/RN/1, R/RN/2 plots; 0-23 cm depth; 31/08/2023

2023/R/RS/1 HIGHFIELD BARE FALLOW

Object: The effect of continuous bare fallow. In 1959 an area of permanent grass (since 1838, Lawes & Gilbert, 1885) adjacent to the Highfield Ley-Arable experiment at Rothamsted was ploughed and has not grown a crop since. This is the Highfield Bare Fallow. Soil organic carbon (SOC) is measured periodically, and this has declined substantially since the area was first ploughed out of grass. Archived soil samples are available.

FARM DIARY

No Farm records for 2023, but likely to have been cultivated periodically to keep bare fallow (plant-free).

Notes

Soil sampling for chemical analysis and archiving: 0-23 cm depth; 31/08/2023

2023/R/RS/9 ACID STRIP (Hoosfield)

Object: Effects of soil acidity on soil properties under winter wheat. This a narrow strip of land at the northern edge of Hoosfield, Rothamsted with a soil pH ranging from 3.7 to 7.8 (at 0-23 cm depth) due to uneven applications of chalk in the 19th Century (1850). Spring barley was grown continuously for over 100 years. It is now sown to winter wheat each year, given only 100 kg N/ha. The wheat starts to die out about halfway along the plot, when the pH is below 5.5. This area has been used to study the relationship between soil pH, and microbial ecology and nutrient dynamics.

FARM DIARY

Date	Application	Rate	Unit
11/10/2022	Drilled: Winter Wheat (Zyatt) using Accord Combination Drill No. 4 with JD6830	350	seeds/m ²
13/10/2022	Sprayed: Pontos using Knight 24m Sprayer with NH T6030	1	L/ha
13/10/2022	Sprayed: Velomax using Knight 24m Sprayer with NH T6030	0.4	L/ha
10/11/2022	Spraying: Hallmark with Zeon Technology using Knight 24m Sprayer with NH T6030	50	mL/ha
05/04/2023	Sprayed: Orius P using Agribuggy2 AB30	1	L/ha
05/04/2023	Sprayed: Moddus using Agribuggy2 AB30	0.15	L/ha
05/04/2023	Sprayed: Stefes CCC using Agribuggy2 AB30	1.25	L/ha
30/04/2023	Sprayed: Presite SX using Agribuggy2 AB30	60	g/ha
30/04/2023	Sprayed: Lentyma XE using Agribuggy2 AB30	0.8	L/ha
30/04/2023	Sprayed: Arizona using Agribuggy2 AB30	1.5	L/ha
10/05/2023	Applied: Yara Bela Extran using Cascade spreader with JD6830	299	kg/ha
23/05/2023	Sprayed: Lentyma XE using Agribuggy2 AB30	0.9	L/ha
23/05/2023	Sprayed: Hurler using Agribuggy2 AB30	0.75	L/ha
10/06/2023	Sprayed: Oraso Pro using Agribuggy2 AB30	0.85	L/ha
11/09/2023	Harvest (Combine) using Wintersteiger Plot Combine	-	-
04/10/2023	Sprayed: Pontos using Agribuggy2 AB30	1	L/ha
04/10/2023	Sprayed: Velomax using Agribuggy2 AB30	0.4	L/ha

2023/W/RN/3 WOBURN LEY-ARABLE (Stackyard D, Woburn)

Object: To compare the effects on soil fertility of rotations with or without leys – Woburn, Stackyard D. The experiment has had many phases throughout its history. The current phase essentially has only 3 different current rotations: all-arable, grass-clover ley-arable, and grass ley-arable, though all have had slightly different histories and hence it is still regarded as having eight treatments. The 86th year, leys, winter barley, winter oats, winter wheat, winter rye. For previous years see ‘Details’ 1967 & 1973 and Yield Books for 1974-2022/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 16 Main-plots, reflecting past and present rotations, and an old FYM application, with a 3-year Treatment crop phase followed by a 2-year Test crop phase when the Main plots are split for differential rotating N applications

Main plot dimensions: 8.53 m × 40.7 m (split into 4 for differential N applications during the Test crop phase)

Current and Previous Treatments (definitive Main plot plan)

Block	Main plot	Dung residue	Last applied	Former treatments	Current treatment
1	01	dr	1965	(Ah) (AB) (ABe)	AO
1	02	–	–	(Ah) (AB) (ABe)	AO
1	03	–	–	(Lu)	Lc3
1	04	dr	1965	(Lu)	Lc3
1	05	dr	1965	(Ar) (AF) (AM)	AO
1	06	–	–	(Ar) (AF) (AM)	AO
1	07	–	–	(L/Ah) (LLc8)	Lc3
1	08	dr	1965	(L/Ah) (LLc8)	Lc3
1	09	–	–	(Ar/Lu) (LLn8)	AO
1	10	dr	1965	(Ar/Lu) (LLn8)	AO
1	11	dr	1965	(Lu/Ar) (LLn8)	Ln3
1	12	–	–	(Lu/Ar) (LLn8)	Ln3
1	13	dr	1965	(L)	Ln3
1	14	–	–	(L)	Ln3
1	15	–	–	(Ah/L) (LLc8) (ABe)	AO
1	16	dr	1965	(Ah/L) (LLc8) (ABe)	AO
2	17	–	–	(Ah) (AB) (ABe)	AO
2	18	dr	1964	(Ah) (AB) (ABe)	AO
2	19	–	–	(Ar) (AF) (AM)	AO
2	20	dr	1964	(Ar) (AF) (AM)	AO
2	21	dr	1964	(Ah/L) (LLc8) (ABe)	AO
2	22	–	–	(Ah/L) (LLc8) (ABe)	AO
2	23	–	–	(L/Ah) (LLc8)	Lc3
2	24	dr	1964	(L/Ah) (LLc8)	Lc3
2	25	dr	1964	(Lu/Ar) (LLn8)	Ln3
2	26	–	–	(Lu/Ar) (LLn8)	Ln3
2	27	–	–	(Ar/Lu) (LLn8)	AO
2	28	dr	1964	(Ar/Lu) (LLn8)	AO
2	29	–	–	(Lu)	Lc3
2	30	dr	1964	(Lu)	Lc3
2	31	–	–	(L)	Ln3
2	32	dr	1964	(L)	Ln3
3	33	dr	1966	(Lu)	Lc3
3	34	–	–	(Lu)	Lc3
3	35	dr	1966	(Ar/Lu) (LLn8)	AO
3	36	–	–	(Ar/Lu) (LLn8)	AO
3	37	–	–	(Lu/Ar) (LLn8)	Ln3

3	38	dr	1966	(Lu/Ar) (LLn8)	Ln3
3	39	dr	1966	(Ar) (AF) (AM)	AO
3	40	–	–	(Ar) (AF) (AM)	AO
3	41	–	–	(L/Ah) (LLc8)	Lc3
3	42	dr	1966	(L/Ah) (LLc8)	Lc3
3	43	–	–	(L)	Ln3
3	44	dr	1966	(L)	Ln3
3	45	–	–	(Ah) (AB) (ABe)	AO
3	46	dr	1966	(Ah) (AB) (ABe)	AO
3	47	–	–	(Ah/L) (LLc8) (ABe)	AO
3	48	dr	1966	(Ah/L) (LLc8) (ABe)	AO
4	49	dr	1963	(Ah/L) (LLc8) (ABe)	AO
4	50	–	–	(Ah/L) (LLc8) (ABe)	AO
4	51	–	–	(Ar/Lu) (LLn8)	AO
4	52	dr	1963	(Ar/Lu) (LLn8)	AO
4	53	–	–	(Ah) (AB) (ABe)	AO
4	54	dr	1963	(Ah) (AB) (ABe)	AO
4	55	–	–	(L/Ah) (LLc8)	Lc3
4	56	dr	1963	(L/Ah) (LLc8)	Lc3
4	57	dr	1963	(L)	Ln3
4	58	–	–	(L)	Ln3
4	59	dr	1963	(Lu)	Lc3
4	60	–	–	(Lu)	Lc3
4	61	–	–	(Lu/Ar) (LLn8)	Ln3
4	62	dr	1963	(Lu/Ar) (LLn8)	Ln3
4	63	dr	1963	(Ar) (AF) (AM)	AO
4	64	–	–	(Ar) (AF) (AM)	AO
5	65	–	–	(L)	Ln3
5	66	dr	1967	(L)	Ln3
5	67	dr	1967	(Ah) (AB) (ABe)	AO
5	68	–	–	(Ah) (AB) (ABe)	AO
5	69	–	–	(Lu/Ar) (LLn8)	Ln3
5	70	dr	1967	(Lu/Ar) (LLn8)	Ln3
5	71	–	–	(Ar/Lu) (LLn8)	AO
5	72	dr	1967	(Ar/Lu) (LLn8)	AO
5	73	dr	1967	(Ar) (AF) (AM)	AO
5	74	–	–	(Ar) (AF) (AM)	AO
5	75	dr	1967	(Ah/L) (LLc8) (ABe)	AO
5	76	–	–	(Ah/L) (LLc8) (ABe)	AO
5	77	dr	1967	(L/Ah) (LLc8)	Lc3
5	78	–	–	(L/Ah) (LLc8)	Lc3
5	79	–	–	(Lu)	Lc3
5	80	dr	1967	(Lu)	Lc3

Current treatment coding to reflect current and previous treatment

(Previous treatments)	Current treatment (since 2021)	Description
(Ah) (AB) (ABe)	AO	All-arable, long-term
(Ar) (AF) (AM)	AO	All-arable, long-term
(Ah/L) (LLc8) (ABe)	AO	All-arable; previous grass-clover ley-arable
(Ar/Lu) (LLn8)	AO	All-arable; previous grass ley-arable
(Lu/Ar) (LLn8)	Ln3	Grass ley-arable; previous all-arable
(L)	Ln3	Grass ley-arable; long-term
(L/Ah) (LLc8)	Lc3	Grass-clover ley-arable; previous all-arable
(Lu)	Lc3	Grass-clover ley-arable; long-term

Notes

All treatments are in paired Main plots with old residues of farmyard manure (see below)

Current treatment crop rotations

Current treatment (since 2021)	Treatment crops (3 years)	Test crops (2 years)
AO	w. rye [R], w. barley [WB], w. oats [O]	w. wheat [W], w. rye [R]
Ln3	3-year Grass only ley (with N)	w. wheat [W], w. rye [R]
Lc3	3-year Grass/Clover ley (no N)	w. wheat [W], w. rye [R]

Previous treatments

1938-1974	
(Ar)	Treatment: 3-year arable (1 year root crop) (P, R, C, P, W until 1971 then P, B, B, W, B); Test: 2-year arable; (became AF)
(Ah)	Treatment: 3-year arable (1 year hay) (P, R, H, P, W until 1971 then P, B, H, W, B); Test: 2-year arable; (became AB)
(L)	Treatment: 3-year grazed grass-clover ley; Test: 2-year arable (P, W until 1971 then W, B); (became Ln3)
(Lu)	Treatment: 3-year lucerne ley; Test: 2-year arable (P, W). Lu (lucerne) then SA 1964-67 then CL 1971-1974; (became Lc3)
(Ar/Lu) (Ah/L) (Lu/Ar) (L/Ah)	Alternating rotations designated as Ar/Lu , Ah/L , Lu/Ar or L/Ah according to the order in which the first 6 Treatment crops appeared; (became LLn8-1st , LLc-1st , LLn8-2nd , and LLc-2nd , respectively)
(dr)	Residues of 38 t/ha FYM applied to one of each main plot pairs (last application in 1963, 1964, 1965, 1966 and 1967 for blocks 4, 2, 1, 3 and 5, respectively); (-) indicates no residues
1973-2002	
(AF)	(replaced Ar); Treatment: 3-year arable (F, F, BE); Test: 2-year arable (W, R); (became AM)
(AB)	(replaced Ah); Treatment: 3-year arable (B, B, BE); Test: 2-year arable (W, R); (became ABe)
(Ln3)	(replaced L); Treatment: 3-year grass ley with N; test: 2-year arable (W, R); (became LLn8 or remained Ln3)
(Lc3)	(replaced Lu); Treatment: 3-year grass/clover ley; Test: 2-year arable (W, R); (became LLc8 or remained Lc3)
(AM)	(replaced AF); Treatment: 3-year arable (R, BE, M); Test: 2-year arable (W, R); (became AO)
(ABe)	(replaced AB); Treatment: 3-year arable (R, M, BE); 2-year arable (W, R) (remained as ABe)
(LLn8-1st)	(replaced Ar/Lu); Treatment: 8-year grass ley with N; Test: 2-year arable (W, R); 1st cycle phased in from 1973 on Block III (and in subsequent years on Blocks V, IV, II and I; 1st cycle); (became LLn/AO)
(LLc8-1st)	(replaced Ah/L); Treatment: 8-year grass/clover ley; Test: 2-year arable (W, R); 1st cycle phased in from 1973 on Block III (and in subsequent years on Blocks V, IV, II and I; 1st cycle); (became LLc/ABe)
(LLn8-2nd)	(replaced Lu/Ar); Treatment: 8-year grass ley with N; Test: 2-year arable (W, R); 2nd cycle phased in from 1978 on Block III (and in subsequent years on Blocks V, IV, II and I; 2nd cycle); (became LLn/Ln3)
(LLc8-2nd)	(replaced L/Ah); Treatment: 8-year grass/clover ley; Test: 2-year arable (W, R); 2nd cycle phased in from 1978 on Block III (and in subsequent years on Blocks V, IV, II and I; 2nd cycle); (became LLc/Lc3)
2007-2020	
(AO)	(replaced AM); Treatment: 3-year arable (R, BE, O); Test: 2-year arable; O replaced M as a treatment crop 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment AO)
(ABe)	(replaced ABe above); O replaced M as a treatment crop 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment AO)
(LLn/AO)	(replaced LLn8-1st) into AO rotation; Treatment: 3-year arable (R, Be, O); Test: 2-year arable (W, R) from 2007; (effectively became current treatment AO)
(LLc/ABe)	(replaced LLc8-1st) into ABe rotation, Treatment: 3-year arable (R, O, Be); Test: 2-year arable (W, R) from 2007; (effectively changed to current treatment AO)
(LLn/Ln3)	(replaced LLn8-2nd) into Ln3 , 3-year grass leys with N 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment Ln3)
(LLc/Lc3)	(replaced LLc8-2nd) into Lc3 , 3-year grass/clover leys 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment Lc3 at top)

Notes

- Crops: B: spring barley; BE: beans; C: carrots; CL: red clover ley; F: fallow; H: hay; L: clover/grass ley; Lu: lucerne; M: forage maize; O: oats; P: potatoes; R: rye; SA: sainfoin ley; W: winter wheat
- Original rotations 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.
- The new scheme started by sowing 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.
- 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.
- 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.

Current applications

Basal fertilisation

Nutrient application rate (kg/ha)	P		K/S			K ^(f)	
	early Autumn	late Autumn	early Autumn	late Autumn	early Spring	early Spring	after each cut (except last)
<u>Treatment crops</u>							
w. rye ^(a)	25	-	-	-	62/27	-	-
w. barley ^(a)	25	-	-	-	62/27	-	-
w. oats ^(a)	25	-	-	-	62/27	-	-
1st year grass only ley ^(b)	43	-	58/25	-	-	83.5	41.5
1st year grass/clover ley ^(b)	43	-	58/25	-	-	83.5	41.5
2-3 year grass only ley ^(c)	-	43	-	58/25	-	83.5	41.5
2-3 year grass/clover ley ^(c)	-	43	-	58/25	-	83.5	41.5
<u>Test crops</u>							
w. wheat ^(d)	25	-	-	-	62/27	-	-
w. rye ^(e)	25	-	-	-	62/27	-	-

P	P as triple superphosphate
K/S	K and S as potassium sulphate (41.5% K; 18% S)
K	K as potassium chloride (Muriate of Potash)
(a)	P applied to stubble of preceding crop; K/S applied in early spring
(b)	P and K/S applied to stubble of preceding w. rye (2 nd Test crop)
(c)	P and K/S applied after final cuts in preceding year (1-2 year leys)
(d)	P applied to stubble of preceding arable crop or the preceding 3-year leys where the 2 nd cut has (usually) been taken early and the sward then killed with glyphosate; K/S applied in early spring
(e)	P applied to stubble of preceding w. wheat (1 st Test crop); K/S applied in early spring
(f)	Corrective K (as muriate of potash) are applied where necessary to 1 st Test crop winter wheat in the autumn

Corrective K

Corrective K dressings as muriate of potash, applied in autumn as necessary to 1st Test crop w. wheat. Note that applications for 2023 were based on rounded means calculated from 2018-2022 data in the absence of more recent data due to a backlog from the COVID-19 pandemic.

Treatment	No FYM residue (-)			FYM residue (dr)		
	Plot	K ₂ O (kg/ha)	K (kg/ha)	Plot	K ₂ O (kg/ha)	K (kg/ha)
(Ah/L) (LLc8) (ABe) AO	50	151	125	49	151	125
(Ar/Lu) (LLn8) AO	51	211	175	52	211	175
(Ah) (AB) (ABe) AO	53	251	209	54	251	209
(L/Ah) (LLc8) Lc3	55	0	0	56	0	0
(L) Ln3	58	27	22	57	27	22
(Lu) Lc3	60	0	0	59	0	0
(Lu/Ar) (LLn8) Ln3	61	13	11	62	13	11
(Ar) (AF) (AM) AO	64	255	211	63	255	211

N fertilisation

Nutrient application rate (kg/ha)	N (33.5%)			N (27%)	
	seedbed	Spring	after each cut except last	late Feb/early Mar	mid Apr
<u>Treatment crops</u>					
w. rye		100			
w. barley		100			
w. oats		100			
1st year all-grass ley	50	75	75		
1st year grass/clover ley	25				
2-3 year all grass ley		75	75		
2-3 year grass/clover ley					
<u>Test crops</u>					
w. wheat ^(a)				0, 40, 40, 40	0, 40, 120, 200
w. rye ^(a)					0, 50, 100, 150

N (33.5%)	N as ammonium nitrate (33.5% N)
N (27%)	N as calcium ammonium nitrate (Nitro-chalk; 27% N) at N0, N1, N2 and N3 levels
(a)	Plots split in 4 during Test crop phase for 4 levels of N which rotates (N3>N2>N1>N0>N3...) from the previous time it was in the Test crop phase as per plans (note different N rates for W and R, and that N is applied in 2 splits to W)

Notes

Split N was tested on w. wheat in 2001-2005 (split N on no-FYM plots (-); single N on FYM plots (dr)).

FARM DIARY

Date		Application	Rate	Units
W. Rye (1st year treatment)				
20/09/2022	a	Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620	-	-
21/09/2022	a	Cultivated/levelled using Cousins Spring Tines with JD6620	-	-
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Arable Plots 35, 36, 39, 40, 45, 46, 47, 48	2	L/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 35, 36, 39, 40, 45, 46, 47, 48	127	kg/ha
28/11/2022	a	Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
30/11/2022	a	Plough: Kuhn Powerharrow 3m with JD6145R Premium	-	-
30/11/2022	S	Drilled: Rye (Lunator) tr. Redigo Pro (15145) using WES Accord 4m Tine Drill with JD6830	300	seeds/m ²
03/04/2023	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 35, 36, 39, 40, 45, 46, 47, 48	150	kg/ha
03/04/2023	f	Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Plots 35, 36, 39, 40, 45, 46, 47, 48	299	kg/ha
03/04/2023	f	Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Plots 35, 36, 39, 40, 45, 46, 47, 48	299	kg/ha
14/05/2023	p	Sprayed: Horus (16216) using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48	1.2	L/ha
14/05/2023	p	Sprayed: Eagle (16490) using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48	40	g/ha
14/05/2023	p	Sprayed: Biopower (A0617) using Agribuggy2 AB30 - Plots Plots 35, 36, 39, 40, 45, 46, 47, 48, 49	1	L/ha
14/06/2023	p	Sprayed: Sprinter using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48	3	L/ha
14/06/2023	p	Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - 35, 36, 39, 40, 45, 46, 47, 48	0.9	L/ha
08/09/2023	a	Harvest (Combine): Haldrup C-85 2m cut	-	-
W. Barley (2nd year treatment)				
20/09/2022	a	Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620	-	-
21/09/2022	a	Cultivated/levelled using Cousins Spring Tines with JD6620	-	-
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 1, 2, 5, 6, 9, 10, 15, 16	2	L/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 01, 02, 05, 06, 09, 10, 15, 16	127	kg/ha
28/11/2022	a	Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
30/11/2022	a	Plough: Kuhn Powerharrow 3m with JD6145R Premium	-	-
30/11/2022	S	Drilled: Winter Barley (KWS Feeris) tr. Raxil star (17805) using WES Accord 4m Tine Drill with JD6830	350	seeds/m ²
03/04/2023	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 1, 2, 5, 6, 9, 10, 15, 16	150	kg/ha
03/04/2023	f	Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Winter Barley Whole Plots 1, 2, 5, 6, 9, 10, 15, 16	299	kg/ha
14/05/2023	p	Sprayed: Presite SX (18776) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16	60	g/ha
14/05/2023	p	Sprayed: Lentyma XE (19301) using Agribuggy2 AB30 - Winter Barley Whole Plots 1, 2, 5, 6, 9, 10, 15, 16	1	L/ha
14/05/2023	p	Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16	2	L/ha

14/05/2023	p	Sprayed: Moraine (19608) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16	0.6	L/ha
14/05/2023	p	Sprayed: Sprinter using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16	2	L/ha
14/06/2023	p	Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16	0.9	L/ha
14/06/2023	p	Sprayed: Sprinter using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16	3	L/ha
08/09/2023	a	Harvest (Combine): Haldrup C-85 2m cut	-	-
W. Oats (3rd year treatment)				
20/09/2022	a	Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620	-	-
21/09/2022	a	Cultivated/levelled using Cousins Spring Tines with JD6620	-	-
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 17, 18, 19, 20, 21, 22, 27, 28	2	L/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 17, 18, 19, 20, 21, 22, 27, 28	127	kg/ha
28/11/2022	a	Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
30/11/2022	a	Plough: Kuhn Powerharrow 3m with JD6145R Premium	-	-
30/11/2022	S	Drilled: Winter Oats (Mascani) tr. Redigo Pro (15145) using WES Accord 4m Tine Drill with JD6830	350	seeds/m ²
03/04/2023	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 17, 18, 19, 20, 21, 22, 27, 28	150	kg/ha
03/04/2023	f	Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Plots 17, 18, 19, 20, 21, 22, 27, 28	299	kg/ha
14/05/2023	p	Sprayed: Presite SX (18776) using Agribuggy2 AB30 - Plots 17, 18, 19, 20, 21, 22, 27, 28	60	g/ha
14/05/2023	p	Sprayed: Moraine (19608) using Agribuggy2 AB30 - Plots 17, 18, 19, 20, 21, 22, 27, 28	0.6	L/ha
14/05/2023	p	Sprayed: Sprinter using Agribuggy2 AB30 - Plots 17, 18, 19, 20, 21, 22, 27, 28	2	L/ha
08/09/2023	a	Harvest (Combine): Haldrup C-85 2m cut	-	-
Grass ley and clover/grass leys (1st year treatment)				
20/09/2022	a	Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620	-	-
21/09/2022	a	Cultivated/levelled using Cousins Spring Tines with JD6620	-	-
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030; 1st Year Leys Plots 33, 34, 37, 38, 41, 42, 43, 44	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; 1st Year Leys Plots 33, 34, 37, 38, 41, 42, 43, 44	2	L/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 33, 34, 37, 38, 41, 42, 43, 44	213	kg/ha
09/11/2022	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Grass Leys Plots 33, 34, 37, 38, 41, 42, 43, 44	140	kg/ha
02/04/2023	f	Applied: Muriate of Potash (MOP) using Cascade Spreader with JD6830 - Grass Leys Plots 33, 34, 37, 38, 41, 42, 43, 44	167	kg/ha
03/04/2023	f	Applied: Yara Bela Extran (N1) using Cascade Spreader with JD6830 - 1st Year Grass/Clover Leys Plots 33, 34, 41, 42	74.6	kg/ha
03/04/2023	f	Applied: Yara Bela Extran (N2) using Cascade Spreader with JD6830 - 1st Year Grass Leys Plots 37, 38, 43, 44	150	kg/ha
03/04/2023	f	Applied: Yara Bela Extran (N2) using Cascade Spreader with JD6830 - 1st Year Grass Leys Plots 37, 38, 43, 44	224	kg/ha
27/04/2023	p	Sprayed: Buffalo Elite using Agribuggy2 AB30 - 1 st Year Grass Leys Plots 33, 34, 37, 38, 41, 42, 43, 44	1	L/ha

27/04/2023	p	Sprayed: Samurai (16238) using Agribuggy2 AB30 - 1 st Year Grass Leys Whole Plots 33, 34, 37, 38, 41, 42, 43, 44	3	L/ha
18/05/2023	s	Drilled: Grass (Grass only mix - RN/3), 1 st Year Grass Whole Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 37, 38, 43, 44	30	kg/ha
18/05/2023	s	Drilled: Grass (Grass Clover Mix - RN/3), 1 st Year Grass/Clover Leys Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 33, 34, 41, 42	30	kg/ha
18/05/2023	a	Cambridge/Ring roll: WES 6m Rolls with JD6145R	-	-
06/06/2023	a	Grass Harvest Cut 1 – Not mown due to insufficient growth	-	-
29/11/2023	a	Grass Harvest Cut 2 – Plots 33, 34, 37, 38, 41, 42, 43, 44	-	-
Grass ley and clover/grass leys (2nd and 3rd year treatments)				
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030; 2nd Year Leys failed Plots 3, 4, 7, 8, 11, 12, 13, 14	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; 2nd Year Leys failed Plots 3, 4, 7, 8, 11, 12, 13, 14	2	L/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 03, 04, 07, 08, 11, 12, 13, 14, 23, 24, 25, 26, 29, 30, 31, 32	213	kg/ha
09/11/2022	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14, 23, 24, 25, 26, 29, 30, 31, 32	140	kg/ha
02/04/2023	f	Applied: Muriate of Potash (MOP) using Cascade Spreader with JD6830 - 2nd/3rd Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14, 23, 24, 25, 26, 29, 30, 31, 32	167	kg/ha
03/04/2023	f	Applied: Yara Bela Extran using Cascade Spreader with JD6830 - 2nd/3rd Year Grass Leys Plots 11, 12, 13, 14, 25, 26, 31, 32	224	kg/ha
27/04/2023	p	Sprayed: Buffalo Elite using Agribuggy2 AB30 - 2nd Year Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14	1	L/ha
27/04/2023	p	Sprayed: Samurai (16238) using Agribuggy2 AB30 - 2nd Year Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14	3	L/ha
18/05/2023	s	Drilled: Grass (Grass only mix - RN/3), 2 nd Year Grass Whole Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 11, 12, 13, 14	30	kg/ha
18/05/2023	s	Drilled: Grass (Grass Clover Mix - RN/3), 2 nd Year Grass/Clover Whole Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 3, 4, 7, 8	30	kg/ha
18/05/2023	a	Cambridge/Ring roll: WES 6m Rolls with JD6145R 2 nd year leys re-sown	-	-
06/06/2023	a	Grass Harvest Cut 1 – 3 rd Year Leys only 23, 24, 25, 26, 29, 30, 31, 32 (no cut on 2 nd year leys)	-	-
22/06/2023	f	Applied: Yara Bela Extran using By Hand, Pedestrian Operated - 3rd Year Grass Plots 25, 26, 31, 32	224	kg/ha
01/08/2023	p	Sprayed: Samurai (16238) using Handheld Compressed Air Pesticide Sprayer; Spraying off 3 rd Year leys	2	L/ha
01/08/2023	p	Sprayed: Buffalo Elite using Handheld Compressed Air Pesticide Sprayer; Spraying off 3 rd Year leys	1	L/ha
29/11/2023	a	Grass Harvest Cut 2 – 2 nd Year only (Plots 03, 04, 07, 08, 11, 12, 13, 14)	-	-
W. Wheat (1st year test)				
20/09/2022	a	Plough; thrown N using Dowdeswell 4 Furrow Plough with JD6620		
21/09/2022	a	Cultivate/level using Cousins Spring Tines with JD6620		
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	2	L/ha
02/11/2022	f	Applied: Muriate of Potash (MOP) by Hand; Plots 49, 50	151	kg/ha
02/11/2022	f	Applied: Muriate of Potash (MOP) by Hand; Plots 51, 52	211	kg/ha

02/11/2022	f	Applied: Muriate of Potash (MOP) by Hand; Plots 53, 54	251	kg/ha
02/11/2022	f	Applied: Muriate of Potash (MOP) by Hand; Plots 57, 58	27	kg/ha
02/11/2022	f	Applied: Muriate of Potash (MOP) by Hand; Plots 61, 62	13	kg/ha
02/11/2022	f	Applied: Muriate of Potash (MOP) by Hand; Plots 63, 64	255	kg/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	127	kg/ha
28/11/2022	a	Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
30/11/2022	a	Plough: Kuhn Powerharrow 3m with JD6145R Premium	-	-
30/11/2022	S	Drilled: Winter Wheat (KWS Zyatt) tr. <u>Beret Gold (16430)</u> using WES Accord 4m Tine Drill with JD6830	350	seeds/m ²
03/04/2023	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	150	kg/ha
05/04/2023	f	Applied: NitroChalk By Hand - Sub Plots 492, 493, 494, 502, 503, 504, 512, 513, 514, 522, 523, 524, 532, 533, 534, 541, 543, 544, 551, 552, 554, 561, 563, 564, 571, 572, 573, 581, 582, 584, 591, 593, 594, 601, 603, 604, 611, 613, 614, 621, 622, 624, 631, 632, 634, 641, 643, 644	148	kg/ha
14/05/2023	p	Sprayed: Horus (16216) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	1.2	L/ha
14/05/2023	p	Sprayed: Eagle (16490) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	40	g/ha
14/05/2023	p	Sprayed: Biopower (A0617) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	1	L/ha
18/05/2023	f	Applied: Nitrochalk by hand – sub plots 493, 502, 514, 522, 533, 544, 551, 561, 573, 582, 594, 604, 613, 621, 631, 644	148	kg/ha
18/05/2023	f	Applied: Nitrochalk by hand – sub plots 492, 503, 512, 524, 534, 543, 554, 563, 572, 584, 593, 603, 614, 624, 634, 641	444	kg/ha
18/05/2023	f	Applied: Nitrochalk by hand – sub plots 494, 504, 513, 523, 532, 541, 552, 564, 571, 581, 591, 601, 611, 622, 632, 643	741	kg/ha
14/06/2023	p	Sprayed: Sprinter using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	3	L/ha
14/06/2023	p	Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64	0.9	L/ha
08/09/2023	a	Harvest (Combine): Haldrup C-85 2m cut		
W. Rye (2nd year test)				
20/09/2022	a	Plough; thrown N using Dowdeswell 4 Furrow Plough with JD6620		
21/09/2022	a	Cultivate/level using Cousins Spring Tines with JD6620		
21/09/2022	p	Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030	1	L/ha
21/09/2022	p	Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	2	L/ha
09/11/2022	f	Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	127	kg/ha
28/11/2022	a	Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
30/11/2022	a	Plough: Kuhn Powerharrow 3m with JD6145R Premium	-	-
30/11/2022	S	Drilled: Rye (Lunator) tr. Redigo Pro (15145) using WES Accord 4m Tine Drill with JD6830	300	seeds/m ²
03/04/2023	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	150	kg/ha
14/05/2023	p	Sprayed: Horus (16216) using Agribuggy2 AB30 - Winter Rye and Winter Wheat Whole Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	1.2	L/ha
14/05/2023	p	Sprayed: Eagle (16490) using Agribuggy2 AB30; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	40	g/ha
14/05/2023	p	Sprayed: Biopower (A0617) using Agribuggy2 AB30; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	1	L/ha

18/05/2023	f	Applied: Nitrochalk by hand – sub plots 654, 661, 671, 683, 691, 703, 712, 723, 734, 741, 752, 764, 773, 784, 794, 801	185	kg/ha
18/05/2023	f	Applied: Nitrochalk by hand – sub plots 652, 664, 673, 681, 694, 704, 711, 724, 731, 742, 753, 762, 772, 783, 792, 802	370	kg/ha
18/05/2023	f	Applied: Nitrochalk by hand – sub plots 653, 663, 672, 682, 692, 702, 713, 721, 732, 744, 751, 763, 771, 782, 791, 803	556	kg/ha
14/06/2023	p	Sprayed: Sprinter using Agribuggy2 AB30 - Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	3	L/ha
14/06/2023	p	Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	0.9	L/ha
08/09/2023	a	Harvest (Combine): Haldrup C-85 2m cut		

Notes

- Samples of grain and grass leys and grass-clover leys (1st and 2nd Cut) were taken for chemical analysis.
- Grain quality analyses completed on all grain samples.
- Soil sampling for chemical analysis and archiving: Block 2 (Treatment year 3; all plots); 0-25 and 25-41 cm depth; 14/03/2023.

YIELDS**TREATMENT CROPS****ARABLE CROPS: WINTER RYE (1ST YEAR), WINTER BARLEY (2ND YEAR) AND WINTER OATS (3RD YEAR):
GRAIN YIELD (t/ha; 85% DM)**

Treatment	Winter rye (R)			Winter barley (WB)			Winter oats (O)		
FYM residue	(-)	(dr)	Mean	(-)	(dr)	Mean	(-)	(dr)	Mean
(Ah) (AB) (ABe) AO	0.46	0.68	0.57	1.85	1.64	1.75	0.52	0.97	0.74
(Ar) (AF) (AM) AO	0.52	0.90	0.71	2.30	2.34	2.32	1.59	1.52	1.56
(Ar/Lu) (LLn8) AO	0.27	0.27	0.27	2.70	2.76	2.73	0.89	0.58	0.74
(Ah/L) (LLc8) (ABe) AO	1.17	0.53	0.85	3.46	2.68	3.07	2.37	2.37	2.37
Mean	0.60	0.60	0.60	2.58	2.35	2.47	1.34	1.36	1.35
Grain mean DM%	86.3			86.3			83.7		

**GRASS CROPS: GRASS-CLOVER LEYS AND GRASS LEYS (1ST-3RD YEARS; 1ST AND 2ND CUTS): DRY
MATTER YIELD (t/ha)**

Treatment	Year	1 st Cut (06/06/2023)			2 nd Cut (29/11/2023)			Total of 2 Cuts		
FYM residue		(-)	(dr)	Mean	(-)	(dr)	Mean	(-)	(dr)	Mean
(Lu) Lc3	1 st	0.00	0.00	0.00	1.29	0.88	1.08	1.29	0.88	1.08
	2 nd	0.00	0.00	0.00	1.71	1.70	1.71	1.71	1.70	1.71
	3 rd	2.07	2.31	2.19	-	-	-	-	-	-
(L) Ln3	1 st	0.00	0.00	0.00	1.93	2.30	2.12	1.93	2.30	2.12
	2 nd	0.00	0.00	0.00	1.32	1.13	1.22	1.32	1.13	1.22
	3 rd	5.66	5.84	5.75	-	-	-	-	-	-
(L/Ah) (LLc8) Lc3	1 st	0.00	0.00	0.00	1.68	1.19	1.43	1.68	1.19	1.43
	2 nd	0.00	0.00	0.00	1.48	1.17	1.32	1.48	1.17	1.32
	3 rd	1.93	2.35	2.14	-	-	-	-	-	-
(Lu/Ar) (LLn8) Ln3	1 st	0.00	0.00	0.00	0.40	1.77	1.08	0.40	1.77	1.08
	2 nd	0.00	0.00	0.00	2.02	1.93	1.98	2.02	1.93	1.98
	3 rd	4.17	4.34	4.25	-	-	-	-	-	-
Mean		1.15	1.24	1.19	1.48	1.51	1.49	1.48	1.51	1.49
Mean DM %		33.0			18.4			23.3		

Notes

- Cut 1: Cut from 3rd year leys only (Block 2). No yields from 1st or 2nd year leys (Blocks 3 and 1, respectively) due to insufficient growth, and the yields were subsequently recorded as 0 (zero). The 2nd year leys failed to establish in 2022 so were resown.
- Cut 2: Cut from 1st and 2nd year leys only (Blocks 3 and 1, respectively). No yields from 3rd year leys (Block 2) (and no total of 2 cuts consequently) due to leys having been ploughed in prior to cut.
- General: Since 2014 **Ln3** (grass-only leys) have not been receiving N after the 1st cut and in some years K has not been applied after the 1st cut on both **Ln** and **Lc** (grass-clover leys).

TEST CROPS

WINTER WHEAT (1ST YEAR): GRAIN YIELD (t/ha; 85% DM) (Means)

Treatment / FYM residue	(-)	(dr)	Mean
(Ar) (AF) (AM) AO	1.32	1.58	1.45
(Ah) (AB) (ABe) AO	1.01	1.28	1.14
(Ar/Lu) (LLn8) AO	1.38	0.91	1.15
(Ah/L) (LLc8) (ABe) AO	0.99	0.71	0.85
(L) Ln3	2.61	1.65	2.13
(Lu/Ar) (LLn8) Ln3	1.75	2.78	2.27
(Lu) Lc3	2.01	2.95	2.48
(L/Ah) (LLc8) Lc3	2.23	1.76	1.99
Mean	1.66	1.70	1.68

Treatment / N	0 kg	80 kg	160 kg	240 kg	Mean
(Ar) (AF) (AM) AO	0.78	1.50	1.83	1.68	1.45
(Ah) (AB) (ABe) AO	0.38	1.23	1.68	1.28	1.14
(Ar/Lu) (LLn8) AO	0.45	1.25	1.21	1.68	1.15
(Ah/L) (LLc8) (ABe) AO	0.14	0.77	1.03	1.44	0.85
(L) Ln3	1.72	2.22	2.69	1.89	2.13
(Lu/Ar) (LLn8) Ln3	1.96	2.04	2.61	2.45	2.27
(Lu) Lc3	1.59	2.59	3.42	2.32	2.48
(L/Ah) (LLc8) Lc3	1.41	2.06	2.43	2.06	1.99
Mean	1.05	1.71	2.11	1.85	1.68

FYM residue / N	0 kg	80 kg	160 kg	240 kg	Mean
(-)	1.04	1.58	2.14	1.89	1.66
(dr)	1.06	1.84	2.08	1.82	1.70
Mean	1.05	1.71	2.11	1.85	1.68

Treatment	FYM residue / N	0 kg	80 kg	160 kg	240 kg
(Ar) (AF) (AM) AO	(-)	0.72	1.27	1.66	1.63
	(dr)	0.83	1.74	2.00	1.73
(Ah) (AB) (ABe) AO	(-)	0.23	0.80	1.91	1.11
	(dr)	0.53	1.67	1.45	1.46
(Ar/Lu) (LLn8) AO	(-)	0.48	1.77	1.31	1.99
	(dr)	0.43	0.73	1.11	1.37
(Ah/L) (LLc8) (ABe) AO	(-)	0.29	0.99	1.17	1.50
	(dr)	-0.01	0.56	0.89	1.38
(L) Ln3	(-)	1.95	2.49	3.30	2.70
	(dr)	1.50	1.95	2.08	1.08
(Lu/Ar) (LLn8) Ln3	(-)	1.80	1.15	2.28	1.79
	(dr)	2.12	2.93	2.95	3.11
(Lu) Lc3	(-)	1.07	1.91	3.05	2.02
	(dr)	2.11	3.27	3.79	2.63
(L/Ah) (LLc8) Lc3	(-)	1.81	2.27	2.47	2.35
	(dr)	1.00	1.85	2.40	1.77
Mean		1.12	1.74	2.11	1.85
Grain mean DM%		87.2			

Notes

- Plot 491 [(Ah/L) (LLc8) (ABe) **AO**; (dr); N0]: Weight lost; yield estimated by ANOVA.
- Plot 644 [(Ar) (AF) (AM) **AO**; (-); N1]: Weight and sample lost; yield estimated by ANOVA.

WINTER RYE (2ND YEAR): GRAIN YIELD (t/ha; 85% DM) (Means)

Treatment / FYM residue	(-)	(dr)	Mean
(Ar) (AF) (AM) AO	0.31	0.30	0.31
(Ah) (AB) (ABe) AO	0.47	0.40	0.43
(Ar/Lu) (LLn8) AO	0.47	0.52	0.50
(Ah/L) (LLc8) (ABe) AO	0.52	0.64	0.58
(L) Ln3	0.34	0.30	0.32
(Lu/Ar) (LLn8) Ln3	0.33	0.28	0.30
(Lu) Lc3	1.14	1.22	1.18
(L/Ah) (LLc8) Lc3	1.32	1.25	1.28
Mean	0.61	0.61	0.61

Treatment / N	0 kg	50 kg	100 kg	150 kg	Mean
(Ar) (AF) (AM) AO	0.27	0.34	0.31	0.31	0.31
(Ah) (AB) (ABe) AO	0.41	0.44	0.49	0.39	0.43
(Ar/Lu) (LLn8) AO	0.46	0.43	0.46	0.63	0.50
(Ah/L) (LLc8) (ABe) AO	0.58	0.48	0.66	0.59	0.58
(L) Ln3	0.19	0.18	0.13	0.78	0.32
(Lu/Ar) (LLn8) Ln3	0.24	0.32	0.27	0.39	0.30
(Lu) Lc3	1.34	0.80	1.11	1.47	1.18
(L/Ah) (LLc8) Lc3	1.22	1.21	1.13	1.56	0.31
Mean	0.59	0.52	0.57	0.77	0.61

FYM residue / N	0 kg	50 kg	100 kg	150 kg	Mean
(-)	0.63	0.51	0.54	0.77	0.61
(dr)	0.55	0.54	0.60	0.76	0.61
Mean	0.59	0.52	0.57	0.77	0.61

Treatment	FYM residue / N	0 kg	50 kg	100 kg	150 kg
(Ar) (AF) (AM) AO	(-)	0.29	0.21	0.29	0.47
	(dr)	0.26	0.47	0.33	0.15
(Ah) (AB) (ABe) AO	(-)	0.40	0.57	0.53	0.38
	(dr)	0.42	0.30	0.45	0.41
(Ar/Lu) (LLn8) AO	(-)	0.56	0.44	0.48	0.41
	(dr)	0.36	0.42	0.43	0.86
(Ah/L) (LLc8) (ABe) AO	(-)	0.54	0.35	0.43	0.74
	(dr)	0.62	0.61	0.90	0.43
(L) Ln3	(-)	0.27	0.17	0.12	0.81
	(dr)	0.12	0.19	0.13	0.76
(Lu/Ar) (LLn8) Ln3	(-)	0.37	0.45	0.22	0.27
	(dr)	0.11	0.19	0.32	0.50
(Lu) Lc3	(-)	1.33	0.74	1.02	1.47
	(dr)	1.35	0.85	1.20	1.46
(L/Ah) (LLc8) Lc3	(-)	1.30	1.13	1.23	1.60
	(dr)	1.15	1.28	1.03	1.53
Mean		0.54	0.52	0.60	0.71
Grain mean DM%		85.65			

Notes

- Plots 663 & 664 [(L) **Ln3**; (dr); N3 and N2] harvested together by mistake; yields estimated by ANOVA.
- Plots 781 & 782 [(L/Ah) (LLc8) **Lc3**; (-); N0 and N3] harvested together by mistake; yield estimated by ANOVA.

2023/W/RN/12 WOBURN ORGANIC MANURING (Stackyard B, Woburn)

Object: To study, from crop yields and soil analyses, the effects of a range of types of organic matter – Woburn, Stackyard B. The 59th year, winter rye. For previous years see ‘Details’ 1973 and Yield Books for 1974-2022/W/RN/12.

Design: 4 blocks of 8 main plots, with main plots divided into 6 sub-plots for differential N application
Whole plot dimensions: 8.0 m × 29.5 m (8.0 m × 26.5 m on Block III).

Treatments: From 1966 to 1971 the experiment had a preliminary period designed to build up organic matter from different sources. An arable rotation was started on two blocks in 1972 and the remaining two blocks in 1973. After a period of testing the residues, a further period of accumulation was started; on two blocks (which included ley sown in 1979) in 1981 and on the other two (which included ley sown in 1980) in 1982. A second test phase began when leys on the first pair of blocks were ploughed for the 1st test crop in 1987 and on the second pair for the 1st test crop in 1988. From 1988 two blocks, and 1989 the other two, to 1994, plots were split into 6 sub-plots to test 6 levels of N (including a 0). From 1995 to 1997 residual effects of that N were measured. In 1998 to 2000 yields were taken from whole plots only. In 2001 plots were split into half-plots to test two rates of N. For 2003 the experiment was modified to test further inputs of organic matter in a third phase. An arable rotation (winter rye, spring barley, winter beans, winter wheat, forage maize) was started on seven plots within each block; the eighth was sown to a grass/clover ley. A modification was made to two of the treatments for the 2023 crop onwards.

Whole plots

Previous and current treatments (not necessarily applied each year)

Treatments 1966-1971/1972	Treatments 1979/1982-1986/1987	Treatments since 2003	Treatments since 2023
(Fd)	(Fd)	F	
(Ln)	(Lc6)	(F)	AD
(St)	(St)	St	
(Gm)	(Lc8)	CC	
(Pt)	(Lc8)	Co	
(Fs)	(Fs)	Dg10	
(Dg)	(Dg)	(Dg25)	F
(Lc)	(Lc6)	Lc	

Current treatment codes (application rates of organics are on a fresh weight basis):

Previous	Current	Current treatment
(Fd)	F	No organic amendment
(Dg) (Dg25)	F	No organic amendment
(Fs)	Dg10	FYM @ 10 t/ha annually
(St)	St	Chopped wheat straw @ 7.5 t/ha annually
(Gm) (Lc8)	CC	Cover crop (white mustard @ 10 kg/ha) prior to spring-sown crop
(Pt) (Lc8)	Co	Compost @ 40 t/ha annually
(Ln) (Lc6) (F)	AD	Anaerobic digestate @ 30 t/ha annually (from 2023)
(Lc) (Lc6)	Lc	Permanent grass/clover: Timothy, Fescue & white clover sown @ 30 kg/ha; 04/10/2002

Notes

- Since 2003, all treatments receive PKS fertilizers (see below).
- N applied as calcium ammonium nitrate (Nitro-chalk; 27 % N) to all crops **EXCEPT w. beans**, and to all treatments **EXCEPT Lc**, at 6 rates which cycle (see below).
- **CC** is only a treatment in years with a spring crop (**spring barley** or **forage maize**); all other plots in those years are bare fallow over winter.

Previous treatment codes (application rates of organics are on a fresh weight basis):

(Dg)	FYM at 50 t/ha annually 1965-1971, and 1981-1985; became (Dg25)
(St)	Straw annually 1965-1971, and 1981-1985; remains as St
(Gm)	Green manure annually 1965-1971; became (Lc8)
(Pt)	Peat annually 1965-71; became (Lc8)
(Lc)	Grass /clover ley 1965-1971; became (Lc6)
(Ln)	Grass ley with N 1965-1971; became (Lc6)
(Fd)	PKMg equivalent to (Dg) rate, annually 1965-1971, and 1981-1986 (blocks 1 & 3), 1981-1987 (blocks 2 & 4); became F
(Fs)	KMg equivalent to (St) with P, annually 1965-1971, then half (Fd) rate 1981-1986 (blocks 1 & 3), 1981-1987 (blocks 2 & 4); became Dg10
(Lc8)	(replaced (Gm) and (Pt)) Grass/clover ley (8-year) 1979-1986 (blocks 1 & 3), 1980/1981-1987 (blocks 2 & 4); became CC (former (Gm)) or Co (former (Pt))
(Lc6)	(replaced (Ln) and (Lc)) Grass/clover ley (6-year) 1981-1986 (blocks 1 & 3), 1981-1987 (blocks 2 & 4); became Lc (former (Lc)) or F (former (Ln))
(Dg25)	FYM at 25 t/ha annually 2003-2022; became F
(F)	No organic input 2003-2022; became AD

Notes

- (Dg25) received no PKS fertilisation (2003-2022).
- In 2003, F and CC treatments received 120 kg N, St received 90 kg N, and Dg10 received 60 kg N; no N was applied to Dg25, Co, or Lc treatments.

Current inorganic applicationsBasal fertilisation

P	20 kg P as Triple Superphosphate in early Spring
KS	83 kg K + 36 kg S as Potassium Sulphate in early Spring
Liming	5 t/ha chalk to all plots every five years (last applied Spring 2022, next due Spring 2027)

Nitrogen fertilisation (kg N/ha) as calcium ammonium nitrate (Nitro-chalk; 27 % N), applied in Spring

Crop	N0	N1	N2	N3	N4	N5
w. wheat	0	50	100	150	200	250
forage maize	0	50	100	150	200	250
s. barley	0	35	70	105	140	175
w. rye	0	30	60	90	120	150
w. beans	0					

Notes

- **Winter wheat** receives 50 kg N in late February/early March, and the remainder in mid-April.
- **Forage maize** receive 50 kg N to the seedbed (late February/early March), and the remainder post-emergence in mid-April.
- **Spring barley** and **winter rye** receive N as a single dressing (April).
- No N applied to **winter beans** (plots are not split for N).
- No N is applied to **Lc** (grass-clover leys).
- N applications cycle N5 > N4 > N3 > N2 > N1 > N0 > N5 > ...

FARM DIARY

Date		Application	Rate	Units
-		Applied: Triple Superphosphate: all Plots	-	kg/ha
-		Applied: Sulphate of Potash: all Plots	-	kg/ha
09/11/2022	f	Applied: Anaerobic Digestate by hand; Plots 02, 16, 20, 25	30	t/ha
09/11/2022	f	Applied: Compost by hand; Plots 07, 12, 21, 27	40	t/ha
09/11/2022	f	Applied: Straw by hand; Plots 03, 15, 17, 31	7.5	t/ha
09/11/2022	f	Applied: Farmyard Manure (FYM) by hand; Plots 08, 14, 18, 28	10	t/ha
22/11/2022	a	Topped using Topper 9 with JD6145R Premium	-	-
22/11/2022	a	Ploughed using Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
28/11/2022	a	Ploughed using Dowdeswell 4 Furrow Plough with JD6145R Premium	-	-
01/12/2022		Drilled: Rye (Mephisto) using WES Accord 4m Tine Drill with JD6830	350	seeds/m2
11/12/2022	a	Operation: Power harrow	-	-
14/05/2023	p	Sprayed: Horus (16216) using Agribuggy2 AB30	1.2	L/ha
14/05/2023	p	Sprayed: Eagle (16490) using Agribuggy2 AB30	40	g/ha
14/05/2023	p	Sprayed: Biopower (A0617) using Agribuggy2 AB30	1	L/ha
22/05/2023	f	Applied: Nitrochalk by hand using; Subplots 021, 036, 046, 055, 063, 072, 083, 092, 104, 113, 124, 143, 153, 166, 173, 186, 195, 206, 212, 222, 232, 253, 265, 274, 286, 303, 313, 324	111	kg/ha
22/05/2023	f	Applied: Nitrochalk by hand using; Subplots 022, 035, 043, 056, 062, 071, 082, 095, 105, 112, 121, 144, 156, 164, 175, 182, 194, 205, 214, 225, 231, 255, 263, 271, 284, 302, 315, 326	222	kg/ha
22/05/2023	f	Applied: Nitrochalk by hand using; Subplots 025, 033, 044, 054, 064, 076, 085, 091, 102, 111, 123, 142, 154, 162, 176, 181, 192, 201, 211, 223, 236, 252, 262, 273, 283, 305, 312, 323	333	kg/ha
22/05/2023	f	Applied: Nitrochalk by hand using; Subplots 023, 034, 042, 051, 061, 074, 086, 094, 103, 114, 125, 141, 152, 165, 172, 183, 191, 204, 216, 221, 234, 254, 264, 275, 281, 306, 316, 321	444	kg/ha
22/05/2023	f	Applied: Nitrochalk by hand using; Subplots 026, 031, 041, 052, 066, 075, 081, 096, 101, 115, 122, 145, 151, 161, 174, 184, 196, 203, 213, 224, 233, 251, 261, 276, 285, 301, 314, 322	556	kg/ha
14/06/2023	p	Sprayed: Lentya XE (19301) using Agribuggy2 AB30 ; Arable Plots.	0.9	L/ha
14/06/2023	p	Sprayed: Sprinter using Agribuggy2 AB30; Arable Plots	3	L/ha
20/06/2023	a	Harvest (Grass Leys) - 1 st Cut using Amazone Grass Harvester - Flail Mower Collector with JD5070; Plots 01, 13, 24, 29	-	-
22/08/2023	a	Harvest; Arable Plots; Haldrup C-85 2m cut	-	-
29/11/2023	a	Harvest (Grass Leys) - 2 nd Cut using Amazone Grass Harvester - Flail Mower Collector with JD5070; Plots 01, 13, 24, 29	-	-

Notes

- There are no records of basal TSP and SOP application and hence there may not have been any P, K or S applied.
- Samples of grain and grass-clover ley (1st and 2nd Cut) were taken for chemical analysis.
- Grain quality analyses completed on all grain samples.
- Soil sampling for chemical analysis and archiving: ((Ln)(Ln6)(F) **AD** and (Dg)(Dg25) **F** treatments only; 8 plots); 0-23, 23-38, and 38-53 cm depth; 14/09/2023.

YIELDS**WINTER RYE: GRAIN YIELD (t/ha; 85% DM) (Means)**

Treatment / N	N0 0 kg	N1 30 kg	N2 60 kg	N3 90 kg	N4 120 kg	N5 150 kg	Mean
(Fd) F	0.541	0.643	0.711	0.852	0.748	0.788	0.714
(Dg) (Dg25) F	0.836	1.091	1.077	1.160	1.074	1.253	1.082
(St) St	0.549	0.592	0.588	0.703	0.712	0.622	0.628
(Gm) (Lc8) CC	0.617	0.666	0.853	0.876	0.921	0.759	0.782
(Pt) (Lc8) Co	0.962	0.949	1.044	0.802	0.839	0.840	0.906
(Fs) Dg10	0.615	0.769	0.694	0.819	0.862	0.786	0.758
(Ln) (Lc6) (F) AD	0.752	0.727	0.766	0.905	1.141	1.114	0.901
Mean	0.696	0.777	0.819	0.874	0.900	0.880	0.824
Grain mean DM%							86.7

Notes

- Plots 213 ((Pt) (Lc8) **Co**; **N5**) and 211 ((Pt) (Lc8) **Co**; **N3**) double-harvested by mistake – yield set to missing and estimated within the ANOVA algorithm.
- Plot 173 ((St) **St**; **N1**) used the second weight. There is no official note about what happened but most likely there was a need to weigh the sample again (probably a bit of trapped grain that was slow to come through). If there had been a problem with the weight, there would be a note to discard the second sample.

GRASS-CLOVER LEYS (1ST AND 2ND CUTS): DRY MATTER YIELD (t/ha) (Means)

Cut	1 st Cut (20/06/2023)	2 nd Cut (29/11/2023)	Total of 2 Cuts
Mean dry matter yield	2.03	1.04	3.07
Mean DM %	38.6	20.6	29.6

Grass-Clover Leys: mean dry matter yield since 2003

Year	1 st Cut	2 nd Cut	Total
2003	-	-	-
2004	1.82	-	1.82
2005	1.86	0.13	1.99
2006	4.07	-	4.07
2007	3.12	1.36	4.48
2008	5.72	1.65	7.37
2009	4.77	-	4.77
2010	4.41	-	4.41
2011	1.46	0.39	1.85
2012	4.11	0.64	4.75
2013	4.65	0.60	5.24
2014	4.09	0.91	5.01
2015	-	0.36	-
2016	3.97	0.56	4.54
2017	2.17	1.48	3.65
2018	2.98	0.93	3.91
2019	2.34	0.39	2.73
2020	1.01	-	-
2021	3.33	1.29	4.63
2022	2.11	0.09	2.19

Weather Summaries

Rothamsted Research															
The Weather : Monthly Summary : 2023															
(Departure from the 30 year means (1991 - 2020) in brackets)															
	Sunshine		Mean Temperatures °C								Rain		Drainage	Wind ***	
			Maximum		Minimum		Dew point	Ground	In ground under grass		Tipping Bucket		20"		
								frosts*	30 cm	100 cm	Total		days**	Total	
	Hours	(hours)	°C	(°C)	°C	(°C)	°C	#	°C	°C	mm	(mm)	#	mm	km/hr
January	88.1	(+24.21)	8.0	(+0.94)	1.3	(-0.30)	2.4	17	5.8	7.6	79.6	(+5.47)	22	36.3	9.4
February	110.3	(+24.16)	9.6	(+2.04)	2.2	(+0.69)	3.3	13	5.7	6.6	5.7	(-51.29)	11	0.4	7.8
March	89.9	(-38.49)	9.8	(-0.45)	3.7	(+0.82)	4.4	11	7.0	7.2	117.2	(+70.09)	25	87.1	9.8
April	176.3	(+4.24)	13.0	(-0.41)	4.0	(-0.47)	5.2	12	9.4	9.0	65.0	(+11.05)	16	22.9	7.7
May	211.6	(+8.25)	16.6	(+0.07)	7.7	(+0.40)	8.2	5	12.7	11.3	48.9	(-4.38)	11	22.5	7.5
June	250.1	(+44.32)	23.3	(+3.78)	11.2	(+1.02)	11.8	0	15.7	13.9	16.0	(-38.86)	7	0.1	7.0
July	181.3	(-25.49)	20.9	(-1.10)	12.2	(-0.11)	11.8	0	16.7	15.5	97.8	(+42.31)	21	7.8	7.5
August	182.9	(-6.51)	21.2	(-0.45)	12.2	(-0.07)	12.7	0	17.2	16.1	50.5	(-21.49)	16	7.6	6.4
September	181.6	(+30.92)	22.5	(+3.98)	13.0	(+2.79)	14.0	0	17.0	16.4	60.3	(+2.53)	11	2.0	5.8
October	135.4	(+22.38)	16.5	(+2.17)	8.8	(+1.28)	10.6	4	14.4	15.0	100.9	(+19.53)	19	62.5	6.2
November	85.4	(+13.20)	10.3	(+0.19)	4.0	(-0.29)	5.8	12	10.0	11.8	75.6	(-5.56)	21	65.7	8.1
December	37.6	(-23.22)	9.4	(+2.04)	4.6	(+2.62)	5.6	10	7.8	9.2	101.3	(+25.70)	26	91.2	11.5
Year	1730.5	(+77.97)	15.1	(+1.04)	7.1	(+0.68)	8.0	84.0	11.6	11.6	818.6	(+55.09)	206.0	33.8	7.9
* Number of nights grass minimum was below 0.0 °C															
** Number of days rain was 0.2 mm or more															
*** At 2 metres above the ground															

Woburn Experimental Farm														
The Weather : Monthly Summary : 2023														
(Departure from 30-year means (1991 - 2020) in brackets)														
	Sunshine		Mean Temperatures								Rain		Wind ***	
			Maximum		Minimum		Dew Point	Ground	In ground under grass		Tipping bucket			
								frosts *	30 cm	100 cm	Total		days **	
	Hours	(hours)	°C	(°C)	°C	(°C)	°C	#	°C	°C	mm	(mm)	#	km/hr
January	70.1	(+10.14)	8.3	(+0.91)	1.2	(-0.31)	1.9	20	5.3	8.3	46.5	(-10.94)	17	10.2
February	103.0	(+20.12)	10.4	(+2.41)	2.0	(+0.56)	3.2	15	5.6	7.0	6.3	(-40.05)	13	8.4
March	86.1	(-40.55)	10.4	(-0.27)	3.6	(+0.98)	4.3	11	7.0	7.5	140.1	(+98.43)	27	9.8
April	174.7	(+7.40)	13.7	(-0.13)	3.8	(-0.19)	5.0	14	9.8	9.1	53.4	(+3.16)	16	7.3
May	205.5	(+4.95)	17.2	(+0.24)	6.7	(-0.09)	8.2	9	13.6	11.3	52.6	(-1.21)	11	6.5
June	235.7	(+37.09)	25.2	(+5.20)	11.3	(+1.57)	12.6	2	18.7	14.9	43.7	(-8.19)	6	7.3
July	184.3	(-13.36)	21.4	(-1.03)	12.4	(+0.48)	11.8	0	17.8	15.8	108.7	(+57.89)	21	9.7
August	181.2	(-8.50)	21.9	(-0.24)	11.9	(-0.02)	12.8	0	18.0	16.5	43.7	(-18.56)	15	7.0
September	177.9	(+34.59)	22.8	(+3.83)	12.1	(+2.39)	14.3	0	17.4	16.8	72.8	(+16.00)	11	6.4
October	127.2	(+16.68)	17.0	(+2.32)	8.8	(+1.54)	11.0	5	14.1	15.5	117.2	(+43.18)	17	7.1
November	67.5	(-1.72)	10.8	(+0.44)	3.9	(-0.15)	5.8	10	9.2	12.5	61.0	(-5.70)	18	8.7
December	26.9	(-27.47)	9.7	(+2.02)	4.3	(+2.57)	5.6	9	7.3	9.8	105.8	(+46.64)	27	11.4
Year	1640.1	(+39.39)	15.7	(+1.27)	6.8	(+0.75)	8.0	95.0	12.0	12.1	851.9	(+180.65)	199.0	8.3
* Number of nights grass minimum was below 0.0 °C														
** Number of days rain was 0.2 mm or more														
*** At 2 metres above the ground														