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Yields of the Field Experiments

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19/W/RN/12 - Organic Manuring (Stackyard B, Woburn Farm)

Rothamsted Research

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19/W/RN/12 ORGANIC MANURING (Stackyard B, Woburn Farm)

Object: To study, from crop yields and soil analyses, the effects of a range of types of organic matter – Woburn, Stackyard B.

Sponsors: A. J. Macdonald

The 55th year, Spring Barley.

For previous years see 'Details' 1973 and Yield Books for 74-18/W/RN/12.

Design: 4 blocks of 8 plots

Whole plot dimensions: 8.0 m x 29.5 m (8.0 m x 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 on 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 five levels of nitrogen and nil. From 1995 to 1997 residual effects of that nitrogen 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. 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.

Whole plots

1. **Treatment** (Not necessarily applied each year):

1966-1971/2	1979/82-1986/7	Since 2003
Fd	Fd	F
Ln	Lc6	F
St	St	St
Gm	Lc8	CC
Pt	Lc8	Co
Fs	Fs	Dg10
Dg	Dg	Dg25
Lc	Lc6	Lc

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F: no organic amendment. St: chopped straw at 7.5t/ha. CC: cover crop prior to spring sown crops. Co: compost at 40t/ha. Dg10: FYM at 10t/ha. Dg25: FYM at 25t/ha. Dg: FYM at 50t/ha. Fd: fertilizers equivalent to FYM. Fs: fertilizers equivalent to straw (+P). Lc/Lc6/Lc8: grass/clover leys. Ln: grass ley + N. Gm: green manure. Pt: peat.

Since 2003, all treatments, except Dg25, have also received PKS fertilizers:

20 kg P/ha, 83 kg K/ha, 36 kg S/ha

In addition, in 2003 F and CC treatments received 120 kg N/ha, St received 90 kg N/ha. Dg10 received 60 kg N/ha. No N was applied to Dg25, Co or Lc treatments.

Nitrogen

In 2008 all plots, except Lc (permanent grass/clover), split into 6 to test rates of N. For crops receiving nitrogen rates rotate as follows:

N0 > N1 > N2 > N3 > N4 > N5 > N0 etc.

For 2014 Spring barley rates were 0, 35, 70, 105, 140 & 175 kg N/ha as Nitro-chalk (27% N)

For 2015 Winter beans – No Nitrogen Applied

For 2016 Winter wheat rates were 0, 50, 100, 150, 200 & 250 kg N/ha as Nitro-Chalk (27% N)

For 2017 Forage maize rates were 0, 50, 100, 150, 200 & 250 kg N/ha as Nitro-Chalk (27% N)

For 2018 Winter rye rates were 0, 30, 60, 90, 120 & 150 kg N/ha as Nitro-chalk (27% N)

Experimental Diary

Date		Application	Rate	Units
17/09/2018	a	Powerharrowed	-	-
22/09/2018	a	Rolled 4 plots	-	-
22/09/2018	a	Hand sowed mustard	10.00	kg/ha
16/10/2018	a	Completed grass sampling	-	-
17/10/2018	a	Topping grass	-	-
20/02/2019	f	Applied FYM by hand; Plots 008, 014, 018, 028	10.00	t /ha
20/02/2019	f	Applied FYM by hand; Plots 005, 011, 023, 026	25.00	t /ha
21/02/2019	f	Applied Compost by hand; Plots 007, 012, 021, 027	40.00	t /ha

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25/02/2019	f	Applied Straw by hand; Plots 003, 015, 017, 031	7.50	t /ha
25/02/2019	a	Topped Straw with topper 9	-	-
25/02/2019	f	Applied TSP	97.00	kg/ha
25/02/2019	f	Applied SOP	200.00	kg/ha
26/02/2019	a	Ploughing	-	-
26/02/2019	a	Powerharrowing	-	-
27/02/2019	a	Rolling	-	-
27/02/2019	a	Ploughing	-	-
27/02/2019	s	Drilled Spring Barley	350.00	seeds/m^2
28/02/2019	a	Powerharrowing	-	-
17/04/2019	f	Applied Nitro-Chalk (27% N) by hand; Plots 0023, 0034, 0042, 0051, 0061, 0074, 0086, 0094, 0103, 0114, 0125, 0141, 0152, 0165, 0172, 0183, 0191, 0204, 0216, 0221, 0234, 0254, 0264, 0275, 0281, 0306, 0316, 0321	130.00	kg/ha
17/04/2019	f	Applied Nitro-Chalk (27% N) by hand; Plots 0026, 0031, 0041, 0052, 0066, 0075, 0081, 0096, 0101, 0115, 0122, 0145, 0151, 0161, 0174, 0184, 0196, 0203, 0213, 0224, 0233, 0251, 0261, 0276, 0285, 0301, 0314, 0322	259.00	kg/ha
17/04/2019	f	Applied Nitro-Chalk (27% N) by hand; Plots 0024, 0032, 0045, 0053, 0065, 0074, 0084, 0093, 0106, 0116, 0126, 0146, 0155, 0163, 0171, 0185, 0193, 0202, 0215, 0226, 0235, 0256, 0266, 0272, 0282, 0304, 0311, 0325	389.00	kg/ha
17/04/2019	f	Applied Nitro-Chalk (27% N) by hand; Plots 0021, 0036, 0046, 0055, 0063, 0072, 0083, 0092, 0104, 0113, 0124, 0143, 0153, 0166, 0173, 0186, 0195, 0206, 0212, 0222, 0232, 0253, 0263, 0274, 0286, 0303, 0313, 0324	519.00	kg/ha
17/04/2019	f	Applied Nitro-Chalk (27% N) by hand; Plots 0022, 0035, 0043, 0056, 0062, 0071, 0082, 0095, 0105, 0112, 0121, 0144, 0156, 0164, 0175, 0182, 0194,	648.00	kg/ha

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		0205, 0214, 0225, 0231, 0255, 0265, 0271, 0283, 0302, 0315, 0326		
21/05/2019	a	Topped paths	-	-
25/05/2019	p	Sprayed Sprinter	3.00	lt/ha
25/05/2019	p	Sprayed Refine Max SX	75.00	gm/ha
25/05/2019	p	Sprayed Cello	1.25	lt/ha
25/05/2019	p	Sprayed Starane Hi-Load HL	0.40	lt/ha
20/06/2019	p	Sprayed Sprinter; Sp Barley only	2.00	lt/ha
20/06/2019	p	Sprayed Cello; Sp Barley only	1.25	lt/ha
28/06/2019	a	Topped Paths	-	-
02/07/2019	a	1st Cut	-	-
15/07/2019	a	Rowing up	-	-
17/09/2019	a	Harvested All Plots; Odds & Ends cleared	-	-
20/09/2019	a	Rowing up	-	-
07/11/2019	a	2nd Cut	-	-

Yields

SPRING BARLEY

GRAIN TONNES/HECTARE (85% DM)

Tables of means

Nitrogen Treatment	0	35	70	105	140	175	Mean
F(Fd)	0.61	1.06	1.31	1.77	1.39	1.49	1.27
F(Ln, Lc6)	0.54	1.82	1.79	2.71	2.31	3.05	2.04
St(St)	0.82	2.01	3.06	3.20	2.74	2.56	2.40
CC(Gm, Lc8)	0.97	1.65	1.71	2.75	2.03	2.53	1.94
Co(Pt, Lc8)	2.39	3.03	3.33	4.12	3.95	3.96	3.46
Dg10(Fs)	1.32	1.98	3.06	2.64	2.73	3.17	2.48
Dg25(Dg)	2.38	3.22	3.51	4.06	3.92	3.44	3.42
Mean	1.29	2.11	2.54	3.04	2.73	2.89	2.43

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Standard errors of differences of means

Table	Treatment	Nitrogen	Treatment Nitrogen
rep.	24	28	4
s.e.d.	0.532	0.172	0.675
d.f.	18	105	43.90

Except when comparing means with the same level(s) of Treatment	0.455
d.f.	105

Grain Mean DM (%) 84.40

Plot area harvested (ha) 0.00063

GRASS/CLOVER

DRY MATTER TONNES/HECTARE
***** Table of means *****

Year	1st Cut	2nd 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

Cut dry matter t/ha (02 JUL 2019 & 07 NOV 2019)

Note: Barley grain and herbage samples were taken for chemical analyses and archiving.

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