ROTHAMSTED RESEARCH

Yields of the Field Experiments 1984

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Rothamsted Research

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ARABLE REFERENCE PLOTS

Object: To study the long term effects of FYM and N, P and K fertilizers on the yield and mineral content of crops - Great Field IV.

Sponsor: F.V. Widdowson.

The 29th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980, w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 24th year of a rotation on the additional plots (as the initial above rotation for 20 years; w. barley, ley, potatoes, w. wheat, w. oats since 1980). The 28th year of permanent grass.

For previous years see 58/Bc/1(t), 59/Bc/1(t), 60/B/3(t), 61-64/B/2, 65/B/2(t), 66/B/2(t), 67/B/2, 68/B/3(t) and 69-83/R/RN/5.

Design: 1 block of 12 plots for each crop on original plots. 1 block of 7 plots for each crop on additional plots.

Whole plot dimensions: 2.13 x 2.44.

Treatments: Fertilizers and farmyard manure:

MANURE

Original plots

0
N1
P
N1P
K
N1K
PK
N1PK
N2PK
D
N1PKD
N2PKD

N1,2 (kg N): 20, 40 (ley): 100, 200 (w. wheat, w. barley and w. oats): 125, 250 (potatoes, and permanent grass) as 'Nitro-Chalk'
P: 63 kg P_2O_5 as superphosphate
K: 250 kg K_2O as muriate of potash
D: 38 tonnes FYM (permanent grass): 100 tonnes (to potatoes only - 50 tonnes to potatoes and kale until 1980): none to other crops

NOTES: (1) All w. wheat on these plots receives a standard dressing of 82 kg MgO as Epsom salts.
(2) Cereals receive 20 kg of N1 and 40 kg of N2 in March, remainder in April.

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Additional plots

MANURE	Fertilizers from 1980 to 1984 and in previous years:
1980-84	Until 1979
0	0
N2PK	N2 PK
N2PKMG	N2 PK MG CA
N2PKS	N2 PK CA S
N2PKMGS	N2 PK MG S
N1PKMGS	N2 PK CA MG S
N3PKMGS	N2 PK CA MG S TE

N: In 1984: N1: 20 kg (ley), 120 kg (w. wheat, w. barley and w. oats), 160 kg (potatoes). N2: 30 kg (ley), 160 kg (w. wheat, w. barley and w. oats), 240 kg (potatoes). N3: 40 kg (ley), 200 kg (w. wheat, w. barley and w. oats), 320 kg (potatoes). Until 1979 N2 = larger rate on original plots in these years. As urea in all years. Cereals receive 40 kg N in March, remainder in April.
P: 126 kg P_2O_5 as potassium dihydrogen phosphate.
K: 251 kg K_2O total. As potassium dihydrogen phosphate (83 kg K_2O) on all PK plots. In addition plots without S receive 168 kg K_2O as potassium chloride, plots with S receive 92 kg K_2O as potassium sulphate plus 76 kg K_2O as potassium chloride. Since 1978 all PK plots receive, in addition to the standard total, 126 kg K_2O for potatoes, applied in autumn as potassium chloride.
MG: 126 kg MgO as magnesium chloride.
CA: 126 kg CaO as calcium carbonate until 1979. In 1980 plots not previously given CA received calcium carbonate at 7.5 t, except 0 which was given 5 t.
S: 30 kg S supplied by the potassium sulphate.
TE: Trace element mixture which included Mn, Cu, Zn, B, Mo, Ca and Fe.

Standard applications:
Original and additional plots:

All cereals: Weedkillers: Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 3.5 l) with (except for oats) chlortoluron at 3.5 kg, applied with the permethrin in 220 l. Fungicides: Prochloraz at 0.40 kg with tridemorph at 0.52 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.37 kg with captafol at 1.1 kg applied with the pirimicarb in 220 l. Insecticides: Permethrin at 0.05 kg; pirimicarb at 0.14 kg.

W. wheat and w. oats: Fungicides: Propiconazole at 0.13 kg and captafol at 1.1 kg in 220 l. Growth regulator: Chlormequat at 1.9 kg in 220 l.

W. barley: Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.37 kg in 220 l. Growth regulator: Mepiquat chloride and ethephon (as 'Terpal' at 2.8 l) in 220 l.

Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 220 l. Fungicide: Mancozeb at 1.3 kg in 220 l applied with the insecticide. Insecticide: Pirimicarb at 0.14 kg.

Seed: W. wheat: Norman, sown at 210 kg.
W. barley: Panda, sown at 200 kg.
W. oats: Peniarth, sown at 210 kg.
Potatoes: Desiree.
Grass-clover ley: RVP Italian ryegrass and Hungaropoly red clover.

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Cultivations, etc.:-

W. wheat: Dug by hand: 19 Sept, 1983 (original plots), 20 Sept (additional plots). P, K and Mg applied to original plots; P, K, Mg and S applied to additional plots: 22 Sept. All plots lightly rotary cultivated, raked level, seed sown and raked in: 23 Sept. 'Brittox', chlortoluron and permethrin applied: 25 Oct. First N applied, prochloraz and tridemorph applied: 1 Mar, 1984. Second N applied: 9 Apr. Chlormequat applied: 25 Apr. Propiconazole and captafol applied: 24 May. Carbendazim, maneb, tridemorph, captafol and pirimicarb applied: 27 June. Harvested by hand: 7 Aug.

W. barley: Rotary cultivated, Mg applied to additional plots: 5 Sept, 1983. P and K applied to original plots; P, K and S to additional plots: 7 Sept. Lightly rotary cultivated, raked level, seed sown, raked in: 20 Sept. 'Brittox', chlortoluron and permethrin applied: 25 Oct. First N applied, prochloraz and tridemorph applied: 1 Mar, 1984. Second N applied: 2 Apr. Growth regulator applied: 25 Apr. Carbendazim, maneb and tridemorph applied: 9 May. Carbendazim, maneb, tridemorph, captafol and pirimicarb applied: 27 June. Harvested by hand: 23 July.

W. oats: Rotary cultivated, Mg applied to additional plots: 5 Sept, 1983. P and K applied to original plots; P, K and S to additional plots: 7 Sept. Lightly rotary cultivated, raked level, seed sown, raked in: 26 Sept. 'Brittox' and permethrin applied: 25 Oct. First N, prochloraz and tridemorph applied: 1 Mar, 1984. Second N applied: 9 Apr. Growth regulator applied: 25 Apr. Propiconazole and captafol applied: 24 May. Carbendazim, maneb, tridemorph, captafol and pirimicarb applied: 27 June. Harvested by hand: 6 Aug.

Potatoes: FYM applied to original plots: 7 Dec, 1983. Dug by hand: 9 Dec. P and K applied to original plots; P, K, Mg and S to additional plots: 19 Dec. N applied, deep rotary cultivated twice, potatoes planted and ridged by hand: 24 Apr, 1984. Weedkillers applied: 9 May. Fungicide and insecticide applied: 2 July. Plots given neither FYM nor K harvested by hand: 24 July. Remaining plots harvested by hand: 12 Sept.

Grass-clover ley: Lightly rotary cultivated, raked level, seed sown and raked in: 22 Aug, 1983. P and K applied to original plots; P, K, Mg and S applied to additional plots: 21 Nov. N applied: 1 Mar, 1984. Cut: 30 May, 19 July, 2 Oct.

Permanent grass: P and K applied: 21 Nov, 1983. FYM and first N applied: 1 Mar, 1984. Second N applied: 24 May. Final N applied: 19 July. Cut: 30 May, 19 July, 2 Oct.

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GREAT FIELD IV (R): ORIGINAL PLOTS

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***** TABLES OF MEANS *****

	WINTER WHEAT:		BARLEY:		LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
	GRAIN	STRAW	GRAIN	STRAW				
MANURE								
0	5.81	5.50	2.35	2.07	3.18	1.18	0.77	5.13
N1	6.49	5.59	2.88	2.78	3.94	1.62	0.81	6.37
P	4.98	4.85	3.34	2.44	2.80	1.22	0.35	4.37
N1P	3.25	4.77	1.68	3.39	3.83	1.53	0.45	5.82
K	5.44	7.32	3.27	2.88	2.49	1.54	0.92	4.95
N1K	6.91	7.82	5.13	5.12	3.39	1.77	0.90	6.05
PK	6.82	7.33	3.32	2.58	3.49	2.07	3.15	8.71
N1PK	11.03	11.22	6.96	6.29	5.62	2.25	1.52	9.39
N2PK	12.11	13.31	9.08	7.69	6.85	2.33	0.98	10.15
D	8.71	10.50	4.75	3.99	4.83	2.12	1.34	8.28
N1PKD	12.24	15.53	8.30	6.95	6.11	2.85	2.50	11.46
N2PKD	10.83	13.95	9.47	8.57	7.37	2.90	0.84	11.11
MEAN DM%	76.6	59.0	85.8	66.2	27.0	31.7	21.4	26.7

	OATS:		POTATOES: TOTAL TUBERS	PERMANENT GRASS : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
	GRAIN	STRAW					
MANURE							
0	3.79	3.39	8.8	0.61	0.68	0.18	1.46
N1	6.99	6.61	11.0	0.94	1.47	0.68	3.08
P	4.47	3.79	15.4	0.53	0.89	0.23	1.65
N1P	5.57	5.68	10.6	1.68	1.87	0.70	4.25
K	3.74	3.90	22.1	1.06	1.02	0.34	2.42
N1K	7.54	8.99	25.8	1.81	2.36	0.99	5.17
PK	3.84	3.55	26.5	0.63	0.83	0.29	1.75
N1PK	8.74	9.07	43.8	2.34	2.76	0.94	6.03
N2PK	8.22	11.10	49.6	3.85	3.56	1.78	9.19
D	6.02	6.10	40.8	3.68	2.06	0.61	6.36
N1PKD	9.71	11.60	59.8	4.84	3.17	1.23	9.24
N2PKD	9.03	13.34	60.5	5.87	4.40	1.95	12.22
MEAN DM%	83.0	43.7	24.2	27.4	32.7	26.6	28.9

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GREAT FIELD IV (R): ADDITIONAL PLOTS

***** TABLES OF MEANS *****

	WINTER WHEAT:		BARLEY:		OATS:		POTATOES: TOTAL
	GRAIN	STRAW	GRAIN	STRAW	GRAIN	STRAW	TUBERS
MANURES							
0	6.91	6.63	2.87	2.33	4.28	3.67	9.4
N2PK	11.06	13.90	9.70	7.62	9.02	10.66	48.8
N2PKMG	12.48	14.46	8.57	7.39	9.20	11.14	53.8
N2PKS	11.42	14.31	8.24	7.17	9.31	12.28	51.9
N2PKMGS	11.47	12.18	8.58	8.35	9.53	12.25	50.4
N1PKMGS	11.80	12.67	7.40	6.25	9.22	9.52	50.0
N3PKMGS	11.33	15.65	9.26	7.69	8.90	12.33	55.4
MEAN DM%	77.1	58.4	85.2	65.5	83.4	49.8	24.4

	LEY : DRY MATTER			
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURES				
0	3.89	1.41	0.58	5.88
N2PK	5.55	2.21	0.67	8.44
N2PKMG	6.34	2.23	0.91	9.48
N2PKS	6.25	2.19	1.30	9.74
N2PKMGS	6.44	2.38	0.88	9.70
N1PKMGS	5.79	2.15	1.09	9.04
N3PKMGS	6.94	2.24	0.60	9.78
MEAN DM%	26.1	32.1	21.5	26.6

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