ROTHAMSTED RESEARCH

Yields of the Field Experiments 1981

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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 fertilisers on the yield and mineral content of crops - Great Field IV.

Sponsor: F.V. Widdowson.

The 26th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980, w. barley, ley, potatoes, w. wheat, w. oats in 1981. The 22nd 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 25th 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 69-80/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: Fertilisers 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): 80, 160 (w. barley, w. wheat and w. oats): 125, 250 (potatoes and permanent grass) as 'Nitro-Chalk'
P: 63 kg P205 as superphosphate
K: 250 kg K20 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

NOTE: Since 1977 all w. wheat on these plots receives a standard dressing of 82 kg MgO as Epsom salts. Before 1976 potatoes tested 0 v 82 kg MgO on sub plots, dressing balanced-up after harvest before w. wheat.

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Additional plots

MANURE	Fertilisers in 1980, 1981 and in previous years:
1980-81	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 1980 & 1981: N1: 20 kg (ley), 80 kg (w. wheat, w. barley & w. oats), 160 kg (potatoes). N2: 30 kg (ley), 120 kg (w. wheat, w. barley & w. oats), 240 kg (potatoes). N3: 40 kg (ley), 160 kg (w. wheat, w. barley & w. oats), 320 kg (potatoes). In 1980 all N rates to w. oats were 10 kg N greater. Until 1979 N2 = larger rate on original plots in these years. As urea in all years.

P: 126 kg P2O5 as potassium dihydrogen phosphate
K: 251 kg K2O total. As potassium dihydrogen phosphate (83 kg K2O) on all PK plots. In addition plots without S receive 168 kg K2O as potassium chloride, plots with S receive 92 kg K2O as potassium sulphate plus 76 kg K2O as potassium chloride. Since 1978 all PK plots receive in addition to the standard total 126 kg K2O 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 potassium sulphate
TE: Trace element mixture which included Mn, Cu, Zn, B, Mo, Ca & Fe.

NOTES: (1) For all rates of N to w. oats 40 kg N of the total dressing was applied to the seedbed, the remainder in April.
(2) For all rates of N to w. wheat and w. barley 40 kg N of the total dressing was applied in March to wheat, in February to barley, the remainder in April.
(3) N dressings to potatoes were divided equally between seedbed and June.

Standard applications:
Original plots only: Manures: Chalk at 3.8 t.
Original and additional plots:
All cereals: Weedkillers: Ioxynil at 0.32 kg with mecoprop at 0.95 kg on the first occasion, ioxynil at 0.42 kg with mecoprop at 1.26 kg on the second occasion, applied in 280 l with the tridemorph on both occasions. Fungicides: Tridemorph at 0.53 kg. Benomyl at 0.28 kg in 280 l.
W. barley: Additional fungicides: Tridemorph at 0.53 kg with benodanil at 1.1 kg in 280 l. Insecticide (additional plots only): Dimethoate at 0.67 l in 280 l.
W. wheat: Additional fungicides: Carbendazim with maneb and tridemorph (as 'Cosmic' at 3.9 kg) plus captafol at 1.1 l in 280 l. Carbendazim at 0.28 kg with zineb at 1.8 kg and captafol at 1.1 l in 280 l applied with the insecticide. Insecticide: Pirimicarb at 0.14 kg.

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Potatoes: Weedkillers: Linuron at 0.93 l with paraquat at 0.28 kg ion in 280 l. Fungicides: Mancozeb at 1.3 kg in 280 l applied three times, with insecticide on the first occasion. Insecticide: Pirimicarb at 0.14 kg.

Seed: W. barley: Igri, sown at 200 kg.
Grass-clover ley: RVP Italian ryegrass and Hungarapoly red clover.
Potatoes: Maris Piper.
W. wheat: Virtue, sown at 200 kg.
W. oats: Pennal, sown at 200 kg.

Cultivations, etc.:-
W. barley: Chalk applied to original plots only: 23 Sept, 1980. Dug by hand: 8 Sept (additional plots), 30 Sept (original plots). Minerals applied, raked in, seed sown: 18 Sept (additional plots), 1 Oct (original plots). Dimethoate applied (additional plots): 23 Oct. Weedkillers and tridemorph applied: 24 Nov. First part N applied to additional plots: 3 Feb, 1981. Benomyl applied: 11 Feb. Weedkillers and tridemorph applied: 26 Mar. Remaining N applied: 9 Apr. Benodanil and tridemorph applied: 13 May. Harvested by hand: 27 July.

Grass-clover ley: Harrowed, seed sown: 18 Aug, 1980. Chalk applied to original plots, minerals applied to all plots: 15 Oct. N applied: 17 Mar, 1981. Cut: 27 May, 13 July, 9 Sept.
Potatoes: Chalk applied to original plots: 15 Oct, 1980. FYM applied to original plots, minerals applied, plots dug by hand: 22 Oct. N applied (first half on additional plots), rotary cultivated, raked, potatoes planted, and ridged by hand: 1 May, 1981. Weedkillers applied: 21 May. Second half N applied to additional plots: 3 June. Fungicide and insecticide applied: 25 June. Fungicide applied: 30 July, 17 Aug. Plots given neither K nor FYM harvested by hand: 17 Aug. Remaining plots harvested by hand: 16 Sept.
W. wheat: Chalk applied to original plots, minerals applied, dug by hand: 22 Sept, 1980. Raked by hand, seed sown: 26 Sept. Weedkillers and tridemorph applied: 24 Nov. Benomyl applied: 11 Feb, 1981. First part N applied to additional plots: 17 Mar. Weedkillers and tridemorph applied: 26 Mar. Remaining N applied: 16 Apr. 'Cosmic' and captafol applied: 29 May. Carbendazim, zineb and captafol applied: 29 June. Harvested by hand: 13 Aug.
W. oats: Dug by hand: 10 Sept, 1980. Chalk applied to original plots: 17 Sept. Minerals applied, first part N applied to additional plots, seed sown: 18 Sept. Weedkillers and tridemorph applied: 24 Nov. Benomyl applied: 11 Feb, 1981. Weedkillers and tridemorph applied: 26 Mar. Remaining N applied: 16 Apr. Harvested by hand: 30 July.
Permanent grass: Chalk and minerals applied: 15 Oct, 1980. FYM applied: 3 Feb, 1981. N applied: 17 Mar, 27 May, 13 July. Cut: 27 May, 13 July, 9 Aug, 28 Oct.

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GREAT FIELD IV (R):ORIGINAL PLOTS

TONNES/HECTARE

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

	WINTER WHEAT:		BARLEY:		LEY : DRY MATTER			
	GRAIN	STRAW	GRAIN	STRAW	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE								
0	4.26	3.99	2.86	2.15	2.13	2.53	3.07	7.73
N1	2.77	3.82	3.56	3.91	3.06	2.57	2.51	8.15
P	5.49	5.32	2.31	2.16	1.88	1.68	1.86	5.43
N1P	1.94	2.69	1.22	2.83	2.90	1.27	1.00	5.17
K	5.57	5.05	3.33	2.88	2.44	2.68	3.21	8.33
N1K	6.90	6.68	5.71	4.35	3.49	2.75	3.39	9.63
PK	5.85	5.57	3.91	3.52	3.48	4.52	4.88	12.88
N1PK	8.84	7.85	7.55	6.83	4.25	3.56	4.59	12.40
N2PK	9.24	9.22	7.05	8.23	4.95	3.08	3.87	11.89
D	7.43	7.08	4.98	4.47	3.88	3.57	4.68	12.13
N1PKD	9.79	9.80	7.13	8.94	5.57	3.59	5.28	14.43
N2PKD	9.72	11.37	6.15	8.17	6.22	3.47	4.28	13.96
MEAN DM%	80.5	58.3	79.4	65.8	20.8	23.1	20.0	21.6

	OATS:		POTATOES: TOTAL TUBERS	PERMANENT GRASS : DRY MATTER				
	GRAIN	STRAW		1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURE								
0	3.53	4.95	8.5	1.18	0.93	0.56	0.15	2.82
N1	6.77	7.46	13.5	2.44	1.38	1.26	0.60	5.68
P	3.78	6.11	20.8	1.23	0.95	0.55	0.10	2.84
N1P	6.84	8.52	11.9	2.76	1.45	1.31	0.52	6.05
K	3.70	5.66	27.3	1.16	0.88	0.77	0.24	3.05
N1K	6.20	8.58	37.5	2.77	1.99	1.66	0.43	6.85
PK	4.42	6.84	42.3	1.47	1.17	0.83	0.34	3.82
N1PK	6.88	10.95	50.4	3.90	1.92	1.71	0.44	7.97
N2PK	6.49	12.41	57.3	5.49	2.55	2.83	0.76	11.64
D	5.43	8.77	52.3	6.26	1.99	1.56	0.78	10.59
N1PKD	6.74	11.71	60.7	6.24	2.93	2.80	0.80	12.77
N2PKD	7.05	12.95	66.5	5.75	3.59	2.90	1.03	13.27
MEAN DM%	79.3	54.3		21.0	29.4	34.1	24.4	27.2

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GREAT FIELD IV (R): ADDITIONAL PLOTS

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

	WINTER WHEAT: GRAIN	WINTER WHEAT: STRAW	BARLEY: GRAIN	BARLEY: STRAW	OATS: GRAIN	OATS: STRAW	POTATOES: TOTAL TUBERS
MANURES							
0	3.62	4.15	2.25	2.21	4.84	5.62	8.3
N2PK	6.93	7.91	6.62	7.71	6.42	14.94	58.8
N2PKMG	8.90	9.22	5.99	6.89	7.74	11.95	53.8
N2PKS	8.52	8.98	6.66	7.18	7.31	12.90	45.0
N2PKMGS	7.49	8.18	4.84	5.65	6.54	14.65	59.2
N1PKMGS	8.76	9.58	5.90	5.94	6.49	11.14	53.4
N3PKMGS	7.20	8.18	6.95	8.79	5.87	13.26	60.4
MEAN DM%	80.8	63.4	84.0	82.7	82.3	64.8	

	LEY : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURES				
0	2.52	2.20	2.34	7.07
N2PK	5.65	3.14	3.21	12.00
N2PKMG	5.17	4.12	4.83	14.12
N2PKS	5.17	4.22	4.65	14.04
N2PKMGS	5.40	4.01	4.54	13.95
N1PKMGS	5.04	3.42	3.78	12.23
N3PKMGS	5.12	3.82	4.13	13.07
MEAN DM%	20.6	22.8	21.7	21.4

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