ROTHAMSTED RESEARCH

Yields of the Field Experiments 1980

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80/R/RN/5 Arable Reference Plots

Rothamsted Research

Rothamsted Research (1981) *80/R/RN/5 Arable Reference Plots ;* Yields Of The Field Experiments 1980, pp 64 - 68 **- DOI: https://doi.org/10.23637/ERADOC-1-31**

80/R/RN/5

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 25th year of the rotation, s. barley, ley, potatoes, w. wheat, kale. The 21st year of a rotation on the additional plots (as above for 20 years; w. barley, ley, potatoes, w. wheat, w. oats in 1980). The 24th 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 69-79/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): 19, 38 (ley): 56, 112 (s. barley): 75, 150 (w. wheat): 125, 250 (potatoes - 75, 150 until 1975): 125, 250 (kale 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): 50 tonnes (kale and potatoes): 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 and in previous years:
1980	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: N1: 20 kg (ley), 80 kg (w. wheat & w. barley), 90 kg (w. oats) 160 kg (potatoes). N2: 30 kg (ley), 120 kg (w. wheat & w. barley), 130 kg (w. oats), 240 kg (potatoes). N3: 40 kg (ley), 160 kg (w. wheat & w. barley), 170 kg (w. oats), 320 kg (potatoes). Until 1979 N2 = larger rate on original plots. As urea in all years.
P: 126 kg P205 as potassium dihydrogen phosphate
K: 251 kg K20 total. As potassium dihydrogen phosphate (83 kg K20) on all PK plots. In addition plots without S receive 168 kg K20 as potassium chloride, plots with S receive 92 kg K20 as potassium sulphate plus 76 kg K20 as potassium chloride. Since 1978 all PK plots receive in addition to the standard total 126 kg K20 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 50 kg N of the total dressing was applied to the seedbed.
(2) For all rates of N to w. wheat and w. barley 40 kg N of the total dressing was applied in February, the remainder in April.
(3) N dressings to potatoes were divided equally between seedbed and June.

Standard applications:

S. barley: Weedkillers: Ioxynil at 0.42 kg and mecoprop at 1.3 kg in 280 l. Insecticide: Pirimicarb at 0.14 kg in 280 l.

W. barley: Weedkillers: Ioxynil at 0.42 kg and mecoprop at 1.3 kg in 280 l. Ioxynil at 0.32 kg and mecoprop at 0.98 kg in 280 l applied with benomyl. Fungicides: Tridemorph at 0.53 kg in 280 l applied twice, with carbendazim on the second occasion. Benomyl at 0.28 kg. Carbendazim (as 'Bavistin' at 0.51 kg). Insecticide: Pirimicarb at 0.14 kg in 280 l.

Potatoes: Weedkillers: Linuron at 0.93 kg in 280 l with paraquat at 0.28 kg ion. Fungicide: Mancozeb at 1.3 kg in 280 l applied three times with insecticide. Insecticide: Pirimicarb at 0.14 kg.

W. wheat: Weedkillers: Ioxynil at 0.32 kg and mecoprop at 0.98 kg in 280 l applied twice with benomyl on the second occasion. Fungicides: Tridemorph at 0.53 kg in 280 l applied twice with carbendazim on the second occasion. Benomyl at 0.28 kg. Carbendazim (as 'Bavistin' at 0.51 kg). Carbendazim with maneb and tridemorph (as 'Cosmic' at 3.9 kg) and captafol at 1.1 kg in 280 l with insecticide. Insecticide: Pirimicarb at 0.14 kg.

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W. oats: Weedkillers: Ioxynil at 0.32 kg and mecoprop at 0.98 kg in 280 l applied twice, with benomyl on the second occasion. Fungicides: Tridemorph at 0.53 kg in 280 l applied twice, with carbendazim on the second occasion. Benomyl at 0.28 kg. Carbendazim (as 'Bavistin' at 0.51 kg). Insecticide: Pirimicarb on 0.14 kg in 280 l.

Seed: S. barley: Minak, sown at 200 kg.
W. barley: Sonja, sown at 200 kg.
Grass-clover ley: RvP Italian ryegrass and Hungaropoly red clover.
Potatoes: Pentland Crown.
W. wheat: Virtue, sown at 200 kg.
Kale: Thousand Head, sown at 4.5 kg.
W. oats: Pennal, sown at 200 kg.

Cultivations, etc.:-
S. barley: Dug by hand: 12 Oct, 1979. P & K applied, rotary cultivated, raked by hand, seed sown: 19 Feb, 1980. N applied: 2 Apr. Weedkillers applied: 2 May. Insecticide applied: 9 June. Harvested by hand: 18 Aug.
W. barley: Dug by hand: P, K, Mg & S applied: 12 Oct, 1979. Raked by hand, seed sown: 15 Oct. First weedkillers applied: 23 Nov. First tridemorph applied: 19 Dec. First part N applied to additional plots: 19 Feb, 1980. Second weedkillers, and benomyl applied: 2 Apr. Remaining N applied: 11 Apr. Carbendazim and second tridemorph applied: 29 Apr. Pirimicarb applied: 9 June. Harvested by hand: 18 Aug.
Grass-clover ley: Grass direct drilled between rows of barley stubble, clover broadcast: 31 Aug, 1979. P, K, Mg and S applied: 28 Nov. N applied: 29 Feb, 1980. Cut: 22 May, 10 July, 14 Aug, 14 Oct.
Potatoes: FYM applied and dug by hand: 23 Oct, 1979. P & K applied: 29 Feb, 1980. N applied, (first half on additional plots) rotary cultivated twice, potatoes planted: 21 Apr. Weedkillers applied: 22 May. Second half N applied to additional plots: 9 June. Fungicide and insecticide applied: 3 July, 23 July and 7 Aug. Plots given neither K nor FYM harvested by hand: 14 Aug. Remaining plots harvested by hand: 17 Sept.
W. wheat: Dug by hand: 25 Sept, 1979. P, K, S and Mg applied: 26 Sept. Plots raked by hand, seed sown: 27 Sept. Weedkiller applied: 23 Nov. Tridemorph applied: 19 Dec. First part N applied to additional plots: 19 Feb, 1980. Remaining N applied, weedkillers plus benomyl applied: 2 Apr. Carbendazim and tridemorph applied: 29 Apr. Pirimicarb applied: 9 June. 'Cosmic', captafol and pirimicarb applied: 10 July. Harvested by hand: 18 Aug.
Kale: FYM applied and dug by hand: 15 Oct, 1979. PK applied: 29 Feb, 1980. N applied, rotary cultivated, raked by hand, seed sown: 22 Apr. Harvested by hand: 23 Sept.
W. oats: Dug by hand: 5 Sept, 1979. P, K, Mg and S applied: 26 Sept. First N applied, raked by hand, seed sown: 27 Sept. Weedkillers applied: 23 Nov. Tridemorph applied: 19 Dec. Second N applied, weedkillers plus benomyl applied: 2 Apr, 1980. Carbendazim and tridemorph applied: 29 Apr. Insecticide applied: 9 June. Hand harvested: 4 Aug.
Permanent grass: PK applied: 28 Nov, 1979. FYM applied: 28 Feb, 1980. N applied: 29 Feb, 22 May and 10 July. Cut: 22 May, 10 July, 14 Aug and 14 Oct.

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GREAT FIELD IV (R):ORIGINAL PLOTS

TONNES/HECTARE

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

	WINTER WHEAT:		SPRING BARLEY:		LEY : DRY MATTER				
	GRAIN	STRAW	GRAIN	STRAW	1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURE									
0	4.00	3.87	2.90	2.15	0.87	0.99	1.09	0.86	3.82
N1	5.67	5.12	5.36	3.74	2.14	1.22	1.05	0.84	5.25
P	5.90	6.78	2.92	2.16	2.27	2.50	2.44	1.85	9.06
N1P	4.97	5.89	3.05	2.95	3.22	1.39	1.15	1.23	7.00
K	4.41	4.00	2.65	2.19	1.95	1.75	1.99	1.54	7.24
N1K	6.59	5.49	5.66	4.52	2.30	1.45	1.64	1.44	6.83
PK	4.82	4.70	3.18	2.64	3.12	3.11	3.42	2.39	12.05
N1PK	8.13	7.20	5.81	4.22	3.79	2.67	2.78	2.08	11.32
N2PK	9.77	8.22	7.19	5.64	4.90	2.34	2.38	2.23	11.85
D	5.88	5.89	4.76	3.43	3.25	2.64	2.47	2.23	10.59
N1PKD	9.22	9.26	6.19	5.14	5.00	2.93	2.91	2.46	13.30
N2PKD	10.50	9.84	7.94	6.12	6.08	2.50	2.35	2.09	13.02
MEAN DM%	82.2	58.9	82.6	65.2	25.6	19.8	13.6	19.9	19.7

	KALE: FRESH WEIGHT	POTATOES: TOTAL TUBERS	PERMANENT GRASS : DRY MATTER 1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURE							
0	5.4	13.5	0.78	0.52	0.37	0.36	2.03
N1	10.0	11.5	1.56	1.08	1.05	0.74	4.43
P	15.4	15.8	0.75	0.49	0.38	0.30	1.92
N1P	13.5	9.6	1.88	1.40	1.36	0.57	5.21
K	5.4	33.8	1.07	0.71	0.55	0.59	2.92
N1K	3.5	43.8	2.36	1.55	1.23	0.72	5.87
PK	33.1	51.7	1.10	0.80	0.55	0.59	3.04
N1PK	54.2	68.6	2.92	1.54	1.51	0.55	6.52
N2PK	71.9	67.5	4.70	2.35	2.12	0.98	10.15
D	50.7	62.3	4.38	1.29	1.12	0.85	7.64
N1PKD	74.6	82.5	4.69	2.19	1.95	0.70	9.54
N2PKD	86.1	87.7	6.45	3.67	2.76	1.21	14.10
MEAN DM%			29.3	25.3	20.8	31.5	26.7

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GREAT FIELD IV (R): ADDITIONAL PLOTS

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

	WINTER WHEAT: GRAIN	WINTER WHEAT: STRAW	WINTER BARLEY: GRAIN	WINTER BARLEY: STRAW	WINTER OATS: GRAIN	WINTER OATS: STRAW	POTATOES: TOTAL TUBERS
MANURES							
0	4.93	4.84	2.30	1.96	4.09	4.78	15.0
N2PK	9.09	10.17	6.77	6.74	7.42	12.59	67.1
N2PKMG	7.64	7.87	7.16	6.34	8.48	12.13	69.0
N2PKS	8.99	9.79	7.20	6.17	7.42	11.61	69.0
N2PKMGS	9.04	9.18	7.24	5.59	7.11	10.72	61.9
N1PKMGS	7.68	8.12	5.64	5.25	7.81	10.82	64.8
N3PKMGS	9.24	9.16	7.83	6.61	8.57	12.12	67.3
MEAN DM%	82.7	57.6	78.4	42.4	79.7	39.7	

LEY : DRY MATTER

	1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURES					
0	1.48	1.27	1.39	1.13	5.27
N2PK	5.90	2.54	2.41	2.10	12.94
N2PKMG	5.90	2.81	2.83	2.16	13.70
N2PKS	4.55	2.69	2.50	1.96	11.70
N2PKMGS	5.52	2.59	2.67	2.16	12.95
N1PKMGS	5.68	2.42	2.41	2.08	12.60
N3PKMGS	5.39	2.91	2.93	2.15	13.37
MEAN DM%	26.3	19.7	12.9	19.3	19.5

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