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82/R/RN/5 Arable Reference Plots - S. Barley, Ley, Potatoes, W. Wheat, Kale

Rothamsted Research

Rothamsted Research (1983) *82/R/RN/5 Arable Reference Plots - S. Barley, Ley, Potatoes, W. Wheat, Kale* ; Yields Of The Field Experiments 1982, pp 66 - 70 - DOI:

<https://doi.org/10.23637/ERADOC-1-33>

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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 27th 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 26th 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 69-81/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

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

N_{1,2} (kg N): 20, 40 (ley): 80, 160 (w. wheat): 125, 250 (potatoes, w. barley, w. oats and permanent grass) as 'Nitro-Chalk'
P: 63 kg P₂O₅ as superphosphate
K: 250 kg K₂O 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) N rates applied to w. barley and w. oats were, in error, greater than the planned rates of 80 and 160 kg N.

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Additional plots

MANURE Fertilizers from 1980 to 1982 and in previous years:

1980-82	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: From 1980 to 1982: N1: 20 kg (ley), 80 kg (w. wheat, w. barley and w. oats), 160 kg (potatoes). N2: 30 kg (ley), 120 kg (w. wheat, w. barley and w. oats), 240 kg (potatoes). N3: 40 kg (ley), 160 kg (w. wheat, w. barley and 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 and Fe.

Standard applications:

Original and additional plots:

All cereals: Weedkillers: Ioxynil at 0.32 kg and mecoprop at 0.95 kg in 280 l applied with the tridemorph. Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 3.5 l) in 280 l applied with the benomyl.

Fungicides: Tridemorph at 0.53 kg. Benomyl at 0.28 kg.

Insecticide: Permethrin at 0.05 kg in 270 l.

W. wheat: Additional fungicides: Carbendazim, maneb and tridemorph (as 'Cosmic' at 3.9 kg) in 220 l applied with the pirimicarb.

Propiconazole at 0.13 kg in 220 l applied with the pirimicarb.

Additional insecticide: Pirimicarb at 0.14 kg in 220 l. Growth

regulator: Chlormequat at 1.9 kg in 220 l.

W. barley: Additional weedkiller: Chlortoluron at 3.5 kg in 280 l.

Additional fungicide: Tridemorph at 0.53 kg in 280 l. Additional

insecticide: Omethoate at 0.64 l in 220 l. Growth regulator:

Mepiquat chloride and ethephon (as 'Terpal' at 2.8 l) in 220 l.

W. oats: Additional fungicide: Tridemorph at 0.53 kg in 280 l. Growth regulator: Chlormequat at 1.9 kg in 220 l.

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

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

Cultivations, etc.:-

- W. wheat: Dug by hand: 22 Sept, 1981 (original plots), 24 Sept (additional plots). P and K applied to original plots; P, K, Mg and S to additional plots: 28 Sept. Mg applied to original plots, all plots raked level, seed sown and raked in: 29 Sept. Ioxynil and mecoprop with tridemorph applied, permethrin applied: 3 Nov. Mecoprop, bromoxynil and ioxynil with benomyl applied: 2 Apr, 1982. N applied: 19 Apr. Growth regulator applied: 29 Apr. Propiconazole with pirimicarb applied: 3 June. Pirimicarb applied: 18 June. Carbendazim, maneb and tridemorph with pirimicarb applied: 2 July. Harvested by hand: 17 Aug.
- W. barley: Rotary cultivated: 17 Aug, 1981. P and K applied to original plots; P, K, Mg and S to additional plots, raked level, seed sown and raked in: 23 Sept. Chlortoluron applied: 28 Sept. Omethoate applied: 22 Oct. Ioxynil and mecoprop, with tridemorph applied, permethrin applied: 3 Nov. N applied: 31 Mar, 1982. Mecoprop, bromoxynil and ioxynil with benomyl applied: 2 Apr. Growth regulator applied: 29 Apr. Tridemorph applied: 19 May. Harvested by hand: 21 July.
- W. oats: Rotary cultivated: 14 Aug, 1981. P and K applied to original plots: 28 Sept. P, K Mg and S applied to additional plots, all plots raked level, seed sown and raked in: 29 Sept. Ioxynil and mecoprop with tridemorph applied, permethrin applied: 3 Nov. N applied: 31 Mar, 1982. Mecoprop, bromoxynil and ioxynil with benomyl applied: 2 Apr. Growth regulator applied: 29 Apr. Tridemorph applied: 19 May. Harvested by hand: 2 Aug.
- Potatoes: FYM applied to original plots, dug by hand: 26 Oct, 1981. Extra K applied to additional plots, dug by hand: 27 Oct. P and K applied to original plots; P, K, Mg and S applied to additional plots: 28 Oct. N applied to original plots, first half of N to additional plots, both plots rotary cultivated twice, raked, potatoes planted and ridged by hand: 27 Apr, 1982. Linuron and paraquat applied: 17 May. Second half of N applied to additional plots: 25 May. Fungicide and insecticide applied: 18 June, 2 July. Plots given neither FYM nor K harvested by hand: 23 Aug. Remaining plots harvested by hand: 9 Sept.
- Grass-clover ley: Rotary cultivated, raked level, seed sown and raked in: 14 Aug, 1981. P and K applied to original plots; P, K, Mg and S applied to additional plots: 28 Oct. N applied: 17 Mar, 1982. Cut: 19 May, 9 July, 23 Sept.
- Permanent grass: PK applied: 28 Oct, 1981. FYM and first N applied: 17 Mar, 1982. Second N applied: 19 May. Final N applied: 9 July. Cut: 19 May, 9 July, 23 Sept.

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GREAT FIELD IV (R):ORIGINAL PLOTS

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

LEY : DRY MATTER

	WINTER WHEAT:		BARLEY:		1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
	GRAIN	STRAW	GRAIN	STRAW				
MANURE								
O	2.67	3.67	1.53	1.56	1.53	1.96	1.83	5.32
N1	3.38	4.65	2.86	3.05	2.49	2.37	1.93	6.79
P	4.61	3.32	2.97	2.76	1.16	1.49	1.14	3.79
N1P	1.52	3.41	2.07	2.32	2.03	2.13	1.30	5.46
K	4.50	4.66	3.03	2.67	2.39	3.02	3.44	8.86
N1K	7.01	6.73	6.10	5.09	3.49	2.83	2.21	8.53
PK	5.10	5.54	3.87	3.11	3.84	4.64	5.60	14.08
N1PK	7.29	7.09	7.62	6.77	4.70	4.48	5.46	14.64
N2PK	8.09	8.82	7.25	12.23	6.22	4.38	4.77	15.38
D	6.53	7.72	4.52	4.55	3.86	3.95	4.73	12.54
N1PKD	8.51	9.40	7.43	9.38	5.67	4.96	5.65	16.28
N2PKD	9.49	11.46	8.14	9.31	7.51	4.44	5.32	17.26
MEAN DM%	82.8	78.6	82.6	60.0	27.3	23.2	26.8	25.8

	OATS:		POTATOES: TOTAL TUBERS	PERMANENT GRASS : DRY MATTER			TOTAL OF 3 CUTS
	GRAIN	STRAW		1ST CUT	2ND CUT	3RD CUT	
MANURE							
O	4.43	4.64	17.3	0.24	0.97	0.78	1.99
N1	5.60	5.50	25.8	0.76	1.96	1.47	4.19
P	3.94	3.85	13.5	0.26	1.09	0.73	2.08
N1P	2.80	5.08	13.8	1.04	2.47	1.59	5.11
K	3.90	4.80	27.5	0.35	1.27	0.97	2.59
N1K	6.56	8.87	36.5	0.98	2.28	2.00	5.26
PK	4.64	5.55	37.1	0.48	1.53	1.01	3.02
N1PK	7.42	12.94	54.4	1.30	2.80	1.91	6.01
N2PK	7.97	11.04	59.2	2.56	3.63	2.73	8.92
D	5.14	6.22	56.9	2.53	2.43	1.78	6.73
N1PKD	7.92	13.50	65.0	4.06	3.69	2.32	10.06
N2PKD	6.87	16.38	75.0	4.57	4.25	3.48	12.30
MEAN DM%	82.6	63.3	23.0	29.2	28.0	32.0	29.7

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GREAT FIELD IV (R): ADDITIONAL PLOTS

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

	WINTER WHEAT:		BARLEY:		OATS:		POTATOES:
	GRAIN	STRAW	GRAIN	STRAW	GRAIN	STRAW	TUBERS
	MANURE						
0	4.20	4.35	1.89	1.90	4.99	5.54	14.6
N2PK	8.92	10.37	7.84	10.09	6.90	10.05	63.2
N2PKMG	7.33	8.44	7.92	7.38	7.57	11.40	67.7
N2PKS	7.07	6.70	8.74	9.13	7.44	10.38	66.3
N2PKMGS	8.05	9.14	7.68	9.56	7.54	10.88	62.5
N1PKMGS	7.12	9.27	7.29	7.14	7.37	9.45	60.7
N3PKMGS	7.61	8.78	8.15	8.19	7.45	11.68	67.3
MEAN DM%	82.8	77.2	83.0	61.2	84.0	69.7	23.7

	LEY : DRY MATTER			
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE				
0	2.63	2.16	2.16	6.95
N2PK	5.89	4.73	4.46	15.08
N2PKMG	6.08	5.31	5.21	16.61
N2PKS	6.45	4.62	4.40	15.47
N2PKMGS	5.85	4.75	4.64	15.24
N1PKMGS	5.34	5.23	5.03	15.61
N3PKMGS	6.02	4.88	4.56	15.46
MEAN DM%	26.3	20.4	25.2	24.0