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88/R/RN/5 Arable Reference Plots - W. Barley, Ley, Potatoes, W. Wheat, W. Oats, Old Grass

Rothamsted Research

Rothamsted Research (1989) *88/R/RN/5 Arable Reference Plots - W. Barley, Ley, Potatoes, W. Wheat, W. Oats, Old Grass* ; Yields Of The Field Experiments 1988, pp 54 - 58 - DOI:
<https://doi.org/10.23637/ERADOC-1-43>

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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: A. Penny.

The 33rd year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980; w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 29th 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 32nd 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 69-87/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

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' (26% N)

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) Cereals receive 20 kg of N1 and 40 kg of N2 in February or March, remainder in April.

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Additional plots

MANURE Fertilizers from 1980 to 1988 and in previous years:

1980-88	Until 1979
O	O
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 1988: 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 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 O which was given 5.0 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 at 0.72 kg, bromoxynil at 0.16 kg and ioxynil at 0.16 kg with dicamba at 0.025 kg, mecoprop at 0.11 kg and MCPA at 0.33 kg in 220 l. Fungicides: Prochloraz at 0.56 kg and carbendazim at 0.21 kg in 220 l. Tridemorph at 0.53 kg in 220 l. Propiconazole at 0.14 kg in 220 l. Chlorothalonil at 1.1 kg in 220 l on two occasions. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.37 kg in 220 l, (and on a second occasion to wheat only). Insecticide: Pirimicarb at 0.14 kg in 220 l. Growth regulators: Chlormequat at 1.6 kg in 220 l, (to wheat & oats). Mepiquat chloride at 0.86 kg and 2-chloroethylphosphonic acid at 0.44 kg in 220 l, (to barley).

W. wheat: Manures: MgO at 82 kg as Epsom salts.

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 on two occasions applied with the insecticide on the second. Applied on a third occasion to later-harvested plots only. Insecticide: Pirimicarb at 0.14 kg in 220 l and on a second occasion at 0.14 kg with the fungicide.

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Seed: W. wheat: Galahad, sown at 210 kg.
W. barley: Panda, sown at 250 kg.
W. oats: Peniarth, sown at 250 kg.
Potatoes: Cara.
Grass-clover ley: RVP Italian ryegrass and Hungaropoly red clover.

Cultivations, etc.:-

Original and additional plots:

All cereals: Weedkillers applied: 6 Nov, 1987. First N treatments applied: 7 Mar, 1988. Second N treatments applied: 12 Apr. Prochloraz and carbendazim applied, tridemorph applied: 21 Apr. Growth regulators applied to barley: 28 Apr, and to wheat and oats: 10 May. Propiconazole applied, first chlorothalonil applied: 10 May (to barley) and 25 May (to wheat and oats). Insecticide applied: 6 June. Carbendazim, maneb and tridemorph applied, second chlorothalonil applied: 13 June. Second carbendazim, maneb and tridemorph applied (to wheat only): 15 July.

W. wheat: P, K, Mg and S applied (to additional plots): 1 Oct, 1987. Rotary cultivated, P, K and Mg applied (to original plots), seed sown and raked in: 2 Oct. Hand harvested: 16 Aug, 1988.

W. barley: Rotary cultivated: 8 Sept, 1987. Rotary cultivated, P and K (to additional plots only) Mg and S applied, seed sown and raked in: 21 Sept. Hand harvested: 20 July, 1988.

W. oats: P, K and (to additional plots only) Mg and S applied: 9 Sept, 1987. Rotary cultivated, seed sown, raked level: 6 Oct. Hand harvested: 3 Aug, 1988.

Potatoes: FYM applied to original plots and all original plots dug by hand: 7 Dec, 1987. All additional plots dug by hand: 8 Dec. P, K and (to additional plots only), Mg and S applied: 9 Dec. N applied, rotary cultivated, potatoes planted: 14 Apr, 1988. Weedkillers applied: 10 May. Insecticide applied: 6 June. Fungicide applied: 23 June. Fungicide with insecticide applied: 15 July. Plots given neither FYM nor K on original plots and plot given no fertilizer on additional plots, harvested by hand, fungicide applied to remaining plots: 10 Aug. Remaining plots harvested by hand: 20 Sept.

Grass-clover ley: Rotary cultivated: 4 Aug, 1987. Rotary cultivated, seed sown and raked in: 21 Aug. Cut: 5 Nov. P, K and (to additional plots only), Mg and S applied: 18 Nov. N applied: 7 Mar, 1988. Cut: 19 May, 12 July and 2 Sept.

Permanent grass: P and K applied: 18 Nov, 1987. FYM and first N applied: 7 Mar, 1988. Cut, second N applied: 16 May. Cut, third N applied: 12 July. Cut: 2 Sept.

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ORIGINAL PLOTS

TONNES/HECTARE

***** Tables of means *****

MANURE	W. WHEAT:		W. BARLEY:		LEY : DRY MATTER				
	GRAIN	STRAW	GRAIN	STRAW	1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
0	4.88	4.66	2.70	1.87	0.36	2.44	1.17	1.39	5.36
N1	6.51	6.74	2.16	3.21	0.39	4.90	1.27	0.90	7.47
P	3.24	3.58	2.98	2.01	0.80	3.00	1.88	2.25	7.92
N1P	3.84	5.71	2.15	3.24	0.87	5.04	1.11	1.09	8.11
K	4.10	4.05	3.26	2.54	0.53	2.73	1.44	1.45	6.14
N1K	7.46	8.45	5.32	4.81	0.51	4.63	1.45	1.28	7.88
PK	4.74	5.27	4.34	3.31	0.84	3.76	3.68	3.78	12.06
N1PK	8.37	9.01	9.28	7.11	0.96	5.30	2.36	3.82	12.44
N2PK	10.32	11.13	10.01	8.18	1.20	7.44	1.95	3.03	13.62
D	6.95	7.37	4.83	3.72	1.16	4.75	2.32	3.45	11.67
N1PKD	9.47	10.48	8.74	7.36	1.38	6.41	2.43	4.37	14.58
N2PKD	10.05	12.41	10.20	8.82	1.44	7.78	1.95	2.69	13.87
MEAN DM%	82.7	59.1	81.9	59.3	18.2	24.9	22.7	17.6	20.9

MANURE	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER			
	GRAIN	STRAW	TOTAL TUBERS	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
0	3.37	4.39	12.7	0.79	0.77	0.54	2.09
N1	6.18	8.54	9.8	1.78	1.33	1.42	4.53
P	3.13	4.36	8.5	0.84	0.95	0.55	2.34
N1P	7.05	9.09	7.5	2.42	1.68	1.66	5.76
K	3.01	4.65	34.6	0.92	0.97	0.67	2.57
N1K	5.95	8.42	34.4	2.34	2.02	1.49	5.86
PK	3.48	5.02	55.7	1.44	1.27	1.24	3.95
N1PK	7.41	10.94	68.8	3.01	2.38	2.11	7.51
N2PK	6.86	13.77	68.0	4.42	2.73	2.58	9.72
D	3.55	5.36	64.0	4.95	1.70	1.54	8.18
N1PKD	8.36	12.09	85.2	5.48	2.15	2.66	10.29
N2PKD	7.36	14.62	82.1	6.24	3.58	3.17	12.99
MEAN DM%	75.9	37.6	21.6	24.9	27.7	22.8	25.1

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ADDITIONAL PLOTS

***** Tables of means *****

	W. WHEAT:		W. BARLEY:		W. OATS:		POTATOES:
	GRAIN	STRAW	GRAIN	STRAW	GRAIN	STRAW	TOTAL TUBERS
MANURE							
0	4.40	4.57	3.25	2.44	2.37	3.84	11.3
N2PK	9.36	10.00	8.99	7.32	8.15	13.27	78.6
N2PKMG	7.34	10.34	8.68	7.67	7.07	13.57	73.8
N2PKS	9.27	9.62	9.55	7.57	7.09	10.78	71.9
N2PKMGS	8.93	9.30	9.09	7.68	8.11	11.68	68.6
N1PKMGS	8.41	9.35	9.34	7.04	7.62	12.38	75.3
N3PKMGS	9.76	10.74	9.79	8.35	7.37	13.33	79.2
MEAN DM%	83.5	52.8	83.0	63.6	74.6	38.9	22.0

	LEY : DRY MATTER				
	1ST CUT	2ND CUT	3RD CUT	4TH CUT	TOTAL OF 4 CUTS
MANURE					
0	0.53	3.05	1.09	1.25	5.92
N2PK	1.23	6.22	2.19	3.95	13.59
N2PKMG	1.04	5.71	2.46	3.54	12.75
N2PKS	1.10	5.70	2.47	4.21	13.48
N2PKMGS	1.17	6.34	2.47	4.00	13.98
N1PKMGS	1.01	5.12	2.76	4.09	12.99
N3PKMGS	1.11	6.04	2.15	3.92	13.22
MEAN DM%	17.3	23.7	20.9	15.8	19.4