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

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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.

Sponsors: R.J. Darby, M.V. Hewitt.

The 34th year of a rotation, s. barley, ley, potatoes, w. wheat, kale until 1980; w. barley, ley, potatoes, w. wheat, w. oats since 1981. The 30th 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 33rd 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 69-88/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'
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 March, remainder in April.

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Additional plots

MANURE Fertilizers from 1980 to 1989 and in previous years:

1980-89	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 1989: 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: Isoproturon at 2.5 kg in 220 l (to wheat and barley). Fluroxypyr at 0.15 kg in 220 l. Fungicides: Prochloraz at 0.56 kg and carbendazim at 0.21 kg in 220 l. Carbendazim at 0.15 kg, maneb at 1.6 kg and tridemorph at 0.38 kg in 220 l. Propiconazole at 0.12 kg applied with the pirimicarb. Insecticides: Dimethoate at 0.67 kg in 220 l. Pirimicarb at 0.14 kg. Growth regulators: Chlormequat at 1.6 kg in 220 l (to wheat and 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 ion in 220 l. Fungicide: Mancozeb at 1.3 kg applied with the insecticide in 220 l. Insecticide: Pirimicarb at 0.14 kg.

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

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Cultivations, etc.:-

Original and additional plots:

All cereals: Isoproturon applied (to wheat and barley): 11 Oct, 1988. Dimethoate applied: 21 Oct. First N treatments applied: 8 Mar, 1989. Prochloraz and carbendazim applied, fluroxypyr applied separately: 28 Mar. Growth regulator applied (to wheat and oats): 29 Mar. Second N treatments applied: 10 Apr. Growth regulators applied (to barley): 12 Apr. Carbendazim, maneb and tridemorph applied: 8 May. Propiconazole and pirimicarb applied: 26 May.

W. wheat: P, K, Mg and (to additional plots only) S applied, rotary cultivated, raked level and seed sown: 22 Sept, 1988. Hand harvested: 1 Aug, 1989.

W. barley: P, K and (to additional plots only) Mg and S applied: 15 Sept, 1988. Rotary cultivated, raked level, seed sown and raked in: 16 Sept. Hand harvested: 18 July, 1989.

W. oats: P, K and (to additional plots only) Mg and S applied: 29 Sept, 1988. Rotary cultivated, raked level, seed sown and raked in: 30 Sept. Hand harvested: 19 July, 1989.

Potatoes: FYM applied (to original plots) and plots dug by hand: 22 Nov, 1988. P, K and (to additional plots only) Mg and S applied: 18 Apr, 1989. N applied, rotary cultivated, potatoes planted: 19 Apr. Weedkillers applied: 15 May. Fungicide with insecticide applied: 21 July. Plots given neither FYM nor K on original plots and plot given no fertilizer on additional plots harvested by hand: 22 Aug. Remaining plots harvested by hand: 14 Sept.

Grass-clover ley: Rotary cultivated, raked level, seed sown and raked in: 6 Sept, 1988. P, K and (to additional plots only), Mg and S applied: 9 Dec, 1988. N applied: 8 Mar, 1989. Cut: 10 May, 25 July and 29 Sept.

Permanent grass: FYM, P, K and first N applied: 8 Mar, 1989. Cut, second N applied: 10 May. Cut, third N applied: 25 July. Cut: 29 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	TOTAL OF 3 CUTS
0	3.49	3.93	2.34	2.06	2.40	0.78	0.25	3.43
N1	2.72	4.42	2.42	2.64	3.59	0.79	0.24	4.62
P	2.47	3.36	4.17	3.04	2.47	0.90	0.23	3.60
N1P	1.94	3.79	4.03	4.82	3.96	0.74	0.21	4.92
K	4.77	5.27	3.25	3.06	2.52	1.03	0.23	3.78
N1K	6.54	7.29	5.16	5.24	2.53	1.43	0.32	4.28
PK	5.86	6.25	4.52	3.38	3.74	1.52	0.90	6.16
N1PK	8.79	9.48	7.77	7.92	4.88	1.16	0.40	6.44
N2PK	8.84	12.06	8.63	8.64	5.98	1.19	0.33	7.50
D	7.96	9.40	5.54	5.28	4.47	1.32	0.33	6.13
N1PKD	9.96	12.94	9.38	9.44	6.10	1.49	0.46	8.05
N2PKD	9.09	14.02	9.13	10.96	6.30	1.59	0.44	8.32
MEAN DM%	84.8	82.9	89.6	90.2	25.1	44.5	38.1	35.9

MANURE	W. OATS:		POTATOES:	PERMANENT GRASS : DRY MATTER			
	GRAIN	STRAW	TOTAL TUBERS	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
0	3.57	5.42	6.9	0.65	0.71	0.26	1.62
N1	5.29	8.81	9.4	1.07	0.69	0.43	2.18
P	3.31	4.71	12.7	0.39	0.69	0.18	1.26
N1P	5.58	9.13	7.7	1.50	0.78	0.67	2.95
K	1.26	5.50	27.1	0.90	0.89	0.39	2.17
N1K	5.57	9.86	19.2	1.76	1.19	0.56	3.52
PK	4.42	7.04	26.9	1.52	1.66	0.30	3.48
N1PK	6.88	12.39	29.2	1.81	1.51	0.63	3.95
N2PK	6.35	14.29	30.0	2.55	1.24	0.79	4.58
D	6.19	10.89	28.1	2.85	1.46	0.69	5.00
N1PKD	6.77	14.47	37.5	3.34	2.37	1.01	6.72
N2PKD	6.12	16.07	36.3	3.61	2.73	0.97	7.31
MEAN DM%	86.4	55.3	23.9	29.9	45.8	41.5	39.1

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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	4.17	4.80	3.23	2.57	3.74	5.13	6.7
N2PK	9.48	11.08	9.11	9.82	6.98	13.26	23.6
N2PKMG	10.73	11.81	8.38	8.62	6.26	13.36	32.1
N2PKS	8.99	11.30	7.57	8.40	6.89	14.22	26.9
N2PKMGS	8.08	9.59	9.48	9.12	6.69	12.53	26.7
N1PKMGS	9.34	10.73	8.77	8.73	7.16	13.27	29.0
N3PKMGS	9.06	11.78	9.30	9.46	6.17	12.60	24.8
MEAN DM%	85.3	82.3	90.1	91.0	87.3	64.1	23.2

	LEY : DRY MATTER			
	1ST CUT	2ND CUT	3RD CUT	TOTAL OF 3 CUTS
MANURE				
0	2.83	1.00	0.28	4.12
N2PK	5.47	1.04	0.32	6.82
N2PKMG	5.73	1.29	0.43	7.45
N2PKS	5.71	1.39	0.40	7.50
N2PKMGS	5.89	1.48	0.48	7.85
N1PKMGS	5.42	1.35	0.55	7.32
N3PKMGS	6.40	1.46	0.43	8.29
MEAN DM%	23.8	45.2	36.0	35.0