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74/W/RN/6 Arable Reference Plots - Oats, Sugar Beet, Barley, Ley, Potatoes, Permanent Grass

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74/W/RN/6

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 - Woburn Stackyard C.

Sponsor: F.V. Widdowson.

The fifteenth year, oats, sugar beet, barley, ley, potatoes and permanent grass.

For previous years see 60/B/3(t), 61-65/B/2, 66/B/2(t), 67/B/2(t), 68/B/3(t), 69/W/RN/6, 70/W/RN/6(t) and 71-73/W/RN/6.

Design: 1 block of 12 plots for each crop.

Whole plot dimensions: 2.74 x 2.13.

Treatments: All combinations of:-

Blocks: 1. Crops:-

After old grass (1960-73):

Barley

In arable rotation since 1960:

Barley

Ley

Potatoes

Sugar beet

Oats

Permanent grass, sown autumn 1973

CROP

Barley/G

Barley/A

Ley

Potatoes

SugrBeet

Oats

PermGras

Plots: 2. Fertilisers and farmyard manure:-

None

N1

P

N1 P

K

N1 K

PK

N1 PK

N2 PK

D

N1 PK D

N2 PK D

MANURE

O

N1

P

N1P

K

N1K

PK

N1PK

N2PK

D

N1PKD

N2PKD

N1,2 (kg N): 31.5, 63 (ley): 63, 126 (barley and oats): 126, 252 (sugar beet and potatoes): 188, 376 (permanent grass) as ammonium nitrate.

P: P205 at 63 kg as triple superphosphate.

K: K20 at 252 kg as potassium bicarbonate.

D: Farmyard manure at 25 tonnes (permanent grass): 50 tonnes (sugar beet and potatoes): none to other crops.

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- NOTES: (1) The old grass block was dug in autumn 1973 and now follows the arable rotation, the crop in 1974 being barley. A new block was sown to permanent grass on adjacent land.
- (2) Potatoes and sugar beet test on sub plots: 0, Mg (82 kg MgO as Epsom salts). Yields are recorded from potatoes only. Untreated sub plots receive 82 kg MgO after potato and sugar beet harvest.

Standard applications:

Winter oats: Weedkillers: Ioxynil at 0.42 kg with mecoprop at 1.3 kg in 450 l. Fungicide: Tridemorph at 0.53 kg in 340 l.

Sugar beet: Manures: Boron at 7.3 kg B₂O₃ as 0.8% solution of borax. Insecticide: Menazon at 0.28 kg in 340 l on four occasions.

Barley: Both blocks: Weedkillers: Ioxynil at 0.42 kg with mecoprop at 1.3 kg in 340 l. Fungicide: Tridemorph at 0.53 kg in 340 l.

Potatoes: Insecticide: Menazon at 0.28 kg in 340 l on four occasions one being with fungicide. Fungicide: Mancozeb at 1.3 kg in 340 l on two occasions one being with insecticide.

Permanent Grass: Manures: Epsom salts at 500 kg. 'Nitro-Chalk' at 310 kg. (0:20:20) at 190 kg.

Seed: Winter oats: Peniarth, sown at 140 kg.

Sugar beet: Klein E, sown at 5.6 kg.

Barley: Julia, dressed with ethirimol, sown at 180 kg.

Grass-clover ley: R.V.P. Italian ryegrass and Hungaropoly red clover.

Potatoes: Desiree.

Permanent Grass: S₂15 Meadow fescue at 20 kg, S₂4 perennial ryegrass at 20 kg, crested dogstail at 7 kg, chewings fescue at 7 kg, smooth stalked meadow grass at 7 kg, alsike clover at 4 kg, wild white clover at 2 kg, mixture sown at 67 kg.

Cultivations, etc.:-

Winter oats: Balancing Mg applied, plots dug by hand: 5 Sept, 1973. P and K applied, seed sown: 8 Oct, 1973. First half N applied: 14 Mar, 1974. Weedkiller applied: 8 Apr. Second half N applied: 24 Apr. Fungicide applied: 22 May. Harvested: 2 Aug.

Sugar beet: FYM applied, plots dug by hand: 4 Dec, 1973. P and K applied: 7 Mar, 1974. First N applied, rotary cultivated, Mg applied to half plots, seed drilled: 8 Apr. Boron applied: 8 May. Second N applied, insecticide applied: 4 June. Insecticide applied: 25 June, 11 July, 18 July. Lifted: 21 Oct.

Barley: Both blocks: Balancing Mg applied to Barley/A only: 11 Oct. 1973. Plots dug by hand: 5 Dec. Rotary cultivated, raked, P and K and first half N applied, seed sown: 7 Mar, 1974. Second half N applied: 24 Apr. Weedkiller applied: 9 May. Fungicide applied: 22 May. Harvested: 9 Aug.

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Grass-clover ley: Rotary cultivated, sown and raked in: 1 Aug, 1973. P and K applied: 4 Dec. N applied: 14 Mar, 1974. Cut five times: 11 Oct, 1973, 22 May, 1974, 18 July, 4 Sept, 15 Oct.

Potatoes: FYM applied, plots dug by hand: 4 Dec, 1973. P and K applied: 7 Mar, 1974. First half N applied, rotary cultivated twice, raked, Mg applied to half plots, potatoes planted, earthed up: 24 Apr. Second half N applied, insecticide applied: 4 June. Insecticide applied: 25 June, 11 July. Fungicide applied: 5 July. Fungicide with insecticide applied: 18 July. Lifted, plots not given K: 2 Aug. Remaining plots lifted: 10 Sept.

Permanent grass: Rotary cultivated: 24 Aug, 1973. Raked, basal Mg, N and PK applied, seeds sown, raked in: 7 Sept. FYM, P and K and first third N applied: 14 Mar, 1974. Second third N applied: 22 May. Third third N applied: 18 July. Cut three times: 22 May, 18 July, 15 Oct.

- NOTES: (1) Samples were taken for determinations of dry matter for each crop, and the percentage of N, P and K.
- (2) The percentage of Mg in sugar beet tops, potato tubers and leaves was determined.
- (3) The percentage of K in potato leaves was determined.

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TABLES OF MEANS
TONNES/HECTARE

MANURE	OATS		ROOTS (WASHED)	SUGAR BEET		BARLEY AFTER OLD GRASS	BARLEY AFTER ARABLE	POTATOES				
	GRAIN	STRAW		SUGAR %	TOTAL SUGAR			TOPS	GRAIN	STRAW	GRAIN	STRAW
0	1.66	1.96	15.72	15.7	2.47	3.79	2.60	1.75	1.26	12.8	13.9	13.3
N1	3.92	4.07	19.99	14.8	2.96	3.99	3.46	3.69	2.99	13.4	14.4	13.9
P	1.69	1.82	13.67	15.2	2.08	2.78	1.95	2.06	1.27	12.2	11.8	12.0
N1P	3.94	4.02	16.74	15.1	2.53	2.34	2.71	3.05	2.82	14.4	12.2	13.3
K	1.92	2.31	16.74	15.5	2.60	4.41	3.01	2.32	1.41	26.0	29.7	27.8
N1K	3.64	5.54	27.68	15.8	4.37	5.67	4.27	5.11	3.68	43.4	47.2	45.3
PK	2.12	2.12	14.69	15.2	2.23	4.29	3.51	2.41	1.60	20.2	25.6	22.9
N1PK	3.25	4.85	34.00	15.9	5.41	6.18	4.99	5.04	3.93	50.2	56.7	53.5
N2PK	4.71	7.98	33.32	14.9	4.97	6.86	5.74	6.31	4.99	55.4	57.4	56.4
D	2.28	2.66	25.63	15.6	4.01	5.11	3.41	3.69	2.48	34.9	43.7	39.3
N1PKD	3.85	6.42	37.59	15.8	5.95	6.69	5.89	5.89	4.14	51.3	56.4	53.8
N2PKD	3.29	8.07	38.95	15.0	5.86	6.53	6.09	6.07	5.74	79.6	73.8	76.7
Mean	79.6	46.1	-	-	-	77.6	57.4	77.2	56.2	-	-	-

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TONNES/HECTARE

MANURE	GRASS-CLOVER LEY: DRY MATTER					PERMANENT GRASS: DRY MATTER			
	1st cut	2nd cut	3rd cut	4th cut	5th cut	1st cut	2nd cut	3rd cut	Total of 3 cuts
O	0.14	1.96	2.59	1.52	0.59	0.88	1.66	1.49	4.03
N1	0.13	3.51	1.84	1.31	0.38	2.97	3.01	2.86	8.84
P	0.23	1.91	1.87	1.05	0.42	0.55	1.02	1.32	2.89
N1P	0.10	3.40	1.32	0.92	0.32	2.52	3.05	2.81	8.38
K	0.56	3.35	3.46	2.74	0.65	1.22	2.96	1.90	6.08
N1K	0.37	3.92	3.28	2.44	0.74	2.97	3.30	3.01	9.28
PK	0.81	3.78	4.24	2.62	0.83	0.80	3.62	1.97	6.39
N1PK	0.49	4.66	3.98	3.06	0.75	2.98	3.43	3.03	9.44
N2PK	0.38	5.26	3.35	2.60	0.66	3.76	4.06	3.44	11.26
D	0.79	3.83	3.76	2.84	0.73	1.05	2.80	2.16	6.01
N1PKD	0.72	5.88	3.52	2.70	0.62	2.49	3.40	3.30	9.19
N2PKD	0.48	5.75	3.82	2.65	0.82	3.88	4.47	4.71	13.06
Mean D.M. %	22.2	25.6	22.1	14.0	17.0	25.2	21.4	22.4	23.0
Total of 5 cuts	6.80					20.2			