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Yields of the Field Experiments 1973

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73/W/RN/3 - Ley/ARABLE - Leys, Barley, Potatoes, Wheat

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LEY/ARABLE

Object: To compare the effects on soil fertility of rotations with or without three-year leys. The effects of the cropping systems on soil-borne pathogens are also studied - Woburn Stackyard D.

Sponsors: D.A. Boyd, J.M. Hirst, A.E. Johnston, F.G.W. Jones.

The 36th year, leys, potatoes, barley, wheat.

For previous years see 'Details' 1967, 68/B/2(t), 69/W/RN/3(t), 70/W/RN/3(t), 71/W/RN/3(t) and 72/W/RN/3(t).

Design: 5 series of 8 plots, split for treatments other than rotations.

Whole plot dimensions: 8.53 x 40.7. Areas harvested: Wheat, 0.00260, Barley, 1st treatment crop: 0.00570, 3rd treatment crop: 0.00601, Potatoes, 1st treatment crop: 0.00130, 1st test crop (Ley and Sainfoin): 0.00260, 1st test crop (Arable and Arable H): 0.00130.

Treatments: All phases of four five-course rotations are present: ROTATION

Grass/clover ley:	L, L, L, P, W	Ley
All legume ley:	SA, SA, SA, P, W until 1971 then CL, CL, CL, P, W	Sainfoin Clover
Arable:	P, R, C, P, W until 1971 then P, B, B, P, W	Arable
Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, W	Arable H

P = potatoes, R = rye, C = carrots, W = wheat, B = barley, H = hay,
L = grass/clover ley, SA = sainfoin ley, CL = red clover ley

Additional treatments to first test crop, potatoes:-

1/2 plots:	1. Farmyard manure residues, last applied 1963:	FYMRES63
	None	None
	38 tonnes on each occasion	FYM
1/4 plots (AH, A rotations only)	2. Fumigant residues, applied 1970:	FUMRES70
	None	None
	Chloropicrin, 448 kg	Chlorop

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1/4 plots (L,S)	3. Fumigant applied in 1973:-	FUM73
1/8 plots (A, AH)		
	None	None
	Chloropicrin, 448 kg, plus aldicarb, 6.7 kg	Chlor/al

Additional treatments to second test crop, winter wheat:-

1/2 plots	1. Farmyard manure residues, last applied 1967:-	FYMRES67
	None	None
	38 tonnes on each occasion	FYM
1/4 plots (A,AH only)	2. Fumigant residues, applied 1969:-	FUMRES69
	None	None
	Chloropicrin, 448 kg	Chlorop
1/4 plots (L,S)	3. Fumigant residues, applied 1972:-	FUMRES72
1/8 plots (A,AH)		
	None	None
	Chloropicrin, 448 kg, plus aldicarb, 11 kg	Chlor/al
1/8 plots	4. Nitrogen fertiliser (kg N) in 1973:-	N73
	None	0
	63	63
	126	126
	189	189

Additional treatments to first treatment crop, potatoes:-

1/2 plots	1. Farmyard manure residues, last applied 1966:-	FYMRES66
	None	None
	38 tonnes on each occasion	FYM
1/8 plots	2. Fumigant residues, applied 1971:-	FUMRES71
	None	None
	Chloropicrin, 448 kg, plus aldicarb, 11 kg	Chlor/al
1/4 plots	3. Fumigant applied in 1973:-	FUM73
	None	None
	Chloropicrin, 448 kg, plus aldicarb, 6.7 kg	Chlor/al

NOTE: Chloropicrin was applied to plots 35, 36, 47 and 48 on 1/4 plots in error.

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Additional treatments to second treatment crop, barley:-

1/2 plots	1. Farmyard manure residues, last applied 1965:-	FYMRES65
	None	None
	38 tonnes on each occasion	FYM
1/4 plots	2. Fumigant residues, applied 1972:-	FUMRES72
	None	None
	Chloropicrin, 448 kg, plus aldicarb 5.6 kg	Chlor/al

Additional treatments to third treatment crop, barley:-

1/2 plots	1. Farmyard manure residues, last applied 1964:-	FYMRES64
	None	None
	38 tonnes on each occasion	FYM

Corrective K dressings (in kg K₂O) as muriate of potash applied to first test crop, potatoes:-

	No FYM half plots	FYM half plots
Continuous rotations		
Ley	502	502
Clover	126	126
Arable with hay	314	376
Arable	439	439
Alternating rotations (last two rotations in order)		
Ley/arable	439	439
Sainfoin/arable with hay	439	502
Arable/ley	502	502
Arable with hay/clover	251	0

NOTE: For a fuller record of previous treatments see 'Details' 1967 etc.

Standard applications:-

Winter wheat: Manures: (0:20:20) at 300 kg. Magnesian limestone at 5 tonnes. Weedkillers: Paraquat at 0.56 kg ion in 280 l. Ioxynil at 0.52 kg plus mecoprop at 1.58 kg in 280 l.
 Barley: Manure: (15:15:15) at 410 kg. Weedkiller: Ioxynil at 0.52 kg plus mecoprop at 1.6 kg in 280 l.
 Potatoes, treatment and test crop: Manures: (13:13:20) at 1940 kg. Weedkiller: Linuron at 1.7 kg in 280 l. Fungicide with insecticide: Mancozeb at 1.3 kg plus demeton-s-methyl at 0.25 kg in 390 l. Fungicide: Mancozeb at 1.3 kg in 390 l on the first occasion and in 370 l on the second occasion.

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Hay: Manures: Nitrogen at 130 kg as 'Nitro-Chalk' plus (0:14:28) at 540 kg in spring, and (25:0:16) at 270 kg after the first cut.
Ley, 1st year: Manures: Nitrogen at 50 kg as 'Nitro-Chalk', P205 at 190 kg as superphosphate, K2O at 130 kg as muriate of potash in the seedbed. (25:0:16) at 360 kg divided between two equal applications.
Weedkiller: Benazolin with 2,4-DB and MCPA ('Legumex Extra' at 7.0 l in 280 l).

Lays, 2nd and 3rd years: Manures: (25:0:16) at 540 kg in three equal applications.

Clover 1st year: Manures: Nitrogen at 60 kg as 'Nitro-Chalk', P205 at 190 kg as superphosphate, K2O at 130 kg as muriate of potash.
Weedkiller: Benazolin with 2,4-DB and MCPA ('Legumex Extra' at 7.0 l in 280 l).

Clover, 2nd and 3rd years: Nitrogen at 60 kg as 'Nitro-Chalk', K2O at 190 kg as muriate of potash.

Varieties: Winter wheat: Cappelle, sown at 200 kg.

Barley: Julia, dressed with ethirimol, sown at 160 kg.

Potatoes: first test crop and treatment crop: Maris Piper.

Red clover: SL23, sown at 45 kg.

Ley: Perennial ryegrass S23, Cocksfoot SL43, late flowering red clover, Alsike clover, sown at 30 kg.

Cultivations, etc.:— Treatment crops:

Ley, 1st year: Deep-tine cultivated twice: 11 Sept, 1972, 18 Sept.

Ploughed: 2 Feb, 1973. Chloropicrin applied in error to plots in alternating rotation: 7 Feb. N, P and K applied, seeds sown: 20 Mar.

Weedkiller applied: 31 Mar. NK applied: 19 June. Cut once: 2 Aug.

NK applied: 16 Aug.

Ley, 2nd year: NK applied: 9 Mar, 1973, 2 July, 16 Aug. Cut twice: 23 June, 13 Aug.

Ley, 3rd year: NK applied: 9 Mar, 1973, 18 June, 16 Aug. Cut three times: 12 June, 2 Aug, 5 Nov.

Clover, 1st year: Deep-tine cultivated twice: 11 Sept, 1972, 18 Sept.

Ploughed: 2 Feb, 1973. Chloropicrin applied in error to plots in alternating rotation: 7 Feb. N, P and K applied, rolled, seed sown: 20 Mar. Weedkiller applied: 31 May. Cut: 2 Aug.

Clover, 2nd year: N applied: 9 Mar, 1973. K applied: 15 Mar. Cut twice: 23 June, 13 Aug.

Clover, 3rd year: NK applied: 9 Mar, 1973. Cut twice: 12 June, 2 Aug.

Potatoes, 1st treatment crop: Deep-tine cultivated twice: 11 Sept, 1972, 18 Sept. Ploughed: 2 Feb, 1973. Chloropicrin applied to continuous arable with hay plots: 7 Feb. Chloropicrin applied to plots in alternating rotations, previously omitted in error: 8 Mar. NPK applied, rotary cultivated: 9 Apr. Aldicarb applied: 16 Apr. Rotary cultivated,

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potatoes planted: 17 Apr. Weedkiller applied: 12 May. Grubbed: 1 June. Rotary ridged: 4 June. Fungicide with insecticide applied: 5 July. Fungicide applied twice: 26 July, 13 Aug. Sprayed with undiluted BOV at 220 l: 24 Sept. Lifted: 3 Oct.

Barley 2nd treatment crop: Deep-tine cultivated: 28 Sept, 1972. Spring-tine cultivated with crumbler: 9 Mar, 1973. Seed sown: 12 Mar. Seeds hay undersown (AH plots): 15 Mar. Weedkiller applied to plots not undersown: 11 May. Combine harvested: 13 Aug.

Barley, 3rd treatment crop: Deep-tine cultivated: 28 Sept, 1972. Ploughed: 29 Dec. Spring-tine cultivated with crumbler: 9 Mar. Seed sown: 12 Mar, 1973. Weedkiller applied: 11 May. Combine harvested: 13 Aug. Seeds Hay: Seeds undersown in barley: 26 Apr, 1972. N, P and K applied: 9 Mar, 1973. Cut twice: 12 June, 2 Aug. NK applied: 19 June.

Test Crops:

Potatoes, 1st test crop: Ploughed: 20 Sept, 1972. First half corrective K applied: 6 Oct. Second half corrective K applied: 1 Feb, 1973. Chloropicrin applied: 7 Feb. NPK applied: 26 Mar. Deep-tine cultivated: 5 Apr. Aldicarb applied, all plots rotary cultivated, potatoes planted: 9 Apr. Weedkiller applied: 12 May. Grubbed: 1 June. Rotary ridged: 4 June. Fungicide with insecticide applied: 5 July. Fungicide applied: 26 July, 13 Aug. Haulm mechanically destroyed: 19 Sept. Sprayed with undiluted BOV at 220 l: 24 Sept. Lifted: 2 Oct.

Wheat, 2nd test crop: Deep-tine cultivated: 30 Sept, 1972. Magnesians limestone applied: 7 Oct. Seed sown: 20 Oct. Paraquat applied: 17 Nov. Seed resown because varieties mixed at first sowing: 24 Nov. N applied: 16 Apr, 1973. Ioxynil and mecoprop applied: 11 May. Combine harvested: 24 Aug.

NOTE: Soil samples were taken from the potato plots monthly throughout the growing season for counts of nematodes.

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TABLES OF MEANS

POTATOES 1ST TEST CROP

	ROTATION			ROTATION		
	Ley	Sainfoin	Mean	Arable	Arable H	Mean
TOTAL TUBERS: TONNES/HECTARE						
FYMRES63						
None	58.5	55.5	57.0	54.4	56.5	55.4
FYM	61.0	58.1	59.5	57.4	58.1	57.7
FUM73						
None	57.9	52.4	55.2	55.2	54.4	54.8
Chlor/al	61.5	61.1	56.8	56.6	60.1	58.4
FUMRES70						
None				55.2	54.7	55.0
Chlorop				56.5	59.9	58.2
Mean	59.7	56.8	58.3	55.9	57.3	56.6

PERCENTAGE WARE: 3.81 CM (1.5 INCH) RIDDLE

FYMRES63						
None	95.2	94.1	94.6	94.5	94.7	94.6
FYM	95.9	93.2	94.5	95.0	94.6	94.8
FUM73						
None	96.0	94.0	95.0	95.0	94.5	94.7
Chlor/al	95.0	93.2	94.1	94.6	94.8	94.7
FUMRES70						
None				95.4	94.4	94.9
Chlorop				94.1	94.9	94.5
Mean	95.5	93.6	94.6	94.8	94.7	94.7

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WHEAT 2ND TEST CROP

GRAIN: TONNES/HECTARE

	ROTATION			ROTATION		
	Ley	Sainfoin	Mean	Arable	Arable H	Mean
N73						
0	5.17	4.59	4.88	4.91	5.16	5.03
63	4.77	4.19	4.48	4.64	4.75	4.70
126	3.84	3.38	3.61	4.00	4.06	4.03
189	3.16	2.76	2.96	3.28	3.47	3.37
FUMRES67						
None	4.22	3.76	3.99	4.22	4.34	4.28
FYM	4.25	3.70	3.98	4.19	4.37	4.28
FUMRES72						
None	4.32	3.77	4.04	4.39	4.41	4.40
Chlor/al	4.15	3.69	3.92	4.02	4.31	4.17
FUMRES69						
None				4.20	4.31	4.25
Chlorop				4.22	4.41	4.31
Mean	4.24	3.73	3.98	4.21	4.36	4.28
Mean D.M. %	34.8					

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WHEAT 2ND TEST CROP

STRAW: TONNES/HECTARE

	ROTATION			ROTATION		
	Ley	Sainfoin	Mean	Arable	Arable H	Mean
N73						
0	4.75	4.11	4.43	4.44	4.69	4.57
63	5.33	4.37	4.85	5.16	4.76	4.96
126	5.23	4.90	5.06	5.43	5.11	5.27
189	5.22	5.16	5.19	4.76	5.09	4.93
FYMRES67						
None	5.01	4.60	4.80	5.14	4.78	4.96
FYM	5.25	4.67	4.96	4.76	5.05	4.90
FUMRES72						
None	4.92	4.70	4.81	5.18	5.00	5.09
Chlor/al.	5.35	4.57	4.96	4.72	4.83	4.77
FUMRES69						
None				5.13	4.93	5.03
Chlorop				4.77	4.90	4.83
Mean	5.13	4.64	4.88	4.95	4.91	4.93

Mean D.M. % 81.2

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POTATOES 1ST TREATMENT CROP

ROTATION

	Ley	Sainfoin	Arable H	Arable	Mean
TOTAL TUBERS: TONNES/HECTARE					
FYMRES66					
None	52.5	53.0	51.2	52.1	52.2
FYM	59.8	56.4	58.4	53.0	56.9
FUMRES71					
None	55.5	54.1	52.5	50.1	53.1
Chlor/al	56.8	55.3	57.1	55.0	56.1
FUM73					
None	55.8	53.1	50.3	47.3	51.6
Chlor/al	56.5	56.3	59.4	57.9	57.5
None	56.2	54.7	54.8	52.6	54.6

PERCENTAGE WARE: 3.81 CM (1.5 INCH) RIDDLE

FYMRES66					
None	92.3	93.5	94.9	94.2	93.7
FYM	93.8	92.7	94.4	93.5	93.6
FUMRES71					
None	92.9	93.4	94.7	93.0	93.5
Chlor/al	93.1	92.9	94.6	94.7	93.8
FUM73					
None	93.1	92.9	94.4	93.0	93.3
Chlor/al	92.9	93.4	94.9	94.7	94.0
Mean	93.0	93.1	94.6	93.9	93.7

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BARLEY 2ND TREATMENT CROP

ROTATION

	Arable	Arable II	Ley	Sainfoin	Mean
GRAIN: TONNES/HECTARE					
FYMRES65					
None	3.61	3.97	4.73	5.31	4.40
FYM	4.18	4.47	5.19	5.07	4.73
FUMRES72					
None	3.22	3.32	4.56	4.98	4.02
Chlor/al	4.58	5.12	5.36	5.40	5.11
Mean	3.90	4.22	4.96	5.19	4.57

STRAW: TONNES/HECTARE

FYMRES65					
None	2.30	3.45	3.11	3.86	3.18
FYM	2.77	3.23	3.90	3.73	3.41
FUMRES72					
None	2.21	3.03	3.03	3.75	3.01
Chlor/al	2.86	3.65	3.98	3.84	3.58
Mean	2.53	3.34	3.51	3.80	3.29

Mean D.M. % Grain: 83.0
Straw: 92.9

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BARLEY 3RD TREATMENT CROP

ROTATION

	Arable	Sainfoin	Mean
GRAIN: TONNES/HECTARE			
FYMRES64			
None	2.32	3.89	3.11
FYM	2.58	4.21	3.40
Mean	2.45	4.05	3.25

STRAW: TONNES/HECTARE

FYMRES64			
None	1.43	2.56	2.00
FYM	1.50	2.80	2.15
Mean	1.47	2.68	2.07

Mean D.M. % Grain 82.6
Straw 92.1