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Yields of the Field Experiments 1975

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

Rothamsted Research

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75/W/RN/3

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. First, A.E. Johnston, F.G.W. Jones.

The 38th year, leys, barley, potatoes, 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), 72/W/RN/3(t) and 73-74/W/RN/3.

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

Whole plot dimensions: 8.53 x 40.7.

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 with roots:	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 1965:-	FYMRES65
	None	NONE
	38 tonnes on each occasion	FYM
1/4 plots:	2. Fumigant applied in 1975:-	FUM75
	None	NONE
	Dichloropropene, 220 kg, plus aldicarb, 11.2 kg	DICHL/AL

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Additional treatments to second test crop, winter wheat:-

1/2 plots	1. Farmyard manure residues, last applied 1964:-	FYMRES6L
	None	NONE
	38 tonnes on each occasion	FYM
1/4 plots	2. Fumigant residues, applied 1974:-	FUMRES74
	None	NONE
	Dichloropropene, 220 kg, plus aldicarb, 6.7 kg	DICHL/AL
1/8 plots	3. Nitrogen fertilisers (kg N) in 1975:-	N75
	None	0
	63	63
	126	126
	189	189

Additional treatments to first treatment crop, potatoes:-

1/2 plots	1. Farmyard manure residues, last applied 1963:-	FYMRES63
	None	NONE
	38 tonnes on each occasion	FYM
1/4 plots (A,AH only)	All combinations of:-	
	2. Fumigant residues, applied 1973:-	FUMRES73
	None	NONE
	Chloropicrin, 448 kg, plus aldicarb, 6.7 kg	CHLOR/AJ
	3. Fumigant applied in 1975 (cumulative to chloropicrin 1970):-	FUM75(70)
	None	NONE
	Dichloropropene, 220 kg, plus aldicarb, 11.2 kg	DICHL/AL
1/4 plots (L,S only)	All combinations of:-	
	2. Fumigant residues, applied 1973:-	FUMRES73
	None	NONE
	Chloropicrin, 448 kg, plus aldicarb, 6.7 kg	CHLOR/AL

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	3. Fumigant applied in 1975:-	FUM75
	None	NONE
	Dichloropropene, 220 kg, plus aldicarb, 11.2 kg	DICHL/AL
Additional treatments to second treatment crop, barley:-		
1/2 plots	1. Farmyard manure residues, last applied 1967	FYMRES67
	None	NONE
	38 tonnes on each occasion	FYM
1/8 plots (A,AH only)	2. Fumigant residues, applied 1972:-	FUMRES72
	None	NONE
	Chloropicrin, 448 kg, plus aldicarb, 11.2 kg	CHLOR/AL
1/4 plots	3. Fumigant residues, applied 1974:-	FUMRES74
	None	NONE
	Dichloropropene, 224 kg, plus aldicarb, 6.7 kg	DICHL/AL
Additional treatments to third treatment crop, barley:-		
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, 11.2 kg	CHLOR/AL
1/4 plots (except S,L)	3. Fumigant residues, applied 1973:-	FUMRES73
	None	NONE
	Chloropicrin, 448 kg, plus aldicarb, 6.7 kg	CHLOR/AL
Corrective K dressings (in kg K ₂ O) as muriate of potash applied to first test crop, potatoes:-		

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Continuous rotations	No FYM	FYM
	half plots	half plots
Ley	176	50
Clover	201	264
Arable with hay	63	0
Arable	75	138
Alternating rotations (last two rotations in order)		
Ley/arable	63	163
Sainfoin/arable with hay	151	138
Arable with hay/clover	213	238
Arable/ley	151	188

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

Standard applications:-

Winter wheat: Manures: Magnesian limestone at 5 tonnes. (0:20:20) at 290 kg, combine drilled. Weedkiller: Ioxynil at 0.63 kg plus mecoprop at 1.9 kg in 280 l.

Barley: Manures: 2nd and 3rd treatment crops: (15:15:15) at 410 kg, combine drilled. Weedkillers: 3rd treatment crop only: Ioxynil at 0.52 kg plus mecoprop at 1.6 kg in 280 l.

Potatoes: Manures: Test and treatment crops: (13:13:20) at 1940 kg. Weedkillers: Linuron at 1.2 kg plus paraquat at 0.28 kg ion in 280 l. Treatment crop only: Paraquat at 0.56 kg ion in 280 l. Insecticide: Demeton-s-methyl at 0.25 kg in 280 l. Fungicide: Mancozeb at 1.3 kg 390 l.

Hay: Manures: N at 130 kg, as 'Nitro-Chalk', plus (0:14:28) at 540 kg in spring. (25:0:16) at 270 kg after the first cut.

Ley, 1st year: Manures: N at 50 kg as 'Nitro-Chalk', P205 at 190 kg as superphosphate, K20 at 130 kg as muriate of potash in the seedbed. Weedkiller: Paraquat at 0.56 kg ion in 280 l.

Leys, 2nd and 3rd years: Manures: (25:0:16) at 360 kg for each cut.

Clover, 1st year: Manures: N at 60 kg as 'Nitro-Chalk', P205 at 190 kg as superphosphate, K20 at 130 kg as muriate of potash. Weedkiller: Paraquat at 0.56 kg ion in 280 l.

Clover, 2nd and 3rd years: Manures: N at 60 kg as 'Nitro-Chalk', K20 at 190 kg as muriate of potash. Weedkiller 3rd year only: Paraquat at 0.84 kg ion in 280 l.

Varieties: Winter wheat: Cappelle, dressed with dieldrin, sown at 200 kg

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

Potatoes: First test and treatment crops: Maris Piper

Red Clover: 1st year: S123, sown at 45 kg

Red Clover: 3rd year resown: S123, sown at 40 kg

Ley: 1st year: Perennial ryegrass S23, Cocksfoot S143, late flowering red clover, Alsike clover, sown at 30 kg.

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Cultivations, etc.:- Treatment crops:

Ley, 1st year: Paraquat applied: 11 Sept, 1974. Subsoiled: Tines 140 cm apart and 56 cm deep: 17 Sept. Ploughed: 31 Oct. Spring-tine cultivated three times: 6 Nov, 24 Apr, 1975, 28 Apr. Rolled, N, P and K applied: 30 Apr. Seeds sown, harrowed in: 2 May. Rolled: 4 May. Topped four times: 8 June, 1 Aug, 2 Sept, 31 Oct.

Ley, 2nd and 3rd years: NK applied: 6 Mar, 1975, 27 June. Cut once: 23 June. 2nd year ley topped: 9 Sept, 31 Oct and 3rd year ley: 2 Sept.

Clover, 1st year: Paraquat applied: 11 Sept, 1974. Subsoiled: Tines 140 cm apart and 56 cm deep: 17 Sept. Ploughed: 31 Oct. Spring-tine cultivated three times: 6 Nov, 24 Apr, 1975, 28 Apr. Rolled, N, P and K applied: 30 Apr. Seed sown, harrowed in: 2 May. Rolled: 4 May. Topped four times: 8 June, 1 Aug, 2 Sept, 31 Oct.

Clover, 2nd year: N and K applied: 6 Mar, 1975. Cut twice: 23 June, 28 Aug.

Clover, 3rd year: N and K applied: 6 Mar, 1975. Cut and carted off weeds, paraquat applied: 22 May. Rotary cultivated: 27 May. Power harrowed, red clover resown, harrowed in, rolled: 6 June. Weeds pulled by hand: 23 June. Topped: 5 Aug, 2 Sept.

Seeds Hay: Seeds undersown in barley: 30 Apr, 1974. N and PK applied: 6 Mar, 1975. Cut: 23 June. NK applied: 27 June.

Potatoes, 1st treatment crop: Paraquat applied: 11 Sept, 1974. Subsoiled: Tines 140 cm apart and 56 cm deep: 17 Sept. Ploughed: 31 Oct. Spring-tine cultivated: 6 Nov. Deep-tine cultivated: 6 Jan, 1975. Dichloropropene applied, spring-tine cultivated: 8 Jan. NPK applied: 21 Apr. Deep-tine cultivated: 25 Apr. Spring-tine cultivated: 28 Apr. Aldicarb applied, all plots rotary cultivated, potatoes planted: 5 May. Ridges rolled: 10 May. Linuron and paraquat applied: 22 May. Grubbed: 23 June. Rotary ridged: 24 June. Insecticide applied: 25 June. Fungicide applied: 15 July. Haulm mechanically destroyed: 26 Sept. Sprayed with undiluted BOV at 160 l. Lifted: 7 Oct.

Barley, 2nd treatment crop: Deep-tine cultivated twice: 31 Dec, 1974, 6 Jan, 1975. Spring-tine cultivated three times, the second time with crumbler: 26 Feb, 21 Mar, 26 Mar. Seed sown: 26 Mar. Spring-tine cultivated with crumbler, seed resown, seeds hay undersown (Arable H plots), covered in, rolled: 1 May. Thistles hoed by hand: 17 July. Combine harvested: 23 July.

Barley, 3rd treatment crop: Ploughed: 17 Dec, 1974. Spring-tine cultivated three times, the second time with crumbler: 26 Feb, 21 Mar, 26 Mar. Seed sown: 26 Mar. Spring-tine cultivated with crumbler, seed resown, rolled: 1 May. Weedkiller applied: 5 June. Combine harvested: 19 Aug.

Test Crops:

Potatoes, 1st test crop: First half corrective K applied: 9 Oct, 1974. Rotary cultivated: 30 Oct. Ploughed: 31 Oct. Spring-tine cultivated: 6 Nov. Deep-tine cultivated: 6 Jan, 1975. Dichloropropene applied, spring-tine cultivated: 8 Jan. Second half corrective K applied: 21 Feb. NPK applied: 22 Apr. Deep-tine cultivated: 25 Apr. Spring-tine cultivated: 28 Apr. Aldicarb applied, all plots rotary cultivated, potatoes planted: 5 May. Ridges rolled: 10 May. Weedkiller applied: 22 May. Grubbed: 23 June. Rotary ridged: 24 June. Insecticide applied:

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25 June. Fungicide applied: 15 July. Haulm mechanically destroyed:
26 Sept. Sprayed with undiluted BOV at 160 l: 2 Oct. Lifted: 6 Oct.
Wheat, 2nd test crop: Magnesian limestone applied, deep-tine cultivated
twice: 7 Nov, 1974. Spring-tine cultivated, seed sown: 8 Nov.
N applied: 26 Mar, 1975. Harrowed: 22 Apr. Rolled: 24 Apr.
Weedkiller applied: 8 May. Combine harvested: 12 Aug.

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WHEAT 2ND TEST CROP

GRAIN TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	LEY	CLOVER	ARABLE	ARABLEH	MEAN
FYMRES64					
NONE	3.63	3.51	2.92	3.14	3.30
FYM	3.47	3.52	2.78	3.07	3.24
FUMRES74					
NONE	3.45	3.35	2.47	2.84	3.03
DICHL/AL	3.66	3.78	3.23	3.37	3.51
N75					
0	2.54	2.34	1.31	1.69	1.97
63	4.15	3.87	3.00	3.48	3.62
126	4.10	4.11	4.04	3.83	4.02
189	3.43	3.95	3.05	3.43	3.47
MEAN	3.55	3.57	2.85	3.11	3.27

GRAIN MEAN DM% 88.3

STRAW TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	LEY	CLOVER	ARABLE	ARABLEH	MEAN
FYMRES64					
NONE	4.51	4.56	3.21	3.45	3.93
FYM	4.69	4.82	3.02	3.65	4.05
FUMRES74					
NONE	4.39	4.42	2.45	3.32	3.64
DICHL/AL	4.31	4.96	3.78	3.78	4.33
N75					
0	1.80	1.83	0.91	1.32	1.46
63	4.44	4.40	3.15	3.61	3.90
126	5.87	5.93	4.18	4.53	5.12
189	6.30	6.60	4.22	4.76	5.47
MEAN	4.60	4.69	3.11	3.55	3.99

STRAW MEAN DM% 93.8

SUB PLOT AREA HARVESTED 0.00260

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BARLEY 2ND TREATMENT CROP

ARABLE AND ARABLE H

GRAIN TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	ARABLE	ARABLEH	MEAN
FYMRES67			
NONE	2.01	2.53	2.27
FYM	2.30	2.43	2.37
FUMRES72			
NONE	2.19	2.42	2.30
CHLOR/AL	2.12	2.54	2.33
FUMRES74			
NONE	2.07	2.43	2.25
DICHL/AL	2.25	2.52	2.39
MEAN	2.16	2.48	2.32

STRAW TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	ARABLE	ARABLEH	MEAN
FYMRES67			
NONE	1.40	1.94	1.67
FYM	1.55	1.70	1.63
FUMRES72			
NONE	1.51	1.71	1.61
CHLOR/AL	1.43	1.93	1.68
FUMRES74			
NONE	1.40	1.80	1.60
DICHL/AL	1.55	1.84	1.69
MEAN	1.47	1.82	1.65

STRAW MEAN DM% 87.8

PLOT AREA HARVESTED 0.00260

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BARLEY 2ND TREATMENT CROP

LEY AND SANFOIN

GRAIN TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	LEY	SAINFOIN	MEAN
FYMRES67			
NONE	2.30	2.00	2.15
FYM	2.39	2.43	2.41
FUMRES74			
NONE	2.20	2.11	2.15
DICHL/AL	2.49	2.32	2.41
MEAN	2.35	2.22	2.28

GRAIN MEAN DM% 84.1

STRAW TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	LEY	SAINFOIN	MEAN
FYMRES67			
NONE	1.38	1.60	1.49
FYM	1.37	1.79	1.83
FUMRES74			
NONE	1.35	1.59	1.47
DICHL/AL	1.90	1.79	1.85
MEAN	1.63	1.69	1.66

STRAW MEAN DM% 87.4

PLOT AREA HARVESTED 0.00559

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BARLEY 3RD TREATMENT CROP

GRAIN TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	ARABLE	SAINFOIN	MEAN
FYMRES66			
NONE	1.73	1.34	1.53
FYM	1.73	2.09	1.93
FUMRES71			
NONE	1.79	1.86	1.82
CHLOR/AL	1.72	1.57	1.64
FUMRES73			
NONE	1.78	1.76	1.77
CHLOR/AL	1.73	1.66	1.70
MEAN	1.75	1.71	1.73

GRAIN MEAN DM% 83.0

STRAW TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	ARABLE	SAINFOIN	MEAN
FYMRES66			
NONE	1.52	1.76	1.64
FYM	1.64	2.56	2.10
FUMRES71			
NONE	1.63	2.40	2.01
CHLOR/AL	1.52	1.92	1.72
FUMRES73			
NONE	1.62	2.26	1.94
CHLOR/AL	1.53	2.05	1.79
MEAN	1.58	2.16	1.87

STRAW MEAN DM% 85.2

PLOT AREA HARVESTED 0.00260

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POTATOES 1ST TEST CROP

TOTAL TUBERS TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION TYPE	LEY	CLOVER	ARABLE	ARABLEH	MEAN
PERM	36.5	38.1	13.6	25.2	28.4
ALT	32.3	32.3	23.5	27.6	28.9
FYMRES65					
NONE	33.3	36.1	16.6	26.7	28.3
FYM	35.0	34.3	20.4	26.2	29.0
FUM75					
NONE	29.4	28.6	14.8	18.3	22.8
DICHL/AL	39.3	41.8	22.2	34.6	34.5
MEAN	34.4	35.2	18.5	26.4	28.6

PERCENTAGE WARE 3.81 (1.5 CM) RIDDLE

*** TABLES OF MEANS ***

ROTATION TYPE	LEY	CLOVER	ARABLE	ARABLEH	MEAN
PERM	91.2	93.7	73.6	83.7	85.5
ALT	91.1	90.3	83.5	90.4	89.0
FYMRES65					
NONE	90.6	91.9	78.8	87.6	87.2
FYM	91.7	92.6	78.4	85.5	87.3
FUM75					
NONE	89.3	89.3	72.6	81.3	83.4
DICHL/AL	92.4	94.6	84.6	92.8	91.1
MEAN	91.1	92.2	78.6	87.1	87.3

PLOT AREA HARVESTED 0.00280

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POTATOES 1ST TREATMENT CROP

ARABLE AND ARABLE H PLOTS

TOTAL TUBERS TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	ARABLE	ARABLEH	MEAN
FYMRES63			
NONE	12.2	10.1	11.1
FYM	13.6	10.5	12.1
FUMRES73			
NONE	13.0	9.3	11.1
CHLOR/AL	12.7	11.4	12.1
FUM75(70)			
NONE	10.7	8.4	9.6
DICHL/AL	15.0	12.2	13.6
MEAN	12.9	10.3	11.6

PERCENTAGE WARE 3.31 CM (1.5 INCH) RIDDLE

*** TABLES OF MEANS ***

ROTATION	ARABLE	ARABLEH	MEAN
FYMRES63			
NONE	93.8	93.1	93.4
FYM	94.8	90.6	92.7
FUMRES73			
NONE	93.9	90.0	91.9
CHLOR/AL	94.8	93.7	94.2
MEAN	94.3	91.8	93.1
FUM75(70)			
NONE	94.6	89.5	92.0
DICHL/AL	94.1	94.2	94.1
MEAN	94.3	91.8	93.1

PLOT AREA HARVESTED 0.00280

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POTATOES 1ST TREATMENT CROP

LEY AND SAINFOIN PLOTS

TOTAL TUBERS TONNES/HECTARE

*** TABLES OF MEANS ***

ROTATION	LEY	SAINFOIN	MEAN
FYMRES63			
NONE	12.8	12.7	12.8
FYM	14.6	11.2	12.9
FUMRES73			
NONE	13.4	12.0	12.7
CHLOR/AL	14.1	11.9	13.0
FUM75			
NONE	11.3	8.9	10.1
DICHL/AL	16.1	15.1	15.6
MEAN	13.7	12.0	12.8

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

*** TABLES OF MEANS ***

ROTATION	LEY	SAINFOIN	MEAN
FYMRES63			
NONE	93.5	94.7	94.1
FYM	94.4	94.4	94.4
FUMRES73			
NONE	93.6	94.5	94.1
CHLOR/AL	94.2	94.6	94.4
FUM75			
NONE	92.9	93.7	93.3
DICHL/AL	95.0	95.4	95.2
MEAN	93.9	94.5	94.2

PLOT AREA HARVESTED 0.00280