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RESEARCH

Yields of the Field Experiments 1975

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75/ R/RN/1&2 - Ley/ARABLE - Old Grass, Leys, Oats, Wheat

Rothamsted Research

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75/R/RN/1 and 75/R/RN/2

LDN/ARABLE

Object: To study the effects of three-year leys on the fertility of the soil as measured by a sequence of three arable test crops. Since 1968, continuous wheat has been grown after the three test crops to study the build-up and decline of take-all (*Gaeumannomyces graminis*) after the different cropping sequences - Highfield and Fosters.

Sponsors: A.E. Johnston, D.P. Slope.

The 27th year, old grass, leys, oats, wheat.

For previous years see 'Details' 1967, 68/B/1(t), 69/R/RN/1&2(t), 70/R/RN/1&2(t), 71/R/RN/1&2(t) and 72-74/R/RN/1&2.

The experiment is duplicated on:-

A site with much organic matter initially (ploughed out from permanent grass)

HIGHFIELD

A site with little organic matter initially

FOSTERS

Treatments: The experiment originally tested four six-course rotations, with all phases present each year. In recent years these rotations were:-

ROTATION

Treatment crops	Test crops
IU, IU, IU,	W, P, B
IC, IC, IC,	W, P, B
LN, LN, LN,	W, P, B
H, SB, O,	W, P, B

LUCERNE
CLOVER
GRASS
ARABLE

IU = lucerne, IC = clover/grass ley, no nitrogen fertiliser, LN = all-grass ley with much nitrogen fertiliser, H = 1-year seeds hay, SB = sugar beet, O = oats, W = wheat, P = potatoes, B = barley.

In 1968 the order of test crops was changed to P, W, B except for those phases that had already started the sequence W, P, B.

In 1975 the barley test crop was changed to wheat.

On both fields in the first three years other plots were sown with long-term reseeded grass

RESEDED

In Highfield plots of the old turf were left initially unploughed, for comparison with the three-year leys

OLDGRASS

75/R/RN/1 and 75/R/RN/2

In 1962 and 1963 some of the old and reseeded grass plots were divided for management identical to:- Clover/grass ley C
All-grass ley N

From 1963 (reseeded) and 1968 (old grass) some grass plots were ploughed and cropped with the same test crops as above, thereafter these plots followed the Arable rotation. In 1973 some of these plots were returned to reseeded grass.

In 1975 the all-grass half plots of the reseeded grass plots were used for a new experiment (see 75/R/CS/169).

From 1968 only two phases on each field have continued in the original six-course rotation. All other phases have been sown to wheat every year at the end of the test-crop cycle. In 1975:-

Wheat, 7th test crop, 6th cereal (P,W,B,W,W,W,W)	CEREAL 6
Wheat, 8th test crop, 7th cereal (P,W,B,W,W,W,W,W)	CEREAL 7
Wheat, 10th test crop, 8th cereal (W,P,B,W,W,W,W,W,W)	CEREAL 8
Wheat, 11th test crop, 9th cereal (W,P,B,W,W,W,W,W,W,W)	CEREAL 9

Treatments to 7th-11th test crops wheat:-

Sub plots: Nitrogen fertiliser (kg N) in 1975:- N 75

75	75
126	126
176	176
225	225

Treatments to 3rd test crop wheat (2nd cereal P,W,W):-

Sub plots: Farmyard manure residues, last applied 1968:- FYMRES68

None	NONE
30 tonnes on each occasion	FYM

Sub sub plots: Residues of nitrogen fertiliser applied to potatoes 1973 (kg N):- N(73)

None	0
80	80
160	160
240	240

Sub sub plots: Residues of nitrogen fertiliser applied to wheat 1974 (kg N):- N(74)

None	0
50	50
100	100
150	150

75/R/N/1 and 75/R/N/2

Sub sub plots: Nitrogen fertiliser in 1975 (kg N):-

N 75

None	0
75	75
150	150
225	225

Standard applications:

3rd Treatment crops:

All-grass ley: Manures: 75 kg P2O5, 150 kg K2O as (0:14:28) in winter. 75 kg N, 48 kg K2O as (25:0:16) for each cut.

Clover-grass ley: Manures: 75 kg P2O5, 150 kg K2O as (0:14:28) in winter. 48 kg K2O as muriate of potash for each cut.

Lucerne: Manures: 115 kg P2O5, 230 kg K2O as (0:14:28) in winter.

Oats: Manures: 50 kg N, 50 kg P2O5, 77 kg K2O as (13:13:20) combine drilled. Weedkiller: Dicamba with mecoprop and MCPA ('Banlene Plus' at 5.6 l in 220 l).

3rd, 7th, 8th, 10th and 11th Test crops:

Winter wheat: Manures: 75 kg P2O5 and 75 kg K2O as (0:20:20), combine drilled. Weedkillers: Mecoprop ('Compitox Extra' at 4.2 l in 220 l).

On Fosters all wheat, on Highfield 3rd test crop only - paraquat at 0.56 kg ion in 220 l, remaining wheat on Highfield 0.84 kg ion in 220 l.

Reseeded grass and Old grass: Manures: 75 kg P2O5 and 150 kg K2O as (0:14:28) in winter.

All-grass half plots: (excluding Reseeded grass): Manures: 75 kg N and 48 kg K2O as (25:0:16) for each cut.

Clover-grass half plots: 48 kg K2O as muriate of potash for each cut.

Seed: Wheat: Cappelle, sown at 200 kg.

Oats: Manod, sown at 200 kg.

Cultivations, etc.:-

3rd year Treatment crops:

All grass ley: PK applied: 15 Jan, 1975. NK applied: 5 Mar, 4 June, 18 Aug. Cut three times: 28 May, 31 July, 10 Nov.

Clover grass ley: PK applied: 15 Jan, 1975. K applied: 5 Mar, 4 June, 18 Aug. Cut three times: 28 May, 31 July, 10 Nov.

Lucerne: PK applied: 15 Jan, 1975. Cut three times: 10 June, 23 July, 10 Nov.

Oats: Ploughed: 17 Jan, 1975. Rotary cultivated and seed sown:

25 Mar. Weedkiller applied: 20 May. Combine harvested: 18 Aug.

75/R/RN/1 and 75/R/RN/2

Test crops: Winter wheat (7th to 11th test crops):

Paraquat applied: 30 Sept, 1974. Ploughed: 11 Oct. Rotary cultivated: 14 Oct. Drilled: Fosters: 15 Oct, Highfield: 30 Oct. N applied: 22 Apr, 1975. Weedkiller applied: 9 May. Combine harvested: 12 Aug.

Winter wheat (3rd test crops):

Paraquat applied: Block 3, Fosters: 30 Sept, 1974. Block 1 Fosters and Blocks 1 and 4 Highfield: 14 Oct. Ploughed: 15 Oct. Rotary cultivated: 28 Oct. Seed sown: 31 Oct. N applied: 22 Apr, 1975. Weedkiller applied: 9 May. Combine harvested: 11 Aug.

Reseeded and Old grass (excluding all-grass half plots of reseeded grass): PK applied: 15 Jan, 1975. NK applied to all-grass half plots and K to clover-grass half-plots: 5 Mar, 4 June and 18 Aug. Cut three times: 28 May, 31 July, 10 Nov.

75/R/RN/1 AND 75/R/RN/2

WHEAT 3RD TEST CROP CEREAL 2

GRAIN TONNES/HECTARE

HIGHFIELD

*** TABLES OF MEANS***

ROTATION FYMRES (68)	LUCERNE	CLOGRA	GRASS	ARABLE	MEAN
NONE	3.98	4.65	4.99	4.69	4.58
FYM	3.99	5.11	5.23	4.83	4.79

N(73)					
0	3.92	5.06	4.93	4.66	4.66
80	3.88	5.04	5.15	4.86	4.73
160	4.23	4.44	4.82	4.93	4.61
240	3.91	4.97	5.48	4.60	4.74

N(74)					
0	3.25	4.49	4.81	4.33	4.22
50	3.31	4.69	4.62	4.83	4.49
100	4.18	5.18	5.50	4.79	4.91
150	4.68	5.16	5.50	5.11	5.11

N 75					
0	2.31	3.59	3.49	2.71	3.02
75	3.96	5.53	4.97	4.75	4.81
150	4.53	4.86	5.92	5.98	5.32
225	5.13	5.53	6.05	5.61	5.58
MEAN	3.98	4.83	5.11	4.76	4.68

GRAIN MEAN DM% 85.9

SUB PLOT AREA HARVESTED 0.00325

75/R/RN/1 AND 75/R/RN/2

WHEAT 3RD TEST CROP CEREAL 2

GRAIN TONNES/HECTARE

FCS TERS

*** TABLES OF MEANS ***

ROTATION FYMRES(68)	LUCERNE	CLOVER	GRASS	ARABLE	MEAN
NONE	5.54	5.36	5.38	5.19	5.37
FYM	6.17	4.94	5.59	5.52	5.55

N(73)	LUCERNE	CLOVER	GRASS	ARABLE	MEAN
0	5.84	5.88	5.69	5.25	5.67
80	5.90	5.03	5.30	5.36	5.40
160	5.55	4.45	5.52	5.63	5.29
240	6.14	5.23	5.43	5.17	5.49

N(74)	LUCERNE	CLOVER	GRASS	ARABLE	MEAN
0	5.53	5.88	5.33	5.04	5.45
50	5.80	4.34	5.50	5.25	5.22
100	5.91	5.30	5.54	5.39	5.54
150	6.18	5.07	5.57	5.72	5.64

N 75	LUCERNE	CLOVER	GRASS	ARABLE	MEAN
0	3.96	4.07	3.84	3.21	3.77
75	6.00	5.12	5.84	5.57	5.63
150	6.77	5.38	6.20	6.14	6.12
225	6.69	6.03	6.06	6.49	6.32
MEAN	5.86	5.15	5.49	5.35	5.46

GRAIN MEAN DM% 85.9

SUB PLOT AREA HARVESTED 0.00325

75/R/RN/1 AND 75/R/RN/2

WHEAT 7TH TEST CROP CEREAL 6

GRAIN TONNES/HECTARE

HIGHFIELD

*** TABLES OF MEANS ***

	N75	75	126	176	225	MEAN
ROTATION						
LUCERNE		4.84	5.34	5.85	5.54	5.40
CLOGRA		5.88	6.48	6.68	6.25	6.32
GRASS		5.50	6.18	5.74	5.64	5.77
ARABLE		5.26	6.11	5.67	5.90	5.74
RESEEDED		6.14	6.49	6.70	6.08	6.35
OLDGRASS		6.16	6.34	6.32	5.67	6.12
MEAN		5.63	6.16	6.16	5.86	5.95

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.364	0.188	0.540
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
ROTATION			0.461

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.364	6.1
BLOCK.WP.SP	18	0.461	7.8

GRAIN MEAN DM% 86.8

SUB PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2
 WHEAT 7TH TEST CROP CEREAL 6
 GRAIN TONNES/HECTARE
 FOSTERS

*** TABLES OF MEANS ***

	N75	75	126	176	225	MEAN
ROTATION						
LUCERNE	5.02	6.43	7.12	6.97	6.38	6.38
CLOGRA	5.16	5.97	7.03	6.50	6.17	6.17
GRASS	5.05	5.80	6.17	6.74	5.94	5.94
ARABLE	5.04	6.21	6.91	7.03	6.30	6.30
RESEEDED	5.62	6.83	7.23	6.74	6.60	6.60
MEAN	5.18	6.25	6.89	6.80	6.28	6.28

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.235	0.180	0.421
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: ROTATION			0.403

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.235	3.7
BLOCK.WP.SP	15	0.403	6.4

GRAIN MEAN DM% 86.9

PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2

WHEAT 8TH TEST CROP CEREAL 7

GRAIN TONNES/HECTARE

HIGHFIELD

*** TABLES OF MEANS ***

	N75	75	126	176	226	MEAN
ROTATION						
LUCERNE		5.21	6.51	6.57	6.34	6.16
CLOGRA		5.91	6.58	6.81	6.27	6.39
GRASS		5.17	6.22	6.26	6.38	6.01
ARABLE		5.44	6.01	6.85	6.28	6.15
RESEDED		5.69	7.07	6.65	6.60	6.50
OLDGRASS		5.89	6.79	7.17	6.47	6.58
MEAN		5.55	6.53	6.72	6.39	6.30

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.159	0.133	0.324
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: ROTATION			0.326

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.159	2.5
BLOCK.WP.SP	18	0.326	5.2

GRAIN MEAN DM% 86.8

SUB PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2

WHEAT 8TH TEST CROP CEREAL 7

GRAIN TONNES /HECTARE

FCS TERS

*** TABLES OF MEANS ***

	N75	75	126	176	225	MEAN
ROTATION						
LUCERNE		5.31	6.23	6.85	6.90	6.32
CLOGRA		4.65	6.35	6.68	6.57	6.06
GRASS		4.48	5.34	6.27	6.78	5.72
ARABLE		4.11	5.77	6.77	6.95	5.90
RESEEDED		5.63	6.72	6.90	7.14	6.60
MEAN		4.84	6.08	6.69	6.87	6.12

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.393	0.151	0.490
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
ROTATION			0.337

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.393	6.4
BLOCK.WP.SP	15	0.337	5.5

GRAIN MEAN DM% 86.5

PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2

WHEAT 10TH TEST CROP CEREAL 8

GRAIN TONNES/HECTARE

HIGHFIELD

*** TABLES OF MEANS ***

	N75	75	126	176	225	MEAN
ROTATION						
LUCERNE		5.26	6.50	6.61	6.36	6.18
CLOGRA		5.97	6.58	5.90	5.39	5.96
GRASS		5.28	6.22	6.32	6.43	6.06
ARABLE		5.50	6.01	6.91	6.33	6.19
RESEEDED		5.75	7.09	6.68	6.57	6.52
OLDGRASS		5.96	6.77	6.18	6.51	6.36
MEAN		5.62	6.53	6.44	6.26	6.21

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.255	0.189	0.475
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: ROTATION			0.463

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.255	4.1
BLOCK.WP.SP	18	0.463	7.5

GRAIN MEAN DM% 87.3

SUB PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2

WHEAT 10TH TEST CROP CEREAL 8

GRAIN TONNES/HECTARE

FOSTERS

*** TABLES OF MEANS ***

	N75	75	126	176	225	MEAN
ROTATION						
LUCERNE		2.64	3.56	5.45	5.71	4.34
CLOGRA		3.47	4.06	6.11	5.99	4.91
GRASS		3.83	5.52	6.33	6.32	5.51
ARABLE		2.74	5.16	6.25	6.09	5.06
RESEEDED		3.90	4.71	5.90	6.07	5.15
MEAN		3.32	4.60	6.01	6.04	4.99

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.277	0.210	0.493
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:			
ROTATION			0.470

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.277	5.6
BLOCK.WP.SP	15	0.470	9.4

GRAIN MEAN DM% 87.3

PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2

WHEAT 11TH TEST CROP CEREAL 9

GRAIN TONNES/HECTARE

HIGHFIELD

*** TABLES OF MEANS ***

	N75	75	126	176	226	MEAN
ROTATION						
LUCERNE		4.24	5.19	5.87	5.83	5.28
CLOGRA		4.57	5.53	5.88	5.57	5.39
GRASS		4.69	5.56	5.72	5.58	5.39
ARABLE		4.50	5.56	6.11	5.60	5.44
RESEDED		5.39	6.26	6.67	6.58	6.23
OLDGRASS		5.60	6.34	6.58	6.34	6.22
MEAN		4.83	5.74	6.14	5.92	5.66

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.451	0.139	0.539
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: ROTATION			0.341

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	5	0.451	8.0
BLOCK.WP.SP	18	0.341	6.0

GRAIN MEAN DM% 86.7

SUB PLOT AREA HARVESTED 0.00663

75/R/RN/1 AND 75/R/RN/2
 WHEAT 11TH TEST CROP CEREAL 9
 GRAIN TONNES/HECTARE
 FOSTERS

*** TABLES OF MEANS ***

	N75	75	126	176	225	MEAN
ROTATION						
LUCERNE		4.35	4.75	5.11	7.08	5.32
CLOGRA		4.10	4.73	5.00	5.92	4.94
GRASS		4.11	5.16	6.35	6.57	5.55
ARABLE		4.11	4.71	5.77	6.53	5.28
RESEEDED		4.96	5.84	6.86	7.00	6.17
MEAN		4.33	5.04	5.82	6.62	5.45

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	ROTATION	N75	ROTATION N75
SED	0.379	0.309	1.063
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: ROTATION			0.691

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	4	0.879	16.1
BLOCK.WP.SP	15	0.691	12.7

GRAIN MEAN DM% 86.5

PLOT AREA HARVESTED 0.00663

75/R/RN/1 and 75/R/RN/2

DRY MATTER: TONNES/HECTARE

OLD GRASS

TOTAL OF 3 CUTS

C N

HIGHFIELD

27th Exptl year

Blocks 1 & 4

Block 2

3.06

2.84

7.50

8.81

SPRING OATS

TONNES/HECTARE

HIGHFIELD

GRAIN

STRAW

3.08

3.21

Mean D.M. %

86.8

91.8

FOSTERS

GRAIN

STRAW

2.88

3.46

Mean D.M. %

86.8

94.2

75/R/RN/1 and 75/R/RN/2

DRY MATTER: TONNES/HECTARE

	HIGHFIELD Mean		FOSTERS Mean	
LUCERNE				
	TOTAL OF 3 CUTS			
3rd year	10.69		13.67	
	ALL GRASS LEY			
	TOTAL OF 3 CUTS			
3rd year	6.97		6.71	
	CICVER-GRASS LEY			
	TOTAL OF 3 CUTS			
3rd year	4.98		4.42	
	RESEEDED GRASS			
	TOTAL OF 3 CUTS			
	HIGHFIELD		FOSTERS	
	Blocks	RC	Blocks	RC
27th Exptl year	1 & 4	3.03	1 & 3	4.20
27th Exptl year (Seeded 1949 Reseeded 1973)	2 & 3	5.46	2 & 4	5.18