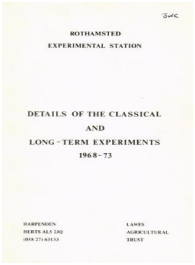
ROTHAMSTED RESEARCH

Details of the Classical and Long-term Experiments 1968-73



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

Rothamsted Research

Rothamsted Research (1977) *W/RN/3 Ley/ARABLE - Leys, Barley, Potatoes, Wheat, Rye, Carrots ;* Details Of The Classical And Long-Term Experiments 1968-73, pp 44 - 49 **- DOI: https://doi.org/10.23637/ERADOC-1-193**

LEY-ARABLE ROTATION
WOBURN, STACKYARD FIELD
(W/RN/3)

This experiment, which was started in 1938, was designed to test the effects on soil fertility of a three-year grazed ley, three years of lucerne and a three course arable rotation including one year hay in comparison with a rotation without leys measured by the yields of two successive test crops. *(Details 1967,* pp. 105-114).

Large differences in the yields of potatoes grown in contrasting conditions in 1966 led to the introduction of a number of studies in soil pathogens. Initially the tests were applied to the treatment crops of potatoes but in 1971 potatoes were re-introduced as the first test crop. A number of other changes were made including the substitution of S123 red clover for sainfoin which had often failed to survive three years. These are summarised below and set out in detail in table 2.

Treatment crops

	1st year	2nd year	3rd year
Ley (L)	Grazed to 1968 Cut from 1969	Grazed to 1968 Cut from 1969	Grazed to 1969 Cut from 1970
Sainfoin (cut) (S)	Till 1971	Till 1971	Till 1971
S123 Clover (cut (C1))	1972–	Sown July 1971	Sown July 1971
Arable (roots) (A)	Potatoes (P)	1968-71 Rye (R) 1972 – Barley (B)	1968-71 Carrots (C) 1972 – Barley
Arable (hay) (AH)	Potatoes	1968-71 Rye 1972 – Barley	Hay* (H)

*the seeds were undersown in the preceding cereals in some seasons.

Test crops

	1st	2nd
1968-70	Barley	Barley
1971	Potatoes	Barley
1972 & 1973	Potatoes	Wheat

Treatments

(i) *Potatoes*

(a) *Treatment crops*

1968 None v. thiram (approx. 8 kg a.i.) applied to tuber

NOTE: Thiram-dressed seed was chitted, untreated seed was not chitted (on 1/24 plots)

1968-70 (a) None v. 448 kg chloropicrin (on ¼ plots)
(b) 125 v. 188 v. 251 kg N (on 1/12 plots)

1969 & 1970 None v. 11 kg aldicarb (on 1/24 plots)

1972 None v. 448 kg chloropicrin plus 5.6 kg aldicarb (on 1/4 plots)

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1973 None v. 448 kg chloropicrin plus 6.7 kg aldicarb (applied also in error to the 1/4 plots of the 1st year ley and 1st year clover on 'alternating' rotations.

(b) *Test crops* (Note: FYM no longer applied to test crop)

1971 None v. 448 kg chloropicrin plus 11.2 kg aldicarb
Varieties: Maris Piper v. Pentland Crown
On 1/2 plots after ley and sainfoin and 1/4 plots after arable and arable with ley (1971 only; other years Maris Piper only).

1972 & 1973 None v. 448 chloropicrin plus:
1972 5.6 kg aldicarb,
1973 6.7 kg aldicarb.

(ii) *Other test crops*

(a) Barley as first test crop 1968-70 (on 1/8 plots) after A and AH rotations: 50 v. 100 v. 150 v. 200 kg N. After L and S rotations: 0 v. 50 v. 100 v. 150 kg N.

(b) Wheat as second test crop 1972 and 73. (on 1/8 plots) 0 v. 63 v. 126 v. 188 kg N.

Residual effects of the farmyard manure applied prior to 1968 and of fumigants from 1968 have been tested in a number of crops as shown in Table 2.

Table 2
Cropping Sequences and Residuals Tested

Phase 1

	Continuous				Alternating rotations		
1967	L1	S1	P	P	P	L1	S1
1968	L2	S2+	R+	R+	R+	L2	S2+
1969	L3	S3	H	C	H	C	L3	S3
1970				BARLEY+			
1971				BARLEY			
1972	L1	Cl1	P*+	P*+	Cl1	L1	P*+	P*+
1973	L2	Cl2	B+F	B+F	Cl2	L2	B+F	B+F

NOTES: (1) FYM at 38 t last applied to 1st test crop (Sugar beet) 1965
Residual effect measured in crops marked (+)
(2) Fumigant test applied to potato crops (*)
Residual effect measured in crops marked (F)

Phase 2

	Continuous				Alternating rotations		
1967	L2	S2	R	R	R	R	S2	L2
1968	L3	S3+	H+	C+	C+	H+	S3+	L3
1969				BARLEY+			
1970				BARLEY			
1971	L1	S/C1	P+	P+	S/C1	L1	P+	P+
1972	L2	C12	B	B	C12	L2	B	B
1973	L3	C13	H	B+	C13	L3	B+	H

NOTES: (1) FYM at 38 t last applied to 1st test crop (Sugar beet) 1964
Residual effect measured in crops marked (+)

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Phase 3

		Continuous			Alternating rotations			
1967				BARLEY				
1968	L1	S1+	P*	P*	S1+	L1	P*	P*
1969	L2	S2	R+F	R+F	S2	L2	R+F	R+F
1970	L3	S3	H	C+F	S3	L3	H	C+F
1971				POTATOES+*				
1972				WHEAT+F				
1973	L1	C11	P*+	P*+	P*+	P*+	C11	L1

NOTES: (1) FYM at 38 t last applied to 1st test crop (Sugar beet) 1966
Residual effect measured in crops marked (+)
(2) Fumigants applied to potatoes (*)
Residual effect measured in crops marked (F)

Phase 4

		Continuous			Alternating rotations			
1967	L3	S3	H	C	H	C	L3	S3
1968				BARLEY+				
1969				BARLEY				
1970	L1	S1	P*+	P*+	S1	L1	P*+	P*+
1971	L2	S2/C1	R+F	R+F	S2/C1	L2	R+F	R+F
1972	L3	C13	H	B	C13	L3	B	H
1973				POTATOES*+				

NOTES: (1) FYM at 38 t last applied to 1st test crop (Sugar beet) 1963
Residual effect measured in crops marked (+)
(2) Fumigants applied to potatoes (*)
Residual effect measured in crops marked (F)

Phase 5

		Continuous			Alternating rotations			
1967				SUGAR BEET				
1968				BARLEY+				
1969	L1	Sl	P*+	P*+	S1	L1	P*+	P*+
1970	L2	S2	R+F	R+F	S2	L2	R+F	R+F
1971	L3	S3	H	C+F	S3	L3	C+F	H
1972				POTATOES*+				
1973				WHEAT+F				

NOTES: (1) FYM at 38 t last applied to 1st crop (Sugar beet) 1967
Residual effect measured in crops marked (+)
(2) Fumigant test applied to potato crops (*)
Residual effect measured in crops marked (F)

Standard manurial dressings (kg)

Treatment crops

	N	P_2O_5	K_2O	Material	Application
Potatoes					
1968-70	–	115	225	(0-14-28)	On the flat
1971–	251	251	387	(13-13-20)	On the flat

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Rye					
1968	75	40	75	'N-Chalk, & (0-14-28)	Top-dressed combine drilled
1969–	40	40	75	'N-Chalk' & (0-14-28)	Top-dressed combine drilled
Barley					
1972–	63	63	63	(15-15-15)	Combine drilled
Carrots					
1968-71	75	75	225	'N-Chalk', Super & Muriate	Seedbed
One year ley (hay)					
1968	125	75	150	'N-Chalk' & (0-14-28)	In spring
	75	–	75	(16-0-16)	After 1st cut
1969-73	Spring dressing as 1968				
	75	–	50	(25-0-16)	After 1st cut
Ley–first year					
1968-73	50	188	125	'N-Chalk', Super & Muriate	Seedbed
1968 (grazed)	75	–	75	(16-0-16)	1 top dressing
1969, 1970, 1972 & 1973 (cut)	100	–	63	(25-0-16)	2 dressings
1971 (cut)	50	–	32	(25-0-16)	1 dressing
	N	P_2O_5	K_2O	Material	Application
Ley-second & third years					
1968 (cut) 2nd year	100	–	100	(16-0-16)	2 dressings
1969 (cut) 3rd year	100	--	63	(25-0-16)	2 dressings
1969 (grazed) 2nd & 3rd year	150	–	93	(25-0-16)	3 dressings
1970-73 (cut)	150	–	93	(25-0-16)	3 dressings
Sainfoin 1st year					
1968-71	63	188	126	'N-Chalk', Super & Muriate	Seedbed
2nd & 3rd year					
1968-71	63	–	188	'N-Chalk' & Muriate	1 dressing
Clover					
1st year 1972	63	188	126	'N-Chalk,' Super & Muriate	To Seedbed
2nd & 3rd years					
1972–	63	–	188	'N-Chalk' & Muriate	1 dressing

Magnesium sulphate (as Epsom salts) was applied to first treatment crops in the seedbed:–

1968 and 1969	620 kg (62 kg Mg)
1970	375 kg (37 kg Mg) – the smaller quantity applied in error.

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Test crops	N	P_2O_5	K_2O	Material	Application
Barley – 1st test					
1968-70	–	63	63	(0-20-20)	Seedbed
Barley – 2nd test					
1968	75	40	0	'N-Chalk' & Super	Seedbed
1969-71	63	63	63	(15-15-15)	Seedbed
Potatoes – 1st test					
1971-73	250	250	385	(13-13-20)	Seedbed
Wheat – 2nd test					
1972-73		60	60	(0-20-20)	Seedbed

Table 3

Corrective K dressings (kg K_2O) applied to first test crop as muriate of potash, half before ploughing and half after

Continuous rotations	1968		1969		1970		1971		1972		1973	
	O	D	O	D	O	D	O	D	O	D	O	D
Leys (L)	0	126	188	0	200	0	126	126	251	251	502	502
Sainfoin (S) (Clover from 1972 (C1))	377	377	439	314	439	377	126	126	0	0	126	126
Arable with hay (AH)	628	502	502	439	628	628	188	188	314	251	314	376
Arable (A)	251	251	377	377	377	251	0	0	314	314	439	439

Alternating rotations (Last two rotations in order)

	1968			1969			1970	
	O	D		O	D		O	D
AH/L	0	63	A/L	251	251	AH/L	251	63
A/S	628	377	AH/S	377	251	A/S	439	314
L/AH	628	377	LU/AH	502	502	L/AH	502	502
LU/A	628	377	L/A	377	377	LU/A	439	439

	1971			1972			1973	
	O	D		O	D		O	D
A/L	188	439	A/L	439	376	L/A	439	439
AH/S	126	126	H/C1	126	126	S/AH	439	502
L/AH	63	63	L/AH	251	251	A/L	502	502
S/A	188	314	C/A	376	376	AH/C	251	0

O = No FYM half plots D = FYM half plots

Liming

Lime was applied in the autumn to the plots intended for the second test crop.

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1968	Ground Magnesium limestone at 5.6 t
1969	Ground Magnesium limestone at 5.0 t
1970	Ground Chalk at 5.0 t
1971-73	Ground Magnesium limestone at 5.0 t

Varieties

1968-70	Common Sainfoin	Maris Badger Barley	Maris Piper Potatoes	King II Rye	Autumn King Carrots
1971	S.123 Red Clover	Julia Barley	Maris Piper* Potatoes	King II Rye	Autumn King Carrots
1972 & 1973	S.123 Red Clover	Julia Barley	Maris Piper Potatoes	Capelle Wheat	

* Pentland Crown was also grown in the test crop plots.

Seeds mixtures

Hay 21 kg S.24 Perennial ryegrass,
10 kg Late flowering Red clover, 2 kg Alsike clover

Ley 22 kg S.23 Perennial ryegrass, 12 kg S.143 Cocksfoot,
7 kg Late flowering Red clover, 3 kg S.100 White clover.

Soil series Cottenham and Flitwick.

Reference

Johnston, A.E. (1973)
The effects of ley and arable cropping systems on the amounts of soil organic matter in the Rothamsted and Woburn ley arable experiments.
Rothamsted Experimental Station. Report for 1972, Part 2, 131-159.

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