



ROTHAMSTED
RESEARCH

Highfield Ley Arable cropping systems supplementary information 1949 onwards

DOI: <https://doi.org/10.23637/rrn1-HLAsupinfo-01>

Cite as: Blyth, F.J.E., Perryman, S.A.M and Glendining, M.J. (2023) Highfield Ley Arable cropping systems supplementary information 1949 onwards, *Electronic Rothamsted Archive, Rothamsted Research, Harpenden, UK*.

Published by: Electronic Rothamsted Archive, Rothamsted Research, Harpenden, Herts, AL5 2JQ, UK.

Date: August 2023

Description: Details of cropping treatments, plot layout, and grass/clover seed mixtures for the Highfield Ley Arable experiment since 1949. The site was previously in long-term grassland since at least 1838.

- **Page 1:** Cover page
- **Page 2:** Ley-arable cropping systems treatment code summary, test crop summary
- **Page 3:** Field plan 1949-1961 (Blocks 1-12)
- **Page 4:** Field plan 1962-1967 (Blocks 1-12)
- **Page 5:** Field plans 1968 onwards (Blocks 1-4 only)
- **Page 6:** Grass and grass/clover seed mixtures, 1949-1972
- **Page 7:** Grass and grass/clover seed mixtures, 1973 onwards

Site: R/RN/1. Highfield Ley Arable experiment, Rothamsted Experimental Farm, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2JQ, UK. Latitude 51.802777, Longitude -0.366025

Data sources:

- Rothamsted Experimental Station (1970) "Details of the Classical and Long-Term Experiments up to 1967", Rothamsted Experimental Station, Lawes Agricultural Trust, Harpenden UK, 128 pp
<https://doi.org/10.23637/ERADOC-1-192>
- Rothamsted (1977) "Details of the Classical and Long-Term Experiments 1968-1973", Rothamsted Experimental Station, Lawes Agricultural Trust, Harpenden UK, 77pp
<https://doi.org/10.23637/ERADOC-1-193>
- Yields of the Long-Term Experiments <https://www.era.rothamsted.ac.uk/eradoc/books/2>
- Highfield Ley-arable 1970-79, (1949-1990) Collection of Plans for the Highfield Ley-Arable Experiment - pp 22 – 31 <https://www.era.rothamsted.ac.uk/eradoc/article/PS-Highfield-Ley-Arable-22-31-4>
- Highfield Ley-arable 1980-90, (1949-1990) Collection of Plans for the Highfield Ley-Arable Experiment - pp 32 – 43 <https://www.era.rothamsted.ac.uk/eradoc/article/PS-Highfield-Ley-Arable-32-43>

Funding: The Rothamsted Long-Term Experiments - National Biosciences Research Infrastructure (RLTE-NBRI) is funded by the UK Research and Innovation – Biotechnology and Biological Sciences Research Council (UKRI-BBSRC) under award BBS/E/RH/23NB0007 (2023-2028). The RLTE-NBRI is also supported by the Lawes Agricultural Trust.

Licence and conditions of re-use:



These plans are published under [the Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/) licence. CC BY 4.00.

You are free to adapt, copy, redistribute these plans but must provide appropriate credit using the provided citation, including the DOI and indicate any changes made. You must not apply additional restrictions on the licence.

Highfield Ley-arable (R/RN/1) treatment codes summary

1949-1961	1962 ¹ -1990	1991-2008	2009-	Rotation type
G ²	Gn Gc	Gc	Gc	Permanent grass
R	Rn	Rc	Became R/CS/767 in 2009	Reseeded grass
	Rc			
	Rpn	Rpc	Became R/CS/767 in 2009	Reseeded grass
	Rpc			
Cg	Ln	Lc(Ln)	F	Ley-arable /Fallow
L	Lc	Lc(Lc)	Lc(Lc)	Ley-arable
Lu	Lu	Lc(Lu)	Al	Ley-arable /arable
A	A	A	Became R/CS/767 in 2009	Arable

¹ New rotations phased in between 1962 and 1967² at the end of the three year test cycles.

² In 1963 one pair of permanent grass plots was mistakenly ploughed and sown with wheat in 1964 before being returned to permanent grass in 1965. This is shown as [G], and was not divided for Gc v Gn treatments.

1949 - 1961

G	Permanent grass/clover from before the start of the experiment, left unchanged, grazed by sheep
R	Reseeded grass: reseeded at the start of experiment, grass/clover, left unchanged, grazed by sheep
Cg	Three year cut grass/clover ley followed by three arable test crops
L	Three year grazed grass/clover ley followed by three arable test crops
Lu	Three year lucerne ley cut for hay followed by three arable test crops
A	Three year arable treatment crops (hay, potatoes, barley, 1949-54, hay, potatoes, oats, 1955-60) followed by three arable test crops

1962- 1990

From 1968 onwards blocks 5-12 were turned over to continuous wheat to study soil-borne disease. The ley-arable experiment continued with blocks 1-4 only.

Gn	Permanent grass/clover (G) split into Gn and Gc in 1962. Grass with nitrogen, cut for silage.
Gc	Permanent grass/clover (G) split into Gc and Gn in 1962. Grass/clover, cut for silage
Rn	Reseeded grass (R) split into Rn and Rc in 1963. Grass with nitrogen, cut for silage (blocks 1 and 4)
Rc	Reseeded grass (R) split into Rn and Rc in 1963. Grass/clover, cut for silage (blocks 1 and 4)
Rpn	Reseeded grass ploughed in 1963, kept in arable rotation until 1973 when resown to grass plus nitrogen. Cut for silage(blocks 2 and 3)
Rpc	Reseeded grass ploughed in 1963, kept in arable rotation until 1973 when resown to grass/clover. Cut for silage (blocks 2 and 3)
Ln	Three year all-grass ley with nitrogen cut for silage, followed by three arable test crops
Lc	Three year grass/clover ley cut for silage, followed by three arable test crops
Lu	Three year lucerne ley cut for hay, followed by three arable test crops
A	Three year arable treatment crops (hay, sugar beet, oats), followed by three arable test crops

1991 - 2008

Gc	Permanent grass/clover from before the start of the experiment, cut for silage
Rc	Grass/clover reseeded at start of experiment, cut for silage (blocks 1 and 4)
Rpc	Grass/clover reseeded at start of experiment, ploughed in 1963, arable until 1973 when resown, cut for silage (blocks 2 and 3)
Lc(Ln)	Three year grass/clover ley cut for silage, followed by three arable test crops, previously Ln
Lc(Lc)	Three year grass/clover ley cut for silage, followed by three arable test crops
Lc(Lu)	Three year grass/clover ley cut for silage, followed by three arable test crops, previously Lu
A	Three arable treatment crops (wheat, fallow, oats), followed by three arable test crops

2009 -

Gc	Permanent grass/clover from before the start of the experiment, cut for silage
F	Permanent fallow (no crop) since autumn 2008. Previously Lc(Ln)
Lc(Lc)	Three year grass/clover ley cut for silage, followed by three arable test crops
Al	Three arable treatment crops (wheat, fallow, oats), followed by three arable test crops, previously Lc(Lu)
R/CS/767	Plots converted to Highfield Conversion Experiment, R/CS/767.
	For more information see https://www.era.rothamsted.ac.uk/experiment/rcs767

Highfield Ley-arable (R/RN/1) Test crop summary

Three years of Test crops grown after three years of Treatment crops in the arable and ley-arable rotations:

	1949-1967 ¹	1968-1974	1975-1982	1983 ² -2008	2009-
1st Test crop	W Wheat	Potatoes	Potatoes	W Wheat	W Wheat
2nd Test crop	Potatoes	W Wheat	W Wheat	W Wheat	W Wheat
3rd Test crop	S Barley	S Barley	W Wheat	W Wheat	W Wheat

¹ The original sequence, if started before 1968, was completed.

² From 1983 the test crops were all W Wheat (except W Barley 2003-2005).

No yields were taken after 1990

Data from Yield Books and Field Plans

Highfield (R/RN1) Ley-Arable Experiment

1949 - 1961

Note: Treatment cropping on the experiment was phased in over a period of 6 years, with the first treatment cropping occurring on blocks 2 and 3 in 1949.



133	135	137	139	141	143
Cg	G	A	R	Lu	L
134	136	138	140	142	144

Block 12

97	99	101	103	105	107	109	111	113	115	117	119
R	Cg	L	A	G	Lu	A	G	Lu	L	R	Cg
98	100	102	104	106	108	110	112	114	116	118	120

Block 9

Block 10

121	123	125	127	129	131
A	Cg	R	L	G	Lu
122	124	126	128	130	132

Block 11

49	51	53	55	57	59	61	63	65	67	69	71
Lu	L	G	Cg	A	R	Cg	Lu	L	A	G	R
50	52	54	56	58	60	62	64	66	68	70	72

Block 5

Block 6

73	75	77	79	81	83	85	87	89	91	93	95
G	L	R	A	Cg	Lu	Lu	R	A	G	L	Cg
74	76	78	80	82	84	86	88	90	92	94	96

Block 7

Block 8

01	03	05	07	09	11	13	15	17	19	21	23
G	Lu	R	Cg	A	L	R	L	Cg	A	Lu	G
02	04	06	08	10	12	14	16	18	20	22	24

Block 1

Block 2

25	27	29	31	33	35	37	39	41	43	45	47
L	A	Cg	R	G	Lu	Lu	R	A	Cg	L	G
26	28	30	32	34	36	38	40	42	44	46	48

Block 3

Block 4

50.60m

6.0m sown, centred on 7.01m

Highfield (R/RN1) Ley-Arable Experiment

1962 - 1967

Note: This new cropping sequence was introduced gradually over a period of 6 years as each experimental phase reached the end of its current cropping rotation.



133	135	137	139	141	143
Ln	G	A	R	Lu	Lc
134	136	138	140	142	144

Block 12 (sequence began in 1963)

97	99	101	103	105	107	109	111	113	115	117	119
R	Ln	Lc	A	G	Lu	A	G	Lu	Lc	R	Ln
98	100	102	104	106	108	110	112	114	116	118	120

Block 9 (sequence began in 1963)

121	123	125	127	129	131
A	Ln	R	Lc	G	Lu
122	124	126	128	130	132

Block 11 (sequence began in 1966)

49	51	53	55	57	59	61	63	65	67	69	71
Lu	Lc	G	Ln	A	R	Ln	Lu	Lc	A	G	R
50	52	54	56	58	60	62	64	66	68	70	72

Block 5 (sequence began in 1962)

Block 6 (sequence began in 1965)

73	75	77	79	81	83	85	87	89	91	93	95
G	Lc	R	A	Ln	Lu	Lu	R	A	G	Lc	Ln
74	76	78	80	82	84	86	88	90	92	94	96

Block 7 (sequence began in 1965)

Block 8 (sequence began in 1962)

01	03	05	07	09	11	13	15	17	19	21	23
G	Lu	R	Ln	A	Lc	R	Lc	Ln	A	Lu	G
02	04	06	08	10	12	14	16	18	20	22	24

Block 1 (sequence began in 1964)

Block 2 (sequence began in 1967)

25	27	29	31	33	35	37	39	41	43	45	47
Lc	A	Ln	R	[G]	Lu	Lu	R	A	Ln	Lc	G
26	28	30	32	34	36	38	40	42	44	46	48

Block 3 (sequence began in 1967)

Block 4 (sequence began in 1964)

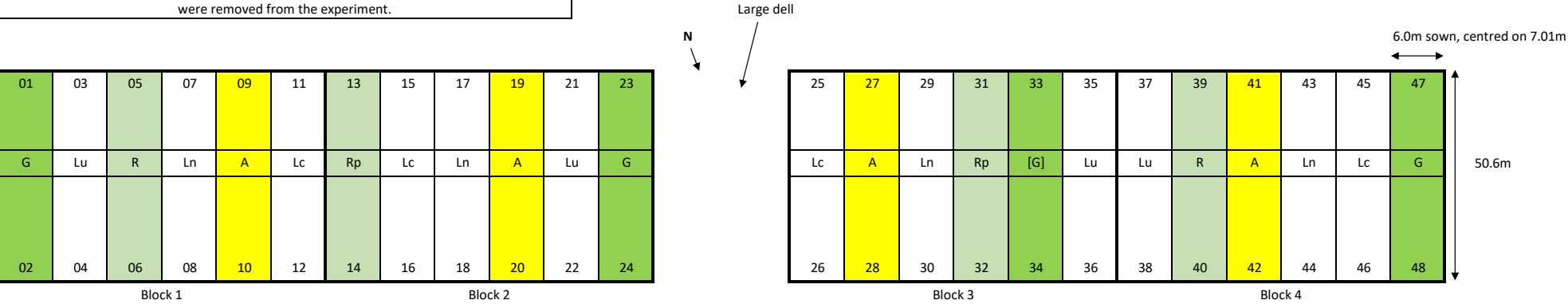
50.60m

6.0m sown, centred on 7.01m

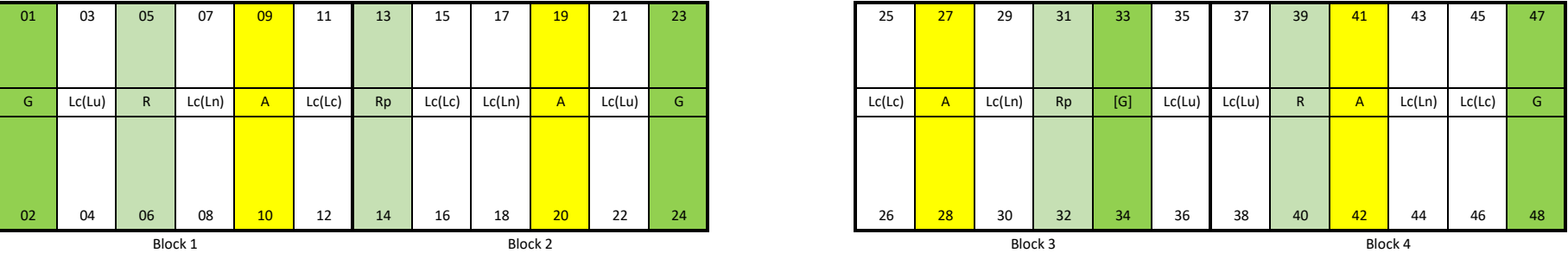
Highfield (R/RN1) Ley-Arable Experiment

1968-1990

Note: Between 1968 and 1972, blocks 5-12 were allowed to finish their existing 6 year cycle, then were removed from the experiment.

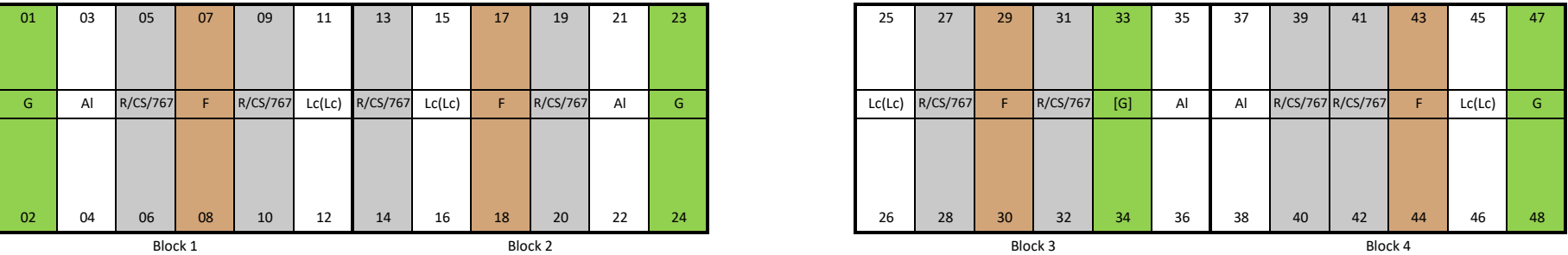


1991-2008



2009-

Note: Plots marked as R/CS/767 were turned over to the Highfield Reversion Experiment in 2009 and are no longer part of the Highfield Ley-arable experiment



Highfield Ley-arable grass and grass/clover seed mixtures, 1949-1972

Ley	Symbol	Species	Proportion
Cut grass	Cg	Italian Ryegrass	21%
		Cocksfoot S.26	57%
		White Clover S.100	14%
		Alsike Clover	7%
Grazed ley	L	Italian Ryegrass	13%
		Perennial Ryegrass S.23	20%
		Perennial Ryegrass Kent Indigenous	20%
		Cocksfoot S.26	10%
		Cocksfoot S.143	10%
		Timothy S.48	5%
		Timothy S.50	5%
		Late Flowering Red Clover	15%
		New Zealand White Clover	1%
Grass-clover	Lc	Kent Indigenous White Clover	1%
		Timothy S.51	42%
		Meadow Fescue S.215	50%
All-grass	Ln	White Clover S.100	8%
		Timothy S.51	45%
One-year hay	H	Meadow Fescue S.215	55%
		Perennial ryegrass S.24	64%
		Red Clover S.123	29%
Reseeded grass (only sown in 1949, 1950 and 1951)	R, Rh, RS	Canadian Alsike	7%
		Italian Ryegrass	13%
		Perennial Ryegrass S.23	20%
		Perennial Ryegrass Kent Indigenous	20%
		Cocksfoot S.26	10%
		Cocksfoot S.143	10%
		Timothy S.48	5%
		Timothy S.50	5%
		Late Flowering Red Clover	15%
		New Zealand White Clover	1%
		Kent Indigenous White Clover	1%

Data sources:

Rothamsted Experimental Station (1970) "Details of the Classical and Long-Term Experiments up to 1967", Rothamsted Experimental Station, Lawes Agricultural Trust, Harpenden UK, 128 pp
 DOI: <https://doi.org/10.23637/ERADOC-1-192>

Rothamsted Experimental Station (1977) "Details of the Classical and Long-Term Experiments 1968-1973", Rothamsted Experimental Station, Lawes Agricultural Trust, Harpenden UK, 77pp
 DOI: <https://doi.org/10.23637/ERADOC-1-193>

Highfield Ley-arable grass and grass/clover seed mixtures, 1973-1990

Ley	Symbol	Species	Proportion	Years used
Grass-clover	Lc	Timothy S.51	42%	1973 - 1978
		Meadow Fescue S.215	50%	
		White Clover S.100	8%	
		Meadow Fescue S.215	50%	1979 - 1981
		Timothy Erecta RvP	40%	
		New Zealand White Clover Huia	10%	
		Meadow Fescue S.215	40%	1982 - 1987
		Timothy Climax	50%	
		New Zealand White Clover Huia	10%	
		Meadow Fescue	44%	1988 - 1990
		Timothy Climax	44%	
		White Clover	12%	
All-grass	Ln	Timothy S.51	45%	1973 - 1978
		Meadow Fescue S.215	55%	
		Meadow Fescue S.215	50%	1979 - 1981
		Timothy Erecta RvP	50%	
		Meadow Fescue S.215	50%	1982 - 1990
		Timothy Climax	50%	
One-year hay	H	Italian Ryegrass	100%	1973 - 1987
		Londras Westerwolths Ryegrass	100%	1988
Reseeded grass (only sown in 1973)	Rp	Timothy S.51	42%	1973
		Meadow Fescue S.215	50%	
		White Clover S.100	8%	

Note 1: All seed mixes were only planted in the following years: 1973, 1976, 1979, 1982, 1985, 1988. This was done to coincide with the beginning of a new treatment cycle.

Note 2: In 1988, the seed mix for clover grass is shown as being planted at 37kg despite the constituent seed quantities only adding up to 9kg. The proportions listed above are those from the constituent seed quantities.

Note 3: No data on grass/clover seed mixtures is available after 1990.

Data sources:

Yields of the Long Term Experiments

<https://www.era.rothamsted.ac.uk/eradoc/books/2>

Highfield Ley-arable 1970-79, (1949-1990) Collection of Plans for the Highfield Ley-Arable Experiment - pp 22 - 31

<https://www.era.rothamsted.ac.uk/eradoc/article/PS-Highfield-Ley-Arable-22-31-4>

Highfield Ley-arable 1980-90, (1949-1990) Collection of Plans for the Highfield Ley-Arable Experiment - pp 32 - 43

<https://www.era.rothamsted.ac.uk/eradoc/article/PS-Highfield-Ley-Arable-32-43>