

The Woburn Ley-arable experiment cropping sequence 1938 - 2020

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Date: November 2021, updated November 2022 to include rotation database, with different crops and cultivars

Description: Details of the arable and ley rotation sequences in each of the five Blocks, and the different treatment crops, 1938-2020.

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- Page 2: Generic plan showing plot and block layout and dimensions
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Site: W/RN/3. Stackyard field, Woburn Experimental Farm, Husborne Crawley, Woburn, Bedfordshire, UK. Geographic location: 51.99906, -0.61673

Derived from:

- Rothamsted Experimental Station (1966) Details of the Classical and Long-term experiments up to 1962. Lawes Agricultural Trust, Harpenden. pp. 87 https://doi.org/10.23637/ERADOC-1-191
- 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 Experimental Station (1978) *Details of the Classical and Long-term experiments 1968-73*. Lawes Agricultural Trust, Harpenden. pp. 77 https://doi.org/10.23637/ERADOC-1-193
- Johnston, A.E., Poulton, P.R., Coleman, K., Macdonald, A.J. & White, R.P. (2017) Changes in soil organic matter over 70 years in continuous arable and ley-arable rotations on a sandy loam soil in England. European Journal of Soil Science, 68, 305-316. https://doi.org/10.1111/ejss.12415

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Generic plan of the Woburn Ley-arable experiment

_	North	5.18 m		1.37 m 19.66 m ─	→
01	02		03	04	
d	-		-	d	
05	06		07	08	
d	-	Block	-	d	34.90 m
09	10	I	11	12	
-	d	Starts	d	-	
13	14	1942	15	16	
d	-		-	d	↓
					← 2.13 m
17	18		19	20	
-	d		-	d	
21	22		23	24	
d	-	Block	-	d	
25	26	II	27	28	♦ 8.53 m
d	-	Starts	-	d	\
29	30	1941	31	32	
-	d		-	d	
33	34		35	36	
d	-		d	-	✓ 0.25 m
37	38		39	40	
-	d	Block		-	183.02 1
41	42	III	43	44	
-	d	Starts	-	d	
45	46	1938	47	48	
-	d		-	d	
49	50		51	52	
d	-		-	d	
53	54		55	56	
-	d	Block		d	
57	58	IV	59	60	
d	-	Starts	d	-	
61	62	1940		64	
-	d		d	-	
	1-2			50	
65	66		67	68	
-	d		d	-	
69	70	P1 1	71	72	
- 72	d	Block	-	d	
73	74	V	75	76	
<u>d</u>	- 70		d	-	
77	78	1939	79	80	
d	-			d 40.69 m	<u> </u>
				40 69 m	

d = plots receiving dung (FYM) every five years until the mid-1960s.

Woburn Ley-arable Treatment codes summary

Rotation ²	1938-42	1964-67	1971-74		1973-77	1978-82	1998-2002		2007	2008-12
Continuous rotations	Ar				AF		AM			АО
	Ah				AB		ABe			ABe*
	L				Ln3					Ln3
	Lu	S	CL		Lc3					Lc3
Alternating rotations	Ar/Lu	Ar/S	Ar/CL	1st cycle 8-yr leys	LLn8			8-yr leys stopped	LLn/AO	
	Ah/L				LLc8				LLc/ABe*	
	Lu/Ar	S/Ar	CL/Ar	2nd cycle 8-yr leys		LLn8		8-yr leys stopped		LLn/Ln3
	L/Ah					LLc8				LLc/Lc3

¹Date started showed as a range, as changes to cropping generally phased in over five years, starting with Block III, followed by Blocks V, IV, II and I The exception is when the 1st cycle 8-yr leys stopped and all changed to continuous arable (AO or ABe) in 2007.

1938-1974

Continuous rotations

Ar three arable Treatment crops, including one year root crop, followed by two arable Test crops

Ah three arable Treatment crops, including one year hay, followed by two arable Test crops

L three year grazed grass-clover ley Treatment crops, followed by two arable Test crops.

Lu three year lucerne ley Treatment crops, followed by two arable Test crops. Lu (lucerne) then S (sainfoin) 1964-67 then CL (red clover ley) 1971-74

The Alternating Rotations were designated as either Ar/Lu, Ah/L, Lu/Ar or L/Ah according to the order in which the first six Treatment crops appeared.

They alternated between the two arable and two ley-arable rotations, eg Ar, Lu, Ah, L, taking 20 years to complete the cycle.

1973-2002

AF (replaced Ar); two years fallow and one arable Treatment crop, followed by two arable Test crops. This changed to **AM**

AB (replaced Ah); three arable Treatment crops, followed by two arable Test crops. This changed to **ABe**;

Ln3 (replaced L); three year grass ley with N Treatment crops, followed by two arable Test crops.Lc3 (replaced Lu); three year grass/clover ley Treatment crops, followed by two arable Test crops.

AM (replaced AF); three years arable Treatment crops, R, BE, M followed by two arable Test crops. This changed to AO

ABe (replaced AB): three years arable Treatment crops R, M, BE followed by two arable Test crops.

The Aternating Rotations were changed completely so that the effects of eight year leys on the subsequent arable Test crops could be included.

So that this could be tested every five years (as with the Continuous Rotations) changes to two of the four Alternating Rotations were phased in from 1973 on Block III (and in subsequent years on Blocks V, IV, II and I; **1st cycle**);

and two were phased in from 1978 on Block III (and in subsequent years on Blocks V, IV, II and I; 2nd cycle).

tlc8 1st cycle (replaced Ar/Lu); eight year grass ley with N Treatment crops, followed by two arable Test crops. (replaced Ah/L); eight year grass/clover ley Treatment crops, followed by two arable Test crops. (replaced Lu/Ar); eight year grass ley with N Treatment crops, followed by two arable Test crops. (replaced L/Ah); eight year grass/clover ley Treatment crops, followed by two arable Test crops.

2007 onwards:

AO (replaced AM): three years arable Treatment crops, R, BE, O, followed by two arable Test crops. Oats (O) replaced Maize (M) as a treatment crop

* Oats (O) replaced maize (M) as a treatment crop from 2008 but the same code (ABe) was retained.

The 8-year leys were all stopped from 2007:

LLn/AO (replaced LLn8 1st cycle) into continuous arable with oats in 2007
LLC/ABe (replaced LLc8 1st cycle) into continuous arable with beans in 2007
LLn/Ln3 (replaced LLn8 2nd cycle) into 3-year grass leys with nitrogen from 2008
LLc/Lc3 (replaced LLc8 2nd cycle) into 3-year gass/clover leys from 2008

²At the start of the experiment, plots were in either Continuous Rotations or Alternating Rotations.

W/RN/3 Woburn Ley-Arable Cropping 1938-2020

The experiment began in 1938 but was "phased-in" so the 1st Test crops following the various Treatment crops were on Block III in 1941, Block V in 1942, Block IV in 1943, Block II in 1944 and Block I in 1945 Changes/exceptions to cropping are given in the footnotes below.

										1st Test					1st Test				ĺ	1st Test	2nd Test				1st 2n Test Te				1st Test	2nd Test				1st Test	2nd Test				1st Test	2nd Test
	_						Treat	ment c	rops	crop	crop	Treat	ment cr	ops	crop	crop	Treat	ment c	rops	crop	crop	Treat	ment cr	ops	crop cro	p Tre	eatment	crops	crop	crop	Treati	ment cr	ps	crop	crop	Treat	ment cr	ops	crop	crop
Block	Rotat	ion'	Plots																																					
			- / D ²			i																				_														
3								1939	1940				1944 1		1946		1948						1954 1		1956 195		8 1959		1961			1964 1		1966			1969 1		1971	
III ³	Cont. Rtns	Ar	40/39			1	P	W	K	P	В	P		SBe	P	В	P P		SBe	P	В	P			SBe B		R	C	SBe	В	P			SBe	В	P	R	С	P	W
		Ah	45/46				P	W	Н	P	В	P	W	Н	P	В		R	Н	P	В	P			SBe B		R	Н	SBe	В	P			SBe	В	P	R	Н	P	W
		L	43/44			1	L1	L2	L3	P	В	L1		L3	Р	В	L1	L2	L3	Р	В	L1			SBe B	L1		L3	SBe	В	L1			SBe	В	L1		L3	Р	w
		Lu	34/33			1	Lu1	Lu2	Lu3	Р	В	Lu1		_u3	Р	В	Lu1		Lu3	Р	В				SBe B			Lu3	SBe	В				SBe	В	S1		S3	Р	W
	Alter. Rtns	Ar/Lu	36/35				Р	W	K	Р	В			_u3	Р	В	P	R	Н	Р	В	L1			SBe B	Р		Н	SBe	В				SBe	В	Р	R	С	Р	w
		Ah/L	47/48				Р	W	Н	Р	В	L1		L3	Р	В	Р		SBe	Р	В				SBe B			С	SBe	В	L1			SBe	В	Р	R	Н	Р	w
		Lu/Ar	37/38				Lu1	Lu2	Lu3	Р	В	Р		SBe	Р	В	L1	L2	L3	Р	В	Р			SBe B			Lu3	SBe	В	Р			SBe	В	L1		L3	P	w
		L/Ah	41/42				L1	L2	L3	Р	В	Р	W	Н	Р	В	Lu1	Lu2	Lu3	Р	В	Р	R S	SBe	SBe B	L1	L2	L3	SBe	В	Р	R	H :	SBe	В	S1	S2	S3	Р	W
						1938	1939	1940	1941	1942	1943	1944	1945 1	946	1947	1948	1949	1950	1951	1952	1953	1954	1955 1	1956 1	1957 195	8 195	9 1960	1961	1962	1963	1964	1965 1	966 1	1967	1968	1969	1970 1	1971	1972	1973
V	Cont. Rtns	Ar	74/73			В	Р	W	K	Р	В	Р	w s	SBe	Р	В	Р	R	SBe	Р	В	Р	R	С	SBe B	P	R	C	SBe	В	Р	R	c :	SBe	В	Р	R	С	Р	w
		Ah	68/67			В	Р	W	н	Р	В	Р	W	н	Р	В	Р	R	н	Р	В	Р	R	н	SBe B	P	R	н	SBe	В	Р	R	н :	SBe	В	Р	R	н	Р	w
		L	65/66			В	L1	L2	L3	Р	В	L1	L2	L3	Р	В	L1	L2	L3	Р	В	L1	L2	L3	SBe B	L1	L2	L3	SBe	В	L1	L2	L3 :	SBe	В	L1	L2	L3	Р	w
		Lu	79/80			В	Lu1	Lu2	Lu3	Р	В	Lu1	Lu2	u3	Р	В	Lu1	Lu2	Lu3	Р	В	Lu1	Lu2 I	Lu3	SBe B	Lu	1 Lu2	Lu3	SBe	В	S1	S2	S3 :	SBe	В	S1	S2	F	Р	w
	Alter. Rtns	Ar/Lu	71/72			В	Р	W	Н	Р	В	Lu1	Lu2	u3	Р	В	Р	R	SBe	Р	В	L1	L2	L3	SBe B	Р	R	Н	SBe	В	S1	S2	S3 :	SBe	В	Р	R	С	Р	w
		Ah/L	76/75			В	Р	W	K	Р	В	L1	L2	L3	Р	В	Р	R	н	Р	В	Lu1		Lu3	SBe B	Р	R	С	SBe	В	L1	L2	L3 :	SBe	В	Р	R	Н	Р	w
		Lu/Ar	69/70			В	Lu1	Lu2	Lu3	Р	В	Р	W	Н	Р	В	L1	L2	L3	Р	В	Р	R	С	SBe B	Lu	1 Lu2	Lu3	SBe	В	Р	R	н :	SBe	В	L1	L2	L3	Р	w
		L/Ah	78/77			В	L1	L2	L3	Р	В	Р	w s	SBe	Р	В	Lu1	Lu2	Lu3	Р	В	Р	R	Н	SBe B	L1	L2	L3	SBe	В	Р	R	C :	SBe	В	S1	S2	F	Р	w
						1																																		
						1939			1942	1943			1946 1		1948		1950	1951		1953			1956 1		1958 195		0 1961		1963			1966 1		1968			1971 1		1973	
IV	Cont. Rtns	Ar	64/63		Р	В	Р	W	K	Р	В	Р		SBe	Р	В	Р		SBe	Р	В	Р			SBe B		R	С	SBe	В	Р		C	В	В	Р	R	В	Р	W
		Ah	53/54		Р	В	Р	W	Н	Р	В	Р	W	Н	Р	В	Р	R	Н	Р	В	P			SBe B		R	Н	SBe	В	Р		Н	В	В	Р	R	Н	Р	w
		L	58/57		Р	В	L1	L2	L3	P	В	L1		L3	Р	В	L1	L2	L3	Р	В	L1			SBe B			L3	SBe	В	L1		L3	В	В	L1		L3	Р	W
		Lu	60/59		Р	В	Lu1	Lu2	Lu3	Р	В	Lu1		_u3	Р	В	Lu1		Lu3	Р	В				SBe B			Lu3	SBe	В	S1		S3	В	В			CL3	Р	w
	Alter. Rtns	Ar/Lu	51/52		P	В	Р	W	K	Р	В			_u3	Р	В	P	R	Н	Р	В	L1			SBe B		R	С	SBe	В	S1		S3	В	В	Р	R	Н	Р	W
	: :	Ah/L	50/49		Р	В	Р	W	Н	Р	В	L1		L3	Р	В	Р		SBe	Р	В				SBe B			H	SBe	В	L1		L3	В	В	Р	R	В	Р	W
		Lu/Ar	61/62		P		Lu1		Lu3	Р	В	P		SBe	P	В	L1	L2	L3	P	В	P			SBe B			Lu3	SBe	В	P			В	В	L1		L3	P	W
		L/Ah	55/56		Р	В	L1	L2	L3	Р	В	Р	W	Н	Р	В	Lu1	Lu2	Lu3	Р	В	Р	R	С	SBe B	L1	L2	L3	SBe	В	Р	R	Н	В	В	S1	CL2	CL3	Р	w
				193	8 1939	1940			1943	1944			1947 1		1949		1951	1952		1954			1957 1		1959 196		1 1962		1964		1966			1969	1970		1972 1		1974	
II	Cont. Rtns	Ar	19/20	В	P	В	Р	W	K	P	В	Р		SBe	Р	В	Р		SBe	Р	В	Р			SBe B	P	R	С	SBe	В	Р		C	В	В	P	В	В	Р	w
		Ah	17/18	В	P	В	Р	W	Н	Р	В	Р	W	Н	P	В	Р	R	Н	Р	В	P			SBe B		R	Н	SBe	В	Р			В	В	Р	В	Н	Р	w
		L	31/32	В	P	В	L1	L2	L3	Р	В	L1		L3	P	В	L1	L2	L3	Р	В	L1			SBe B	L1		L3	SBe	В	L1		L3	В	В	L1		L3	Р	w
		Lu	29/30	В	P	В	Lu1	Lu2	Lu3	Р	В			_u3	Р	В	Lu1		Lu3	Р	В				SBe B			Lu3	SBe	В	S1		S3	В	В			CL3	Р	w
	Alter. Rtns	Ar/Lu	27/28	В	P	В	Р	W	K	Р	В	L1		L3	Р	В	Р	R	Н	Р	В				SBe B			С	SBe	В	L1		L3	В	В	Р	В	Н	Р	w
		Ah/L	22/21	В	P	В	Р	W	Н	Р	В			_u3	Р	В	Р		SBe	Р	В	L1			SBe B			Н	SBe	В	S1		S3	В	В	Р	В	В	Р	w
		Lu/Ar	26/25	В	P	В	Lu1		Lu3	P	В	Р		Н	Р	В	L1	L2	L3	Р	В	Р	R		SBe B			Lu3	SBe	В	Р		Н	В	В	L1		L3	Р	w
		L/Ah	23/24	В	Р	В	L1	L2	L3	Р	В	Р	w s	SBe	Р	В	Lu1	Lu2	Lu3	Р	В	Р	R	Н	SBe B	L1	L2	L3	SBe	В	Р	R	С	В	В	CL1	CL2	CL3	Р	w
				1938 193	9 1940	1941	1942	1943	1944	1945	1946	1947	1948 1	949	1950	1951	1952	1953	1954	1955	1956	1957	1958 1	959 1	1960 196	1 106	2 1963	196/	1965	1966	1967	1968 1	969 1	1970	1971	1972	1973 1	1974	1975	1976
	Cont. Rtns	Ar	6/5	R K	D 1340	R	D D	W	L)44	P	B	D .		SBe	P .	В	D		SBe	P	В	D D			SBe B		,2 1303 R	C	SBe	B	P		c	В.	B	D D	B	В	D D	W
•	# #	Ah	2/1	B H	P	В	P	W	н	P	В	P	w	Н	P	В	P	R	Н	P	В	P			SBe B		R	Н	SBe	В	P			В	В	P	В	н	P	w
		L.	14/13	B H	P	В	L1	L2	L3	P	В	L1		L3	P	В	L1	L2	L3	P	В	L1			SBe B			L3	SBe	В	L1		L3	В	В	L1		L3	P	w
		Lu	3/4	B K	Р	В	Lu1	Lu2	Lu3	P	В			_u3	P	В	Lu1		Lu3	P	В				SBe B			Lu3	SBe	В	S1			В	- 1			CL3	P	w
	Alter. Rtns	Ar/Lu	9/10	B K	Р	В	P	W	Н	Р	В	L1		L3	Р	В	P		SBe	P	В				SBe B			Н	SBe	В	L1		L3	В	В	P	В	В	Р	w
	" "	Ah/L	15/16	в н	Р.	В	P	w	ĸ	Р	В			_u3	Р	В	P	R	Н	P	В	L1			SBe B			С	SBe	В	S1			В	В	P	В	н	Р	w
		Lu/Ar	12/11	В Н	Р.	В	Lu1	Lu2	Lu3	Р	В	P		SBe	Р	В	L1	L2	L3	P	В	Ρ.	R		SBe B			Lu3	SBe	В	Р.			В	В	Ĺ1		L3	Р	w
		L/Ah	7/8	в к	P	В	L1	L2	L3	P	В	P	W	Н	P	В	Lu1		Lu3	P	В	P			SBe B			L3	SBe	В	P			В				CL3	P	W

¹ at the start of the experiment, plots were in either Continuous Rotations or Alternating Rotations.

Crops: P=Potatoes; B=Spring barley; W=Winter wheat; K=Kale; H=one-year Hay; SBe=Sugar beet; R=Winter rye; C=Carrots; O=oats; BE=Winter beans; M=Maize; F=Fallow. L1, L2, L3 = 1st, 2nd, 3rd year of grass-clover ley [given little N, grazed by sheep until 1968 (except for existing 3rd year leys which were grazed in 1969), cut thereafter];

Lu1, Lu2, Lu3 = 1st, 2nd, 3rd year of Lucerne ley; S1, S2, S3 = 1st, 2nd, 3rd year of Sainfoin (replaced Lucerne from 1964); Lc1, Lc2, Lc3 = 1st, 2nd, 3rd year of Red clover ley (replaced Sainfoin from 1971).

Ln3, 1, 2, 3 = 1st, 2nd, 3rd year of grass ley given N; Lc3, 1, 2, 3 = 1st, 2nd, 3rd year of grass/clover ley.

LLn8, 1, 2, 3 + 3, 5, 6, 7, 8 = 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th year of grass/clover ley.

Ar; three arable Treatment crops, including one year root crop, followed by two arable Test crops

Ah; three arable Treatment crops, including one year hay, followed by two arable Test crops

L; three year grazed grass-clover ley Treatment crops, followed by two arable Test crops.

Lu; three year lucerne ley Treatment crops, followed by two arable Test crops.

The Aternating Rotations were designated as either Ar/Lu, Ah/L, Lu/Ar or L/Ah according to the order in which the first six Treatment crops appeared.

² the second of each pair of plots received D (Dung i.e. farmyard manure; 38 t/ha applied for the 1st Test crop i.e. every 5 years) up to and including the 1st Test crop in 1967 (see Table of FYM applications, 10.23637/wrn3-manag1938-2020-01).

³ Block III was the first block to be "phased in", followed by Blocks V, IV, II and I

Block Rotation ¹ III ² AF Year 1-197 AB Ln3 Lc3 1st cycle Lln8	-/D ² 40/39 45/46 43/44 34/33 36/35	1973 P P L1 CL1 L1	2 1974 B B L2 CL2 L2	3 1975 B H L3 CL3	1st Test crop 4 1976 W W W	2nd Test crop 5 1977 B B B B	Tr 6 1978 F B 1 1	reatment cre 7 1979 F B 2 2	8 1980 O O 3 3	1st Test crop 9 1981 W W W	2nd Test crop 10 1982 B B B B	1983 F B 1	1984 F B 2 2	13 1985 BE BE 3 3	1st Test crop 14 1986 W W W	2nd Test crop 15 1987 B B B B	16 1988 F B 1 1	17 1989 F B 2 2	18 1990 BE BE 3 3	1st Test crop 19 1991 W W W	2nd Test crop 20 1992 R R R R	1993 F B 1	22 1994 F B 2 2	ps 23 1995 BE BE 3 3 3 3	1st Test crop 24 1996 W W W	2nd Test crop 25 1997 R R R R	Trea 26 1998 R R 1 1	1999 BE M 2 2	28 2000 M BE 3 3	1st Test crop 29 2001 W W W	2nd Test crop 30 2002 R R R R	7re: 31 2003 R R 1	atment cro 32 2004 BE M 2 2	2005 M BE 3 3 3	1st Test crop 34 2006 W W W	2nd Test crop 35 2007 R R R R
"" LLc8 2nd cycle LLn8 "" LLc8	47/48 37/38 41/42 74/73	CL1 P P 1974	CL2 B B 1975 B	CL3 H B 1976 O	4 W W 1977 W	5 B B 1978	6 1 1 1979	7 2 2 1980	8 3 3 1981 BE	1982 W	B 5 5 1983 B	1 6 6 1984 F	2 7 7 1985	3 8 8 1986 BE	4 W W 1987 W	5 B B	6 1 1	7 2 2 1990	8 3 3 1991 BE	W 4 4 1992 W	R 5 5 1993 R	1 6 6 1994	7 7 7	3 8 8 1996 BE	4 W W	5 R R	6 1 1 1999 R	7 2 2 2000 BE	8 3 3 2001 M	W 4 4 2002 W	R 5 5 2003 R	1 6 6 2004 R	2 7 7 2005 BE	3 8 8 2006 M	4 W W	R R R
Year 1-197 AB Ln3 Lc3 1st cycle LLn8 LLc8 2nd cycle LLn8 LLc8	68/67 65/66 79/80 71/72 76/75 69/70 78/77	P L1 CL1 L1 CL1 P	B L2 CL2 L2 CL2 B B	0 3* 3* 3* 3* 3* 3*	W W W 4 4 W	B B B S 5 B	B 1 1 6 6 1 1	B 2 2 7 7 7 2 2	BE 3 3 8 8 8 3	W W W W W 4 4	B B B B 5	B 1 1 1 1 6 6	B 2 2 2 2 2 7 7	BE 3 3 3 3 8 8 8	W W W 4 4 W	B B B 5 5 B	B 1 1 6 6 1 1	B 2 2 7 7 2 2	BE 3 3 8 8 8 3 3 3	W W W W W 4	R R R R R 5	B 1 1 1 1 6 6	B 2 2 2 2 7 7	BE 3 3 3 3 8 8 8	W W W 4 4 W	R R R 5 5 R R	R 1 1 6 6 1	M 2 2 7 7 7 2 2 2	BE 3 3 8 8 8 3 3	W W W W 4	R R R R S 5	R 1 1 1 1 6 6	M 2 2 2 2 2 7 7 7	BE 3 3 3 3 3	w w w w w	R R R R R
IV AF Year 1-197 AB Lc3 Lc3 1st cycle LLn8 LLc8 2nd cycle LLn8 LLc8	64/63 53/54 58/57 60/59 51/52 50/49 61/62 55/56	1975 P P L1 CL L1 CL P	1976 F B 2* 2* 2* 2* 2* 2*	1977 O O 3 3 3 3 3	1978 W W W W 4 4 W	1979 B B B B S 5 5 B	1980 F B 1 1 6 6 1	1981 F B 2 2 7 7 2 2	1982 BE BE 3 3 8 8	1983 W W W W W 4 4	1984 B B B B B 5	1985 F B 1 1 1 6	1986 F B 2 2 2 2 7 7	1987 BE BE 3 3 3 3	1988 W W W W 4 4 W	1989 B B B S 5 5	1990 F B 1 1 6 6 1	1991 F B 2 2 7 7 2	1992 BE BE 3 3 8 8 8	1993 W W W W W 4 4	1994 R R R R R R S	1995 F B 1 1 1 6 6	1996 F B 2 2 2 2 7 7	1997 BE BE 3 3 3 8 8	1998 W W W W 4 4 W W	1999 R R R R S 5 R	2000 R R 1 1 6 6 1	2001 BE M 2 2 7 7 2 2	2002 M BE 3 3 8 8 8	2003 W W W W W 4	2004 R R R R R R	2005 R R 1 1 1 1 6	2006 BE M 2 2 2 2 2 7	2007 M BE 3 3 O BE	2008 W W W W W W	2009 R R R R R R
II AF Year 1-197 AB Lr3 Lc3 1st cycle Lln8 Llc8 2nd cycle Lln8 Llc8	19/20 17/18 31/32 29/30 27/28 22/21 26/25 23/24	1976 F B 1 1 1 1	1977 F B 2 2 2 2 2 2	1978 O O 3 3 3 3 3	1979 W W W W 4 4 W W	1980 B B B B S 5 5 B	1981 F B 1 1 6 6 1	1982 F B 2 2 7 7 7 2 2	1983 P P 3 3 8 8 8 3	1984 W W W W W 4 4	1985 B B B B B	1986 F B 1 1 1 6 6	1987 F B 2 2 2 2 7 7	1988 BE BE 3 3 3 8	1989 W W W W 4 4 W W	1990 B B B B S 5 5 B	1991 F B 1 1 6 6 1	1992 F B 2 2 7 7 7 2	1993 BE BE 3 3 8 8 8	1994 W W W W W 4 4	1995 R R R R R R S	1996 F B 1 1 1 6 6	1997 F B 2 2 2 2 7 7	1998 BE BE 3 3 3 8 8	1999 W W W W 4 4 W W	2000 R R R R S S	2001 R R 1 1 6 6 6 1	2002 BE M 2 2 7 7 2 2	2003 M BE 3 3 8 8	2004 W W W W W W 4 4	2005 R R R R R R S	2006 R R 1 1 1 6	2007 BE M 2 2 BE O 7	2008 M BE 3 3 O BE	2009 W W W W W W	2010 R R R R R R R
l AF Year 1-197 AB Lc3 Lc3 1st cycle LLn8 LLc8 2nd cycle LLn8	6/5 2/1 14/13 3/4 9/10 15/16 12/11 7/8	1977 F B 1 1 1 1 1	1978 F B 2 2 2 2 2 2 2	1979 O O 3 3 3 3 3	1980 W W W W 4 4 W	1981 B B B B S 5 5 B	1982 F B 1 1 6 6 1	1983 F B 2 2 7 7 7 2	1984 BE BE 3 3 8 8 8	1985 W W W W W 4 4	1986 B B B B B	1987 F B 1 1 1 6 6	1988 F B 2 2 2 2 7 7	1989 BE BE 3 3 3 8 8	1990 W W W W 4 4 W	1991 B B B B S 5 5 B	1992 F B 1 1 6 6 1 1	1993 F B 2 2 7 7 2 2	1994 BE BE 3 3 8 8 8	1995 W W W W W 4 4	1996 R R R R R R S 5	1997 F B 1 1 1 6 6	1998 F B 2 2 2 2 7 7	1999 BE BE 3 3 3 8 8	2000 W W W W W 4 4 W	2001 R R R R S 5 5 R	2002 R R 1 1 6 6 6 1	2003 BE M 2 2 7 7 2 2	2004 M BE 3 3 8 8 8	2005 W W W W W 4 4	2006 R R R R R R	2007 R R 1 1 R* R*	2008 BE M 2 2 BE O 7	2009 M BE 3 3 0 BE	2010 W W W W W W	2011 R R R R R R R

Crops: P=Potatoes; B=Spring barley; W=Winter wheat; K=Kale; H=one-year Hay; SBe=Sugar beet; R=Winter rye; C=Carrots; O=oats; BE=Winter beans; M=Maize; F=Fallow.

R*= Rye instead of forage maize 1976 2* and 3* were fresh sowings of leys in 1976 phased in to the new rotations

1976 all grass and clover/grass leys sown in 1976 failed to establish because of the summer drought, they were re-sown by hand October 1976

L1, L2, L3 = 1st, 2nd, 3rd year of grass-clover ley [given little N, grazed by sheep until 1968 (except for existing 3rd year leys which were grazed in 1969), cut thereafter];
Lu1, Lu2, Lu3 = 1st, 2nd, 3rd year of Lucerne ley, S1, S2, S3 = 1st, 2nd, 3rd year of Sainfoin (replaced Lucerne from 1964); Lc1, Lc2, Lc3 = 1st, 2nd, 3rd year of Red dover ley (replaced Sainfoin from 1971).

Ln3, 1, 2, 3 = 1st, 2nd, 3rd year of grass ley given N; Lc3, 1, 2, 3 = 1st, 2nd, 3rd year of grass/clover ley.

LLn8, 1, 2, 3, 4, 5, 6, 7, 8 = 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th year of grass ley given N; LLc8, 1, 2, 3, 4, 5, 6, 7, 8 = 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th year of grass/clover ley.

Between 1973 and 1980, on Block III (and in subsequent years on Blocks V, IV, II and I) major changes were made. Thus:-

¹ at the start of the experiment, plots were in either Continuous Rotations or Alternating Rotations.

The Continuous Rotations were:

AF (replaced Ar); two years fallow and one arable Treatment crop, followed by two arable Test crops. In 1998 on Block III (and in subsequent years on Blocks V, IV, II and I) this changed to AM; R, BE, M Treament crops followed by two arable Test crops.

AB (replaced Ah); three arable Treatment crops, followed by two arable Test crops. In 1998 on Block III (and insubsequent years on Blocks V, IV, II and I) this changed to ABE, R, M, BE Treament crops followed by two arable Test crops.

Ln3 (replaced L); three year grass ley with N Treatment crops, followed by two arable Test crops.

Lc3 (replaced Lu); three year grass/clover ley Treatment crops, followed by two arable Test crops.

The Aternating Rotations were changed completely so that the effects of eight year leys on the subsequent arable Test crops could be included.

So that this could be tested every five years (as with the Continuous Rotations) changes to two of the four Alternating Rotations were phased in from 1973 on Block III (and in subsequent years on Blocks V, IV, II and I;1st cycle);

and two were phased in from 1978 on Block III (and in subsequent years on Blocks V, IV, II and I; 2nd cycle). LLn8 1st cycle (replaced Ar/Lu); eight year grass ley with N Treatment crops, followed by two arable Test crops.

LLc8 1st cycle (replaced Ah/L); eight year grass/clover ley Treatment crops, followed by two arable Test crops.

LLn8 2nd cycle (replaced Lu/Ar); eight year grass ley with N Treatment crops, followed by two arable Test crops. LLc8 2nd cycle (replaced L/Ah); eight year grass/clover ley Treatment crops, followed by two arable Test crops.

² the second of each pair of plots received D (Dung i.e. farmyard manure; 38 t/ha applied for the 1st Test crop i.e. every 5 years) up to and including the 1st Test crop in 1967 (see Table of FYM applications, 10.23637/wm3-fert1938-2020-01).

³ Block III was the first block to be "phased in", followed by Blocks V, IV, II and I

						1st test	2nd test				1st test	2nd test				
Block	Treatment ¹ Code (since 1973)	Plots	36	37	38	39	40	41	42	43	44	45	46	47	48	
	,		2008	2009	2010	2011	2012	2013 4	2014	2015	2016	2017	2018	2019	2020	
III ³	(AF) (AM) AO	40/39	R	BE	0	W	R	R	BE	0	w	R	R	BE	0	
	(AB) (ABe) ABe	45/46	R	0	BE	W	R	R	0	BE	w	R	R	0	BE	
	Ln3	43/44	1	2	3	W	R	1	2	3	w	R	1	2	3	
	Lc3	34/33	1	2	3	W	R	1	2	3	W	R	1	2	3	
	LLn/AO	36/35	R	BE	0	W	R	R	BE	0	W	R	R	BE	0	Into continuous arable from 2007 (LLn/AO)
	LLc/ABe	47/48	R	0	BE	W	R	R	0	BE	W	R	R	0	BE	Into continuous arable from 2007 (LLc/ABe)
	LLn/Ln3	37/38	1	2	3	W	R	1	2	3	W	R	1	2	3	Into 3-yr grass leys from 2008 (LLn/Ln)
	LLc/Lc3	41/42	1	2	3	W	R	1	2	3	W	R	1	2	3	Into 3-yr grass/clover leys from 2008 (LLc/Lc)
			2009	2010	2011	2012	2013 4	2014	2015	2016	2017	2018	2019	2020		
V	(AF) (AM) AO	74/73	R	BE	0	W	R	R	BE	0	W	R	R	BE		
	(AB) (ABe) ABe	68/67	R	0	BE	W	R	R	0	BE	W	R	R	0		
	Ln3	65/66	1	2	3	W	R	1	2	3	W	R	1	2		
	Lc3	79/80	1 R	2 BE	0	W	R R	1 R	BE	3 O	W	R R	1 R	2 BE		l-t
	LLn/AO LLc/ABe	71/72 76/75	R	O BE	BE	W	R	R	O BE	BE	w	R	R	O BE		Into continuous arable from 2007 (LLn/AO) Into continuous arable from 2007 (LLc/ABe)
	LLn/Ln3	69/70	1	2	3	W	R	1	2	3	w	R	1	2		Into 3-yr grass leys from 2009 (LLn/Ln)
	LLc/Lc3	78/77	1	2	3	W	R	1	2	3	w	R	1	2		Into 3-yr grass/clover leys from 2009 (LLc/Lc)
			2010	2011	2012	2013 4	2014	2015	2016	2017	2018	2019	2020			
IV	(AF) (AM) AO	64/63	R	BE	0	W	R	R	BE	0	w	R	R			
	(AB) (ABe) ABe	53/54	R	0	BE	W	R	R	0	BE	w	R	R			
	Ln3	58/57	1	2	3	W	R	1	2	3	w	R	1			
	Lc3	60/59	1	2	3	W	R	1	2	3	w	R	1			
	LLn/AO	51/52	R	BE	0	W	R	R	BE	0	W	R	R			Into continuous arable from 2007 (LLn/AO)
	LLc/ABe	50/49	R	0	BE	W	R	R	0	BE	W	R	R			Into continuous arable from 2007 (LLc/ABe)
	LLn/Ln3	61/62	1	2	3	W	R	1	2	3	W	R	1			Into 3-yr grass leys from 2010 (LLn/Ln)
	LLc/Lc3	55/56	1	2	3	W	R	1	2	3	W	R	1			Into 3-yr grass/clover leys from 2010 (LLc/Lc)
			2011	2012	2013 4	2014	2015	2016	2017	2018	2019	2020				
II	(AF) (AM) AO	19/20	R	BE	0	W	R	R	BE	0	W	R				
	(AB) (ABe) ABe	17/18	R	0	BE	W	R	R	0	BE	W	R				
	Ln3 Lc3	31/32 29/30	1	2	3	W	R R	1	2	3	w	R R				
	LLn/AO	27/28	R	BE	0	W	R	R	BE.	0	w	R				Into continuous arable from 2007 (LLn/AO)
	LLc/ABe	22/21	R	0	BE	w	R	R	0	BE	w	R				Into continuous arable from 2007 (LLc/ABe)
	LLn/Ln3	26/25	1	2	3	w	R	1	2	3	w	R				Into 3-yr grass leys from 2011 (LLn/Ln)
	LLc/Lc3	23/24	1	2	3	W	R	1	2	3	W	R				Into 3-yr grass/clover leys from 2011 (LLc/Lc)
			2012	2013 4	2014	2015 5	2016	2017	2018	2019	2020					
- 1	(AF) (AM) AO	6/5	R	BE	0	W	R	R	BE	0	W					
	(AB) (ABe) ABe	2/1	R	0	BE	W	R	R	0	BE	W					
	Ln3	14/13	1	2	3	W	R	1	2	3	w					
	Lc3	3/4	1	2	3	W	R	1	2	3	W					
	LLn/AO	9/10	R	BE	0	W	R	R	BE	0	W					Into continuous arable from 2007 (LLn/AO)
	LLc/ABe	15/16	R	0	BE	W	R	R	0	BE	W					Into continuous arable from 2007 (LLc/ABe)
	LLn/Ln3	12/11	1	2	3	W	R	1	2	3	W					Into 3-yr grass leys from 2012 (LLn/Ln)
	LLc/Lc3	7/8	1	2	3	W	R	1	2	3	W					Into 3-yr grass/clover leys from 2012 (LLc/Lc)
								I			l					I

Crops: P=Potatoes; B=Spring barley; W=Winter wheat; K=Kale; H=one-year Hay; SBe=Sugar beet; R=Winter rye; C=Carrots; O=oats; BE=Winter beans; M=Maize; F=Fallow.

L1, L2, L3 = 1st, 2nd, 3rd year of grass-clover ley [given little N, grazed by sheep until 1968 (except for existing 3rd year leys which were grazed in 1969), cut thereafter];

Lu1, Lu2, Lu3 = 1st, 2nd, 3rd year of Lucerne ley; S1, S2, S3 = 1st, 2nd, 3rd year of Sainfoin (replaced Lucerne from 1964); Lc1, Lc2, Lc3 = 1st, 2nd, 3rd year of Red clover ley (replaced Sainfoin from 1971).

Ln3, 1, 2, 3 = 1st, 2nd, 3rd year of grass ley given N; Lc3, 1, 2, 3 = 1st, 2nd, 3rd year of grass/clover ley.

LLn8, 1, 2, 3, 4, 5, 6, 7, 8 = 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th year of grass ley given N; LLc8, 1, 2, 3, 4, 5, 6, 7, 8 = 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th year of grass/clover ley.

² the second of each pair of plots received D (Dung i.e. farmyard manure; 38 t/ha applied for the 1st Test crop i.e. every 5 years) up to and including the 1st Test crop in 1967 (see Table of FYM applications, 10 23637/wrn3-manag1938-2020-01).

³ Block III was the first block to be "phased in", followed by Blocks V, IV, II and I

All crops (wheat, rye, beans and oats) were spring varieties in 2013 because they were late sown due to very wet autumn and spring weather.

⁵ Winter wheat failed block I 2015, resown to spring wheat