



## Broadbalk Wheat Experiment cropping 1843-2021

ROTHAMSTED  
RESEARCH

**Cite as:** Glendining, M.J., Poulton, P.R. and Macdonald, A.J. (2021) *Broadbalk Wheat Experiment cropping 1843-2021*. *Electronic Rothamsted Archive, Rothamsted Research, Harpenden, UK*.  
<https://doi.org/10.23637/rbk1-crop1843-2021-01>

**Prepared by:** Glendining, M.J., CAS Department, Rothamsted Research, Harpenden, Herts, AL5 2JQ, UK.

**Published by:** Electronic Rothamsted Archive, Rothamsted Research, Harpenden, UK

**Date:** July 2021; updated June 2022 cropping details 1904 and 1905

**Description:** Cropping details for the Broadbalk Wheat Experiment, 1843-2021, with details of crops grown, cultivars, strip divisions, sections and rotations.

- **Page 1:** Cover page
- **Pages 2-4:** Broadbalk cropping 1843-1925, showing winter wheat cultivars, cropping and the various strip divisions. Also cropping 1839-1843 before the experiment was started.
- **Pages 5-6:** Broadbalk cropping 1926-1967, showing winter wheat cultivars, cropping and the different sections
- **Pages 7-8:** Broadbalk cropping 1968-2021, showing wheat cultivars, crop rotations and the different sections. 1<sup>st</sup> wheat in the rotations is clearly indicated. Also details of cultivars of the other crops in the rotations (spring and winter beans, potatoes, forage maize, oats).

**Site:** R/BK/1. Broadbalk field, Rothamsted Experimental Farm, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2JQ, UK. Geographic location: 51.80946 -0.37301

### Derived from:

- Johnston, A.E. & Garner, H.V. (1969) *The Broadbalk Wheat Experiment 2. Historical Introduction*. Rothamsted Report for 1968, part 2, pp12-25. <https://doi.org/10.23637/ERADOC-1-34916>
- 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 Research (2018) *Broadbalk experiment fertilizer and manure treatments, 1852-2021*, <https://doi.org/10.23637/rbk1-FertTreats>

**Funding:** Rothamsted Research receives strategic funding from the UK Biotechnology and Biological Sciences Research Council (BBSRC). The Rothamsted Long-term Experiments National Capability is supported by the BBSRC Grant BBS/E/C/000J0300 and the Lawes Agricultural Trust.

### Licence and conditions of re-use:



These details 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 details 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.

## Broadbalk Winter Wheat Experiment Cropping 1843-1925

Winter Wheat Cultivar	Harvest Year	Cropping	Strip Divisions		Notes		
Old Red Lammas	1844	W			No division of strips		
Old Red Lammas	1845	W			No division of strips		
<b>From 1846 most strips divided into field-length halves, a (North) and b (South) with DIFFERENT fertilizer treatments</b>							
Old Red Lammas	1846	W,W	a	b			
Old Red Lammas	1847	W,W	a	b			
Old Red Lammas	1848	W,W	a	b			
Old Red Cluster	1849	W,W	a	b			
Old Red Cluster	1850	W,W	a	b			
Old Red Cluster	1851	W,W	a	b			
<b>From 1852 fertilizer treatments on most strips became established, a and b halves received the SAME fertilizer treatments</b>							
Old Red Cluster	1852	W,W	a	b			
Red Rostock	1853	W,W	a	b			
Red Rostock	1854	W,W	a	b			
Red Rostock	1855	W,W	a	b			
Red Rostock	1856	W,W	a	b			
Red Rostock	1857	W,W	a	b			
Red Rostock	1858	W,W	a	b			
Red Rostock	1859	W,W	a	b			
Red Rostock	1860	W,W	a	b			
Red Rostock	1861	W,W	a	b			
Red Rostock	1862	W,W	a	b			
Red Rostock	1863	W,W	a	b			
Red Rostock	1864	W,W	a	b			
Red Rostock	1865	W,W	a	b			
Red Rostock	1866	W,W	a	b			
Red Rostock	1867	W,W	a	b			
Red Rostock	1868	W,W	a	b			
Red Rostock	1869	W,W	a	b			
Red Rostock	1870	W,W	a	b			
Red Rostock	1871	W,W	a	b			
Red Rostock	1872	W,W	a	b			
Red Rostock	1873	W,W	a	b			
Red Rostock	1874	W,W	a	b			
Red Rostock	1875	W,W	a	b			
Red Rostock	1876	W,W	a	b			
Red Rostock	1877	W,W	a	b			
Red Rostock	1878	W,W	a	b			
Red Rostock	1879	W,W	a	b			
Red Rostock	1880	W,W	a	b			
Red Rostock	1881	W,W	a	b			
Red Club	1882	W,W	a	b			
Red Club	1883	W,W	a	b			
Red Club	1884	W,W	a	b			
Red Club	1885	W,W	a	b			
Red Club	1886	W,W	a	b			
Red Club	1887	W,W	a	b			
Red Club	1888	W,W	a	b			
Red Club	1889	W,W,W,W	aT	aB	bT	bB	Four sub-plots: 'T' sown in 9 wide rows, to allow cultivation to control weeds; 'B' in usual 18 row spacing
Red Club	1890	W,W,W,W	aT	aB	bT	bB	Four sub-plots: 'B' sown in 9 wide rows to allow cultivation to control weeds; 'T' in usual 18 row spacing

Red Club	1891	W,W	a	b		
Red Club	1892	W,W	a	b		
Red Club	1893	W,W	a	b		
<b>From 1894 a and b halves combined (except 9a, 9b, 10a and 10b), paths added between all strips, reducing the size of the cropped area. Strips 5-8, 15 and 16 divided into T (Top, West) and B (Bottom, East) halves, receiving the same fertilizer treatments. The other strips were not divided.</b>						
Red Club	1894	W,W	T	B	Division of strips 5-8, 15 and 16	
Red Club	1895	W,W	T	B	Division of strips 5-8, 15 and 16	
Red Club	1896	W,W	T	B	Division of strips 5-8, 15 and 16	
Red Club	1897	W,W	T	B	Division of strips 5-8, 15 and 16	
Red Club	1898	W,W	T	B	Division of strips 5-8, 15 and 16	
Red Club	1899	W,W	T	B	Division of strips 5-8, 15 and 16	
Squarehead's Master	1900	W,W	T	B	Division of strips 5-8, 15 and 16	
Squarehead's Master	1901	W,W,W	TT	TM	B	Strips 6-8, 10-14 and 18 divided into three. T strip harvested as two equal parts, TT and TM. TT and B received usual ammonium sulphate, TM received bicarbonate of ammonia in the spring.
Squarehead's Master	1902	W			No division of strips	
Squarehead's Master	1903	W			No division of strips	
Squarehead's Master	1904	W,F	a	b	All strips divided into halves over length of the field. One half sown to wheat, the other half in bare fallow. 2ab, 2ba, 3b, 5a, etc cropped. No fertilizer applied to fallow	
Giant Red	1905	F,W	a	b	All strips divided into halves over length of the field. The half cropped in 1904 in bare fallow, the half fallow in 1904 sown to wheat. 2aa, 2bb, 3a, 5b, etc cropped. No fertilizer applied to fallow	
Squarehead's Master	1906	W			No division of strips	
Squarehead's Master	1907	W			No division of strips	
Squarehead's Master	1908	W			No division of strips	
Squarehead's Master	1909	W			No division of strips	
Browick Red	1910	W			No division of strips	
Little Joss	1911	W			No division of strips	
<b>From 1912 all strips divided into T (Top) and B (Bottom) halves except strip 20</b>						
Little Joss	1912	W,(W)	T	B	B only harvested as there was little crop on T due to weeds	
Squarehead's Master	1913	W,W	T	B		
Squarehead's Master	1914	F,W	T	B	T bare fallowed, B cropped as usual	
Squarehead's Master	1915	W,F	T	B	T cropped as usual, B bare fallowed	
Squarehead's Master	1916	W,W	T	B		
Red Standard	1917	W,W	T	B		
Red Standard	1918	W,W	T	B		
Red Standard	1919	W,W	T	B		
Red Standard	1920	W,W	T	B		
Red Standard	1921	W,W	T	B		
Red Standard	1922	W,W	T	B		
Red Standard	1923	W,W	T	B		
Red Standard	1924	W,W	T	B		
Red Standard	1925	W,W	T	B		

Winter wheat (W) grown every year, except for occasional bare fallow (F, no crop) to control weeds. Harvest year refers to the year in which the crop was harvested. Winter wheat was sown the previous autumn. The first crop was sown in autumn 1843 and harvested in summer 1844. Fertilizer and manures were applied to the different treatment strips, which ran the whole length of the field.

**Cropping on the whole field before the wheat experiment was started in 1843:**

Turnips	1839		FYM applied
Barley	1840		No fertilizer or manure
Peas	1841		No fertilizer or manure
Wheat	1842		No fertilizer or manure
Oats	1843		No fertilizer or manure

**Straw incorporation, 1867-1879:**

The straw which grew on strip 5a-8a, 11a-14a and 17a or 18a in the previous season was chopped and incorporated, 1867-1879 only. No straw was incorporated on the 'b' strips. Strips 17a and 18a alternated, with straw incorporated in the year when N fertilizer was not applied (see plan for details). Mean yield differences were less than 5%, except for strips 17/18 where straw incorporation reduced yields by 10%.

1904 and 1905 revised June 2022

## Broadbalk Cropping 1926 - 1967

### Old section number <sup>a</sup>

Winter Wheat Cultivar	Harvest Year	I		II	III	IV	V	
Red Standard	1926	F		F	F	W		W
Red Standard	1927	F		F	F	W		W
Red Standard	1928	W		W	F	F		F
Squarehead's Master	1929	W		W	F	F		F
Red Standard	1930	W		W	W	W		W
Red Standard	1931	F		W	W	W		W
Red Standard	1932	W		F	W	W		W
Red Standard	1933	W		W	W	W		F
Red Standard	1934	W		W	W	F		W
Red Standard	1935	W		W	F	W		W
Red Standard	1936	F		W	W	W		W
Red Standard	1937	W		F	W	W		W
Red Standard	1938	W		W	W	W		F
Red Standard	1939	W		W	W	F		W
Squarehead's Master	1940	W		W	F	W		W
Squarehead's Master	1941	F		W	W	W		W
Stand up	1942	W		F	W	W		W
Squarehead's Master	1943	W		W	W	W		F
Red Standard	1944	W		W	W	F		W
Red Standard	1945	W		W	F	W		W
Squarehead's Master	1946	F		W	W	W		W
Squarehead's Master	1947	W		F	W	W		W
Squarehead's Master	1948	W		W	W	W		F
Squarehead's Master	1949	W		W	W	F		W
Squarehead's Master	1950	W		W	F	W		W
Squarehead's Master	1951	F		W	W	W		W
Squarehead's Master	1952	W		F	W	W		W
Squarehead's Master	1953	W		W	W	W		F
Squarehead's Master	1954	W		W	W	F		W
<b>Section number:</b>		<b>IA</b>	<b>IB</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>VA</b>	<b>VB</b>
Squarehead's Master	1955	W	W	W	F	W	W	W
Squarehead's Master	1956	W	F	W	W	W	W	W
Squarehead's Master	1957	W	W	F	W	W	W	W
Squarehead's Master	1958	W	W	W	W	W	F	F
Squarehead's Master	1959	W	W	W	W	F	W	W
Squarehead's Master	1960	W	W	W	F	W	W	W
Squarehead's Master	1961	W	F	W	W	W	W	W
Squarehead's Master	1962	W	W	F	W	W	W	W
Squarehead's Master	1963	W	W	W	W	W	F	W
Squarehead's Master	1964	W	W	W	W	F	W	W
Squarehead's Master	1965	W	W	W	F	W	W	W
Squarehead's Master	1966	W	F	W	W	W	W	W
Squarehead's Master	1967	W	W	F	W	W	W	W

1968 onwards, becomes new section number:

0    1    2    3    4    5    6    7    8    9

W=winter wheat, F=fallow (no crop)

Harvest year refers to the year in which the crop was harvested.

<sup>a</sup> **1926:** Experiment divided into five sections (I-V) to allow sequential fallowing to control weeds.

**1955:** Section I divided into IA and IB. IA received herbicides and was no longer fallowed, section IB continued the 5 year cycle of wheat and fallow.

Section V divided into VA and VB. VB received a single application of lime, VA did not.

**1963:** Section VB no longer fallowed, and received herbicides as required;

section VA continued with the 5 year wheat and fallow cycle.

**1968:** Divided to make 10 'New' sections, 0-9

**Seed:** New seed was bought each year up to 1963. From 1963 saved seed from the previous Broadbalk crop (bulked from several plots and well mixed) was sown.

# Broadbalk Cropping 1968-2021

1st wheat shown in yellow

## New section number

Wheat cultivar	Harvest Year	Continuous wheat					Rotational wheat				
		1	9	0"	8*	6**	5	3	7	4	2
Cappelle Desprez	1968	W	W	W	W	F	W	W	P	W	BE
Cappelle Desprez	1969	W	W	W	W	W	F	W	BE	P	W
Cappelle Desprez	1970	W	W	W	W	W	W	F	W	BE	P
Cappelle Desprez	1971	W	W	W	W	F	W	W	P	W	BE
Cappelle Desprez	1972	W	W	W	F	W	F	W	BE	P	W
Cappelle Desprez	1973	W	W	W	W	W	W	F	W	BE	P
Cappelle Desprez	1974	W	W	W	W	F	W	W	P	W	BE
Cappelle Desprez	1975	W	W	W	W	W	F	W	BE	P	W
Cappelle Desprez	1976	W	W	W	W	W	W	F	W	BE	P
Cappelle Desprez	1977	W	W	W	W	F	W	W	P	W	BE
Cappelle Desprez	1978	W	W	W	W	W	F	W	BE	P	W
Flanders	1979	W	W	W	W	W	W	F	W	P	F
Flanders	1980	W	W	W	W	W	W	W	F	W	P
Flanders	1981	W	W	W	F	W	W	W	P	F	W
Flanders	1982	W	W	W	W	W	W	W	W	P	F
Flanders	1983	W	W	W	W	W	W	W	F	W	P
Flanders	1984	W	W	W	W	W	W	W	P	F	W
Brimstone	1985	W	W	W	W	W	F	W	W	P	W
Brimstone	1986	W	W	W	W	W	P	F	W	W	W
B & SHM*	1987	W	W	W	W	W*	W	P	W	W	F
B & SHM*	1988	W	W*	W	F	W*	W	W*	F	W	P
B & SHM*	1989	W	W*	W	W	W*	W	W	P	F	W*
B & SHM*	1990	W	W*	W	W	W*	F	W	W*	P	W
Apollo	1991	W	W	W	W	W	P	F	W	W	W
Apollo	1992	W	W	W	W	W	W	P	W	W	F
Apollo	1993	W	W	W	W	W	W	W	F	W	P
Apollo	1994	W	W	W	F	W	W	W	P	F	W
Apollo	1995	W	W	W	W	W	F	W	W	P	W
Hereward	1996	W	W	W	W	W	P	O	W	W	W
Hereward	1997	W	W	W	W	W	W	M	W	W	O
Hereward	1998	W	W	W	W	W	W	W	O	W	M
Hereward	1999	W	W	W	W	W	W	W	M	O	W
Hereward	2000	W	W	W	W	W	O	W	W	M	W
Hereward	2001	W	W	W	F	W	M	O	W	W	W
Hereward	2002	W	W	W	W	W	W	M	W	W	O
Hereward	2003	W	W	F	W	W	W	W	O	W	M
Hereward	2004	W	W	F	W	W	W	W	M	O	W
Hereward	2005	W	W	W	W	W	O	W	W	M	W
Hereward	2006	W	W	W	W	W	M	O	W	W	W
Hereward	2007	W	W	W	W	W	W	M	W	W	O
Hereward	2008	W	W	W	F	W	W	W	O	W	M
Hereward	2009	W	W	W	W	W	W	W	M	O	W
Hereward	2010	W	W	W	W	W	O	W	W	M	W
Hereward	2011	W	W	W	W	W	M	O	W	W	W

Hereward	2012	W	W	W	W	W	W	M	W	W	O
Crusoe <sup>a</sup>	2013	W	W	W	W	W	W	W	O	W	M
Crusoe	2014	W	W	W	W	W	W	W	M	O	W
Mulika <sup>b</sup>	2015	W	W	W	F	W	O	W	W	M	W
Crusoe	2016	W	W	W	F	W	M	O	W	W	W
Crusoe	2017	W	W	W	W	W	W	M	W	W	O
Crusoe	2018	W	W	W	W	W	W	W	Be	O	W
Zyatt	2019	W	W	W	W	W	O	W	W	W	Be
Tybalt <sup>c</sup>	2020	W	W	W	W	W	W	O	W	Be	W
Zyatt	2021	W	W	W	W	W	Be	W	O	W	W

W=winter wheat, P=potatoes, BE=spring beans, F=fallow, O=winter oats, M=forage maize

"straw incorporated since autumn 1986 \*no herbicides \*\*no spring or summer fungicides since 1985

Section 0 fallowed in 2003 and 2004 in an attempt to control *Equisetum* and test various herbicides

B & SHM\* comparison of modern variety Brimstone and old variety Squarehead's Master, except on FYM plots  
Brimstone in all other sections 1985-1990

<sup>a</sup> variety changed to Crusoe in 2013, but sown very late, due to a wet autumn and winter.

<sup>b</sup> spring wheat variety Mulika sown in 2015, as wet autumn and winter prevented sowing of winter wheat.

<sup>c</sup> spring wheat variety Tybalt sown in 2020, as wet autumn and winter prevented sowing of winter wheat.

Winter wheat varieties selected primarily for their yield potential, and also their suitability for breadmaking.

#### Continuous wheat: Sections 0, 1, 6, 8 and 9

Section 0 has straw incorporated since 1986

Section 8 has no herbicides, so yields are restricted by weeds. It is fallowed frequently.

Section 6 was in a wheat/wheat/fallow rotation until 1979 and has restricted fungicide use.

#### Rotational wheat: Sections 2, 3, 4, 5 and 7

These Sections grow wheat in rotation with other arable crops (potatoes, maize, oats, beans & fallow).

Between 1968 and 1980 sections 3, 5 and 6 had a three year rotation of wheat/wheat/fallow.

Section 6 then became continuous wheat.

Between 1968 and 1978 sections 2, 4 and 7 had a three year rotation of wheat/potato/beans.

In 1979 this changed to a three year rotation of fallow/potato/wheat until 1984.

From around 1985 all sections changed to a five year rotation of wheat/wheat/wheat/fallow/potato until around 1996, then wheat/wheat/wheat/oats/maize until 2017.

In 2018 the rotation changed to wheat/wheat/oats/wheat/winter beans. Note there are two first wheats.

Changes to rotation indicated by a thick line.

#### Other crop cultivars

Spring field beans (*Vicia faba*): 1968-1978: Maris Bead (1968-74); Minor (1975) Minden (1976-78)

Winter field beans (*Vicia faba*) 2018 onwards: Tundra

Potato (*Solanum tuberosum*) 1968-1996: Majestic (1968-69); King Edward (1970-75);

Pentland Crown (1976-93); Estima (1994-96).

Forage maize (*Zea mays*) whole crop for silage: 1997-2017: Hudson (1997-2014); Severus (2015-2017)

Yields may have been reduced due to the accidental application of herbicide to the crop in June/July 2013

Winter oats (*Avena sativa*) 1996 onwards: Image (1996-2000); Revisor (2001), Gerald (2002 onwards)