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## Broadbalk Wheat Experiment fertilizer and manure treatments 1852-2021

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### Description:

- **Page 1:** Cover Page
- **Pages 2-4:** Broadbalk Wheat Experiment fertilizer and manure treatment details, 1852-2021, updated June 2021

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

Latitude 51.80946, Longitude -0.37301

### Derived from:

- Table 1 Macdonald et al, 2018 <https://doi.org/10.23637/ROTHAMSTED-LONG-TERM-EXPERIMENTS-GUIDE-2018>
- 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>

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## Broadbalk fertilizer and organic manure treatments

Strip	Treatments 1852-1967	Treatments from 1968	Treatments from 1985	Treatments from 2001	Treatments from 2006	Treatments from 2021
01	-	FYM N2 PK	FYM N4 PK	(FYM) N4	(FYM) N4	(FYM) N4
2.1 (2a)*	FYM since 1885	FYM N2	FYM N2	FYM N2	FYM N3 (since 2005)	FYM N3
2.2 (2b)*	FYM	FYM	FYM	FYM	FYM	FYM
03	Nil	Nil	Nil	Nil	Nil	Nil
05	PKNaMg	PK(Na)Mg	PKMg	(P)KMg	(P)KMg	(P)KMg
06	N1 PKNaMg	N1 PK(Na)Mg	N1 PKMg	N1 (P)KMg	N1 (P)KMg	N1 (P)KMg
07	N2 PKNaMg	N2 PK(Na)Mg	N2 PKMg	N2 (P)KMg	N2 (P)KMg	N2 (P)KMg
08	N3 PKNaMg	N3 PK(Na)Mg	N3 PKMg	N3 (P)KMg	N3 (P)KMg	N3 (P)KMg
09	N*1 PKNaMg	N4 PK(Na)Mg	N4 PKMg	N4 (P)KMg	N4 (P)KMg	N4 (P)KMg
10	N2	N2	N2	N4	N4	N4
11	N2 P	N2 P	N2 P	N4 PMg	N4 PMg	N4 (P)Mg
12	N2 PNa*	N2 PNa*	N2 PNa*	N1+3+1 (P)K2Mg2	N1+3+1 (P)KMg	N1+3+1 (P)KMg
13	N2 PK	N2 PK	N2 PK	N4 PK	N4 PK	N4 (P)K
14	N2 PMg*	N2 PKMg*	N2 PKMg*	N4 PK*(Mg*)	N4 PK*(Mg*)	N4 (P)K*(Mg*)
15	N2 PKNaMg	N3 PK(Na)Mg	N5 PKMg	N5 (P)KMg	N5 (P)KMg	N5 (P)KMg
16	N*2 PKNaMg	N2 PK(Na)Mg	N6 PKMg	N6 (P)KMg	N6 (P)KMg	N6 (P)KMg
17	N2(A)	N2 1/2[PK(Na)Mg]	N0+3 1/2[PKMg](A)	N1+4+1 PKMg	N1+4+1 PKMg	N1+4+1 PKMg
18	PKNaMg(A)	N2 1/2[PK(Na)Mg]	N1+3 1/2[PKMg](A)	N1+2+1 PKMg	N1+2+1 PKMg	N1+2+1 PKMg
19	C	C	(C)	N1+1+1 KMg	N1+1+1 KMg	N1+1+1 KMg
20	N2 KNaMg since 1906	N2 K(Na)Mg	N2 KMg	N4 KMg	N4 KMg	N4 KMg

(A) Treatment to strips 17 & 18 alternating each year. From 1968 both strips received N2 and half-rate PK(Na)Mg; from 1980 wheat on strips 17 & 18 received N1+3 ie autumn N1 in alternate years plus N3 in spring. Other crops did not receive autumn N

\* Strip 2.1 originally called 2a; Strip 2.2 originally called 2, named 2b in 1885 when plot 2a was made.

## Annual treatment per hectare

FYM : Farmyard manure (from cattle) at 35t  
(FYM) : Farmyard manure at 35t 1968-2000 only  
P : 35kgP as triple superphosphate  
(P) : 35kgP as triple superphosphate until 2000;  
not applied since 2000 due to high levels of soil P,  
reviewed annually since 2000  
Last applied to plots 11, 13 and 14 in 2020  
K : 90kgK as potassium sulphate (135 kgK 1852-58)  
K2 : 180kgK as potassium sulphate, 2001-5  
(plus 450 kgK in autumn 2000 only)  
K\* : 90kgK as potassium chloride  
Mg : 12kgMg as Kieserite (hydrated magnesium sulphate).  
Was 35kgMg every 3rd year 1974-2000. Previously 11kgMg as  
magnesium sulphate until 1973  
Mg2 : 24kgMg as Kieserite, 2001-5  
(plus 60 kg Mg in autumn 2000 only)  
Mg\* : 30kgMg as Kieserite 1974-2000. Previously 31kgMg  
1859-1973 as magnesium sulphate (47kgMg 1852-58)  
(Mg\*) : Previously Mg\* until 2000  
Na : 16kgNa 1859-1973 as sodium sulphate (31kgNa 1852-58)  
(Na) : Previously Na until 1973  
Na\* : 55kgNa on strip 12 only until 2000 (57kgNa  
1859-1973, 86kgNa 1852-58)  
C : Castor meal to supply 96kgN until 1988  
(C) : Previously C until 1988

N1, N2, N3, N4, N5, N6 : 48, 96, 144, 192, 240, 288 kgN  
N1\*,N\*2 : 48, 96 kgN as sodium nitrate (1852-1967)

N applied as ammonium salts until 1967 except  
N\* applied as sodium nitrate;  
N as calcium ammonium nitrate (Nitro-chalk, 21-27.5%N) 1968-85;  
N as ammonium nitrate (Nitram,34.5%N) since 1986

Since 1968:

N to wheat as single application in mid-April

Split N to wheat in mid-March, mid-April, mid-May

N1+1+1 : 48+48+48 kgN (strip 19)

N1+2+1 : 48+96+48 kgN (strip 18)

N1+3+1 : 48+144+48 kgN (strip 12)

N1+4+1 : 48+192+48 kgN (strip 17)

Split N to forage maize, 1997-2017, in seedbed and post-emergence

N2+1 : 96+48 kgN (strip 19)

N2+2 : 96+96 kgN (strip 18)

N2+3 : 96+144 kgN (strip 12)

N2+4 : 96+192 kgN (strip 17)

No N or FYM to oats, 1996-2017

From 2018 N to oats at ½ rate, as a single application in mid-April

½N1, ½N2, ½N3, ½N4, ½N5, ½N6: 24, 48, 72, 96, 120, 144 kgN

Oats on strips 19, 18, 12 and 17 also receive N as a single mid-April  
application: ½N3, ½N4, ½N5, ½N6 respectively

No N or FYM to beans from 2018

**FYM nutrient content:**

FYM. The FYM added between 1968-2016 contained, on average (per hectare, per year), 249 kg N, 47 kg P, 333 kg K, 146 kg Ca, 30 kg Mg, 28 kg Na, 42 kg S (analysed 1999-2016 only).

(FYM). The FYM applied to strip 01, 1968-2000, contained, on average, 254 kg N, 44 kg P, 351 kg K, 130 kg Ca, 26 kg Mg, 28 kg Na. S was not analysed until 1999; see value above.

S (sulphur) has been added, by default, as part of the potassium sulphate, magnesium sulphate, Kieserite (hydrated magnesium sulphate), FYM and ammonium sulphate applications. **S has not been applied to plot 14 from 2001 onwards.**

**Fertilizer applications to the non-wheat crops in the rotational sections (2, 3, 4, 5 and 7):**

From 2018 onwards the rotation is Wheat>Wheat>Oats>Wheat>Beans. The oats receives N at half of the normal rate (see above); the beans do not receive N or FYM.

In the previous rotation, Wheat>Wheat>Wheat>Oats>Maize from 1996-2017, oats did not receive N or FYM.

In earlier rotations from 1968-1996, beans and potatoes received N, FYM (and PKNaMg) at the same rate as wheat.

**Fallow management:**

From autumn 1967 onwards, FYM and the autumn fertilizers (P,K, Na, Mg and Castor meal) were applied to the fallow sections of the rotational sections (and Section 8 when fallowed). N was NOT applied.

This is in contrast to the management of the fallow sections 1926-1967, when no fertilizers or manures were applied to those sections which were fallowed to control weeds in the continuous wheat sections.

Updated from Table 1, Macdonald et al, 2018

<https://doi.org/10.23637/ROTHAMSTED-LONG-TERM-EXPERIMENTS-GUIDE-2018>