Broadbalk experiment fertilizer and manure treatments 1852-2021

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Description:

- **Page 1:** Cover Page
- **Pages 2-4:** Broadbalk experiment fertilizer and manure treatment details, 1852-2021

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

Latitude 51.80946, Longitude -0.37301

Related Resources:

- 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	FYM since 1885	FYM N2	FYM N2	FYM N2	FYM N3 (since 2005)	FYM N3
2.2	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. Maize did not receive autumn N

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
K2 :	180kgK as potassium sulphate, 2001-5 (plus 450 kgK in autumn 2000 only)
K* :	90kgK as potassium chloride
Mg :	12kgMg as Kieserite.Was 35kgMg every 3rd year 1974-2000. Previously 11kgMg as magnesium sulphate until 1973
Mg2 :	24kgMg as Kieserite (magnesium sulphate), 2001-5 (plus 60 kg Mg in autumn 2000 only)
(Mg*) :	30kgMg as Kieserite 1974-2000. Previously 31kgMg as magnesium sulphate until 1973
(Na) :	16kgNa as sodium sulphate until 1973; 55kgNa on strip 12 only until 2000 (57kgNa until 1973)
(C) :	Castor meal to supply 96kgN until1988

N to wheat as single applications (mid-April)
N1,N2,N3,N4,N5,N6 : 48,96,144,192,240,288 kgN

Split N to wheat (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, (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 (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 application: ½N3, ½N3, ½N5, ½N6 respectively

No N or FYM to beans from 2018

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

S (sulphur) has been added, by default, as part of the potassium sulphate, magnesium sulphate, Kieserite, 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 PK etc) 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