

## Broadbalk Fertiliser 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   | N to wheat as single applications (mid-April)  |
| (FYM) : Farmyard manure at 35t 1968-2000 only  | N1,N2,N3,N4,N5,N6 : 48,96,144,192,240,288 kgN  |
| 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  | Split N to wheat (mid-March, mid-April, Mid-May)   |
| (P*) : 35kgP as triple superphosphate until 2020; not applied since 2020 due to high levels of soil P, reviewed annually | N1+1+1 : 48+48+48 kgN (strip 19)   |
| K : 90kgK as potassium sulphate  | N1+2+1 : 48+96+48 kgN (strip 18)   |
| K2 : 180kgK as potassium sulphate, 2001-2005. (plus 450 kgK in autumn 2000 only)   | N1+3+1 : 48+144+48 kgN (strip 12)  |
| K* : 90kgK as potassium chloride   | N1+4+1 : 48+192+48 kgN (strip 17)  |
| Mg : 12kgMg as Kieserite. Was 35kgMg every 3rd year 1974-2000. Previously 11kgMg as magnesium sulphate until 1973        | Split N to forage maize, 1997-2017, (seedbed and post-emergence)   |
| Mg2 : 24kgMg as Kieserite, 2001-2005. (plus 60 kg Mg in autumn 2000 only)  | N2+1 : 96+48 kgN (strip 19)  |
| (Mg*) : 30kgMg as Kieserite 1974-2000. Previously 31kgMg as magnesium sulphate until 1973                                | N2+2 : 96+96 kgN (strip 18)  |
| (Na) : 16kgNa as sodium sulphate until 1973; 55kgNa on strip 12 only until 2000 (57kgNa until 1973)                      | N2+3 : 96+144 kgN (strip 12)   |
| (C) : Castor meal to supply 96kgN until 1988   | 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  |

Note : 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.**

### Rotations:

In 2018 the rotation sections of the experiment changed to Wheat, Wheat, Oats, Wheat, Beans. The oats will receive N at half of the normal rate (see above); the beans will 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 fertilisers (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 fertilisers or manures were applied to those sections which were fallowed to control weeds in the continuous wheat sections.

### Further information:

For more detailed information on treatments, particularly before 1968, see references below:

Dyke, G. V. , George, B. J. , Johnston, A. E. , Poulton, P. R. and Todd, A. D. (1983) "The Broadbalk wheat experiment 1968-78: yields and plant nutrients in crops grown continuously and in rotation", *Rothamsted Experimental Station Report for 1982* , **Part 2** , 5-44  
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Johnston, A. E. and Garner, H. V. (1969) "Broadbalk: Historical Introduction", *Rothamsted Experimental Station Report for 1968* , **Part 2** , 12-25  
DOI: <https://doi.org/10.23637/ERADOC-1-34916>

Rothamsted (1966) "Details of the Classical and Long-Term Experiments up to 1962", *Rothamsted Experimental Station, Lawes Agricultural Trust*, Harpenden, UK, 87 pp  
DOI: <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  
DOI: <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, 77 pp  
DOI: <https://doi.org/10.23637/ERADOC-1-193>

<http://www.era.rothamsted.ac.uk/Broadbalk/bbksolchem>

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