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# **Rothamsted Long-term Experiments Farm Diary and Yields of the Classical and Other Long-term Experiments Weather Summaries 2023**



[Full Table of Content](#)

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## **2023/W/RN/3 - Woburn Ley-arable (Stackyard D, Woburn Farm)**

### **Rothamsted Research**

Rothamsted Research (2025) *2023/W/RN/3 - Woburn Ley-arable (Stackyard D, Woburn Farm)* ;  
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## 2023/W/RN/3 WOBURN LEY-ARABLE (Stackyard D, Woburn)

**Object:** To compare the effects on soil fertility of rotations with or without leys – Woburn, Stackyard D. The experiment has had many phases throughout its history. The current phase essentially has only 3 different current rotations: all-arable, grass-clover ley-arable, and grass ley-arable, though all have had slightly different histories and hence it is still regarded as having eight treatments. The 86<sup>th</sup> year, leys, winter barley, winter oats, winter wheat, winter rye. For previous years see ‘Details’ 1967 & 1973 and Yield Books for 1974-2022/W/RN/3. For a comprehensive guide to the treatments and cropping sequences from 1938, please see <https://doi.org/10.23637/wrn3-cropping1938-2020-02>.

**Design:** 5 series of 16 Main-plots, reflecting past and present rotations, and an old FYM application, with a 3-year Treatment crop phase followed by a 2-year Test crop phase when the Main plots are split for differential rotating N applications

**Main plot dimensions:** 8.53 m × 40.7 m (split into 4 for differential N applications during the Test crop phase)

### Current and Previous Treatments (definitive Main plot plan)

| Block | Main plot | Dung residue | Last applied | Former treatments   | Current treatment |
|-------|-----------|--------------|--------------|---------------------|-------------------|
| 1     | 01        | dr           | 1965         | (Ah) (AB) (ABe)     | AO                |
| 1     | 02        | –            | –            | (Ah) (AB) (ABe)     | AO                |
| 1     | 03        | –            | –            | (Lu)                | Lc3               |
| 1     | 04        | dr           | 1965         | (Lu)                | Lc3               |
| 1     | 05        | dr           | 1965         | (Ar) (AF) (AM)      | AO                |
| 1     | 06        | –            | –            | (Ar) (AF) (AM)      | AO                |
| 1     | 07        | –            | –            | (L/Ah) (LLc8)       | Lc3               |
| 1     | 08        | dr           | 1965         | (L/Ah) (LLc8)       | Lc3               |
| 1     | 09        | –            | –            | (Ar/Lu) (LLn8)      | AO                |
| 1     | 10        | dr           | 1965         | (Ar/Lu) (LLn8)      | AO                |
| 1     | 11        | dr           | 1965         | (Lu/Ar) (LLn8)      | Ln3               |
| 1     | 12        | –            | –            | (Lu/Ar) (LLn8)      | Ln3               |
| 1     | 13        | dr           | 1965         | (L)                 | Ln3               |
| 1     | 14        | –            | –            | (L)                 | Ln3               |
| 1     | 15        | –            | –            | (Ah/L) (LLc8) (ABe) | AO                |
| 1     | 16        | dr           | 1965         | (Ah/L) (LLc8) (ABe) | AO                |
| 2     | 17        | –            | –            | (Ah) (AB) (ABe)     | AO                |
| 2     | 18        | dr           | 1964         | (Ah) (AB) (ABe)     | AO                |
| 2     | 19        | –            | –            | (Ar) (AF) (AM)      | AO                |
| 2     | 20        | dr           | 1964         | (Ar) (AF) (AM)      | AO                |
| 2     | 21        | dr           | 1964         | (Ah/L) (LLc8) (ABe) | AO                |
| 2     | 22        | –            | –            | (Ah/L) (LLc8) (ABe) | AO                |
| 2     | 23        | –            | –            | (L/Ah) (LLc8)       | Lc3               |
| 2     | 24        | dr           | 1964         | (L/Ah) (LLc8)       | Lc3               |
| 2     | 25        | dr           | 1964         | (Lu/Ar) (LLn8)      | Ln3               |
| 2     | 26        | –            | –            | (Lu/Ar) (LLn8)      | Ln3               |
| 2     | 27        | –            | –            | (Ar/Lu) (LLn8)      | AO                |
| 2     | 28        | dr           | 1964         | (Ar/Lu) (LLn8)      | AO                |
| 2     | 29        | –            | –            | (Lu)                | Lc3               |
| 2     | 30        | dr           | 1964         | (Lu)                | Lc3               |
| 2     | 31        | –            | –            | (L)                 | Ln3               |
| 2     | 32        | dr           | 1964         | (L)                 | Ln3               |
| 3     | 33        | dr           | 1966         | (Lu)                | Lc3               |
| 3     | 34        | –            | –            | (Lu)                | Lc3               |
| 3     | 35        | dr           | 1966         | (Ar/Lu) (LLn8)      | AO                |
| 3     | 36        | –            | –            | (Ar/Lu) (LLn8)      | AO                |
| 3     | 37        | –            | –            | (Lu/Ar) (LLn8)      | Ln3               |

|   |    |    |      |                     |     |
|---|----|----|------|---------------------|-----|
| 3 | 38 | dr | 1966 | (Lu/Ar) (LLn8)      | Ln3 |
| 3 | 39 | dr | 1966 | (Ar) (AF) (AM)      | AO  |
| 3 | 40 | –  | –    | (Ar) (AF) (AM)      | AO  |
| 3 | 41 | –  | –    | (L/Ah) (LLc8)       | Lc3 |
| 3 | 42 | dr | 1966 | (L/Ah) (LLc8)       | Lc3 |
| 3 | 43 | –  | –    | (L)                 | Ln3 |
| 3 | 44 | dr | 1966 | (L)                 | Ln3 |
| 3 | 45 | –  | –    | (Ah) (AB) (ABe)     | AO  |
| 3 | 46 | dr | 1966 | (Ah) (AB) (ABe)     | AO  |
| 3 | 47 | –  | –    | (Ah/L) (LLc8) (ABe) | AO  |
| 3 | 48 | dr | 1966 | (Ah/L) (LLc8) (ABe) | AO  |
| 4 | 49 | dr | 1963 | (Ah/L) (LLc8) (ABe) | AO  |
| 4 | 50 | –  | –    | (Ah/L) (LLc8) (ABe) | AO  |
| 4 | 51 | –  | –    | (Ar/Lu) (LLn8)      | AO  |
| 4 | 52 | dr | 1963 | (Ar/Lu) (LLn8)      | AO  |
| 4 | 53 | –  | –    | (Ah) (AB) (ABe)     | AO  |
| 4 | 54 | dr | 1963 | (Ah) (AB) (ABe)     | AO  |
| 4 | 55 | –  | –    | (L/Ah) (LLc8)       | Lc3 |
| 4 | 56 | dr | 1963 | (L/Ah) (LLc8)       | Lc3 |
| 4 | 57 | dr | 1963 | (L)                 | Ln3 |
| 4 | 58 | –  | –    | (L)                 | Ln3 |
| 4 | 59 | dr | 1963 | (Lu)                | Lc3 |
| 4 | 60 | –  | –    | (Lu)                | Lc3 |
| 4 | 61 | –  | –    | (Lu/Ar) (LLn8)      | Ln3 |
| 4 | 62 | dr | 1963 | (Lu/Ar) (LLn8)      | Ln3 |
| 4 | 63 | dr | 1963 | (Ar) (AF) (AM)      | AO  |
| 4 | 64 | –  | –    | (Ar) (AF) (AM)      | AO  |
| 5 | 65 | –  | –    | (L)                 | Ln3 |
| 5 | 66 | dr | 1967 | (L)                 | Ln3 |
| 5 | 67 | dr | 1967 | (Ah) (AB) (ABe)     | AO  |
| 5 | 68 | –  | –    | (Ah) (AB) (ABe)     | AO  |
| 5 | 69 | –  | –    | (Lu/Ar) (LLn8)      | Ln3 |
| 5 | 70 | dr | 1967 | (Lu/Ar) (LLn8)      | Ln3 |
| 5 | 71 | –  | –    | (Ar/Lu) (LLn8)      | AO  |
| 5 | 72 | dr | 1967 | (Ar/Lu) (LLn8)      | AO  |
| 5 | 73 | dr | 1967 | (Ar) (AF) (AM)      | AO  |
| 5 | 74 | –  | –    | (Ar) (AF) (AM)      | AO  |
| 5 | 75 | dr | 1967 | (Ah/L) (LLc8) (ABe) | AO  |
| 5 | 76 | –  | –    | (Ah/L) (LLc8) (ABe) | AO  |
| 5 | 77 | dr | 1967 | (L/Ah) (LLc8)       | Lc3 |
| 5 | 78 | –  | –    | (L/Ah) (LLc8)       | Lc3 |
| 5 | 79 | –  | –    | (Lu)                | Lc3 |
| 5 | 80 | dr | 1967 | (Lu)                | Lc3 |

**Current treatment coding to reflect current and previous treatment**

| (Previous treatments) | Current treatment (since 2021) | Description                                  |
|-----------------------|--------------------------------|----------------------------------------------|
| (Ah) (AB) (ABe)       | AO                             | All-arable, long-term                        |
| (Ar) (AF) (AM)        | AO                             | All-arable, long-term                        |
| (Ah/L) (LLc8) (ABe)   | AO                             | All-arable; previous grass-clover ley-arable |
| (Ar/Lu) (LLn8)        | AO                             | All-arable; previous grass ley-arable        |
| (Lu/Ar) (LLn8)        | Ln3                            | Grass ley-arable; previous all-arable        |
| (L)                   | Ln3                            | Grass ley-arable; long-term                  |
| (L/Ah) (LLc8)         | Lc3                            | Grass-clover ley-arable; previous all-arable |
| (Lu)                  | Lc3                            | Grass-clover ley-arable; long-term           |

**Notes**

All treatments are in paired Main plots with old residues of farmyard manure (see below)

### Current treatment crop rotations

| Current treatment (since 2021) | Treatment crops (3 years)               | Test crops (2 years)     |
|--------------------------------|-----------------------------------------|--------------------------|
| AO                             | w. rye [R], w. barley [WB], w. oats [O] | w. wheat [W], w. rye [R] |
| Ln3                            | 3-year Grass only ley (with N)          | w. wheat [W], w. rye [R] |
| Lc3                            | 3-year Grass/Clover ley (no N)          | w. wheat [W], w. rye [R] |

### Previous treatments

|                                        |                                                                                                                                                                                                                                                                    |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1938-1974</b>                       |                                                                                                                                                                                                                                                                    |
| (Ar)                                   | Treatment: 3-year arable (1 year root crop) (P, R, C, P, W until 1971 then P, B, B, W, B); Test: 2-year arable; (became <b>AF</b> )                                                                                                                                |
| (Ah)                                   | Treatment: 3-year arable (1 year hay) (P, R, H, P, W until 1971 then P, B, H, W, B); Test: 2-year arable; (became <b>AB</b> )                                                                                                                                      |
| (L)                                    | Treatment: 3-year grazed grass-clover ley; Test: 2-year arable (P, W until 1971 then W, B); (became <b>Ln3</b> )                                                                                                                                                   |
| (Lu)                                   | Treatment: 3-year lucerne ley; Test: 2-year arable (P, W). Lu (lucerne) then SA 1964-67 then CL 1971-1974; (became <b>Lc3</b> )                                                                                                                                    |
| (Ar/Lu)<br>(Ah/L)<br>(Lu/Ar)<br>(L/Ah) | Alternating rotations designated as <b>Ar/Lu</b> , <b>Ah/L</b> , <b>Lu/Ar</b> or <b>L/Ah</b> according to the order in which the first 6 Treatment crops appeared; (became <b>LLn8-1st</b> , <b>LLc-1st</b> , <b>LLn8-2nd</b> , and <b>LLc-2nd</b> , respectively) |
| (dr)                                   | Residues of 38 t/ha FYM applied to one of each main plot pairs (last application in 1963, 1964, 1965, 1966 and 1967 for blocks 4, 2, 1, 3 and 5, respectively); (-) indicates no residues                                                                          |
| <b>1973-2002</b>                       |                                                                                                                                                                                                                                                                    |
| (AF)                                   | (replaced <b>Ar</b> ); Treatment: 3-year arable (F, F, BE); Test: 2-year arable (W, R); (became <b>AM</b> )                                                                                                                                                        |
| (AB)                                   | (replaced <b>Ah</b> ); Treatment: 3-year arable (B, B, BE); Test: 2-year arable (W, R); (became <b>ABe</b> )                                                                                                                                                       |
| (Ln3)                                  | (replaced <b>L</b> ); Treatment: 3-year grass ley with N; test: 2-year arable (W, R); (became <b>LLn8</b> or remained <b>Ln3</b> )                                                                                                                                 |
| (Lc3)                                  | (replaced <b>Lu</b> ); Treatment: 3-year grass/clover ley; Test: 2-year arable (W, R); (became <b>LLc8</b> or remained <b>Lc3</b> )                                                                                                                                |
| (AM)                                   | (replaced <b>AF</b> ); Treatment: 3-year arable (R, BE, M); Test: 2-year arable (W, R); (became <b>AO</b> )                                                                                                                                                        |
| (ABe)                                  | (replaced <b>AB</b> ); Treatment: 3-year arable (R, M, BE); 2-year arable (W, R) (remained as <b>ABe</b> )                                                                                                                                                         |
| (LLn8-1st)                             | (replaced <b>Ar/Lu</b> ); Treatment: 8-year grass ley with N; Test: 2-year arable (W, R); 1st cycle phased in from 1973 on Block III (and in subsequent years on Blocks V, IV, II and I; 1st cycle); (became <b>LLn/AO</b> )                                       |
| (LLc8-1st)                             | (replaced <b>Ah/L</b> ); Treatment: 8-year grass/clover ley; Test: 2-year arable (W, R); 1st cycle phased in from 1973 on Block III (and in subsequent years on Blocks V, IV, II and I; 1st cycle); (became <b>LLc/ABe</b> )                                       |
| (LLn8-2nd)                             | (replaced <b>Lu/Ar</b> ); Treatment: 8-year grass ley with N; Test: 2-year arable (W, R); 2nd cycle phased in from 1978 on Block III (and in subsequent years on Blocks V, IV, II and I; 2nd cycle); (became <b>LLn/Ln3</b> )                                      |
| (LLc8-2nd)                             | (replaced <b>L/Ah</b> ); Treatment: 8-year grass/clover ley; Test: 2-year arable (W, R); 2nd cycle phased in from 1978 on Block III (and in subsequent years on Blocks V, IV, II and I; 2nd cycle); (became <b>LLc/Lc3</b> )                                       |
| <b>2007-2020</b>                       |                                                                                                                                                                                                                                                                    |
| (AO)                                   | (replaced <b>AM</b> ); Treatment: 3-year arable (R, BE, O); Test: 2-year arable; O replaced M as a treatment crop 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment <b>AO</b> )                                                       |
| (ABe)                                  | (replaced <b>ABe</b> above); O replaced M as a treatment crop 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment <b>AO</b> )                                                                                                           |
| (LLn/AO)                               | (replaced <b>LLn8-1st</b> ) into <b>AO</b> rotation; Treatment: 3-year arable (R, Be, O); Test: 2-year arable (W, R) from 2007; (effectively became current treatment <b>AO</b> )                                                                                  |
| (LLc/ABe)                              | (replaced <b>LLc8-1st</b> ) into <b>ABe</b> rotation, Treatment: 3-year arable (R, O, Be); Test: 2-year arable (W, R) from 2007; (effectively changed to current treatment <b>AO</b> )                                                                             |
| (LLn/Ln3)                              | (replaced <b>LLn8-2nd</b> ) into <b>Ln3</b> , 3-year grass leys with N 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment <b>Ln3</b> )                                                                                                 |
| (LLc/Lc3)                              | (replaced <b>LLc8-2nd</b> ) into <b>Lc3</b> , 3-year grass/clover leys 2008-2012 (blocks III, V, IV, II and I); (effectively became current treatment <b>Lc3</b> at top)                                                                                           |

### Notes

- Crops: B: spring barley; BE: beans; C: carrots; CL: red clover ley; F: fallow; H: hay; L: clover/grass ley; Lu: lucerne; M: forage maize; O: oats; P: potatoes; R: rye; SA: sainfoin ley; W: winter wheat
- Original rotations followed different cycles:

- On four plots in each block the rotations were repeated.
- On four plots in each block arable rotations alternated every five years with ley rotations.
- From 1973 all the rotations were changed on all phases except for the first and second test crops in 1976.
- The new scheme started by sowing new leys in spring 1976 on four phases and in spring 1977 on the fifth phase (2<sup>nd</sup> test crop in 1976).
- In 1992 winter rye (R) replaced spring barley (B) as the second test crop.
- From 2007 plots previously in the 1<sup>st</sup> cycle of testing eight-year leys followed by two arable test crops (i.e. those plots which were changed to eight-year ley treatments in 1976 or 1977) changed to a three-year arable rotation followed by two arable test crops. Plots were “phased in” but joined the relevant point in the rotation. From 2008 the second cycle 8-yr grass and grass/clover leys changed to 3-yr grass or grass/clover leys respectively. They were phased in between 2008 and 2012.
- From 2009 winter oats (O) replaced forage maize (M) in the **AM** and **ABe** rotations on block III and were phased in on blocks V, IV, II and I in subsequent years. The **AM** treatment was re-named **AO**. The new rotations were fully in phase by 2016.
- For 2021, a further change was made to replace winter beans (which had occasionally failed on the experiment) with winter barley (WB), and to synchronise all arable rotations. As a result, treatments **ABe**, **AO**, **LLc/ABe** and **LLn/AO** all follow the same rotation: R, WB, O, W, R.

### Current applications

#### Basal fertilisation

| Nutrient application rate<br>(kg/ha)     | P               |                | K/S             |                |                 | K <sup>(f)</sup> |                                 |
|------------------------------------------|-----------------|----------------|-----------------|----------------|-----------------|------------------|---------------------------------|
|                                          | early<br>Autumn | late<br>Autumn | early<br>Autumn | late<br>Autumn | early<br>Spring | early<br>Spring  | after each cut<br>(except last) |
| <u>Treatment crops</u>                   |                 |                |                 |                |                 |                  |                                 |
| w. rye <sup>(a)</sup>                    | 25              | -              | -               | -              | 62/27           | -                | -                               |
| w. barley <sup>(a)</sup>                 | 25              | -              | -               | -              | 62/27           | -                | -                               |
| w. oats <sup>(a)</sup>                   | 25              | -              | -               | -              | 62/27           | -                | -                               |
| 1st year grass only ley <sup>(b)</sup>   | 43              | -              | 58/25           | -              | -               | 83.5             | 41.5                            |
| 1st year grass/clover ley <sup>(b)</sup> | 43              | -              | 58/25           | -              | -               | 83.5             | 41.5                            |
| 2-3 year grass only ley <sup>(c)</sup>   | -               | 43             | -               | 58/25          | -               | 83.5             | 41.5                            |
| 2-3 year grass/clover ley <sup>(c)</sup> | -               | 43             | -               | 58/25          | -               | 83.5             | 41.5                            |
| <u>Test crops</u>                        |                 |                |                 |                |                 |                  |                                 |
| w. wheat <sup>(d)</sup>                  | 25              | -              | -               | -              | 62/27           | -                | -                               |
| w. rye <sup>(e)</sup>                    | 25              | -              | -               | -              | 62/27           | -                | -                               |

|     |                                                                                                                                                                                                                |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P   | P as triple superphosphate                                                                                                                                                                                     |
| K/S | K and S as potassium sulphate (41.5% K; 18% S)                                                                                                                                                                 |
| K   | K as potassium chloride (Muriate of Potash)                                                                                                                                                                    |
| (a) | P applied to stubble of preceding crop; K/S applied in early spring                                                                                                                                            |
| (b) | P and K/S applied to stubble of preceding w. rye (2 <sup>nd</sup> Test crop)                                                                                                                                   |
| (c) | P and K/S applied after final cuts in preceding year (1-2 year leys)                                                                                                                                           |
| (d) | P applied to stubble of preceding arable crop or the preceding 3-year leys where the 2 <sup>nd</sup> cut has (usually) been taken early and the sward then killed with glyphosate; K/S applied in early spring |
| (e) | P applied to stubble of preceding w. wheat (1 <sup>st</sup> Test crop); K/S applied in early spring                                                                                                            |
| (f) | Corrective K (as muriate of potash) are applied where necessary to 1 <sup>st</sup> Test crop winter wheat in the autumn                                                                                        |

### Corrective K

Corrective K dressings as muriate of potash, applied in autumn as necessary to 1<sup>st</sup> Test crop w. wheat. Note that applications for 2023 were based on rounded means calculated from 2018-2022 data in the absence of more recent data due to a backlog from the COVID-19 pandemic.

| Treatment              | No FYM residue (-) |                          |           | FYM residue (dr) |                          |           |
|------------------------|--------------------|--------------------------|-----------|------------------|--------------------------|-----------|
|                        | Plot               | K <sub>2</sub> O (kg/ha) | K (kg/ha) | Plot             | K <sub>2</sub> O (kg/ha) | K (kg/ha) |
| (Ah/L) (LLc8) (ABe) AO | 50                 | 151                      | 125       | 49               | 151                      | 125       |
| (Ar/Lu) (LLn8) AO      | 51                 | 211                      | 175       | 52               | 211                      | 175       |
| (Ah) (AB) (ABe) AO     | 53                 | 251                      | 209       | 54               | 251                      | 209       |
| (L/Ah) (LLc8) Lc3      | 55                 | 0                        | 0         | 56               | 0                        | 0         |
| (L) Ln3                | 58                 | 27                       | 22        | 57               | 27                       | 22        |
| (Lu) Lc3               | 60                 | 0                        | 0         | 59               | 0                        | 0         |
| (Lu/Ar) (LLn8) Ln3     | 61                 | 13                       | 11        | 62               | 13                       | 11        |
| (Ar) (AF) (AM) AO      | 64                 | 255                      | 211       | 63               | 255                      | 211       |

### N fertilisation

| Nutrient application rate (kg/ha) | N (33.5%) |        |                            | N (27%)            |                 |
|-----------------------------------|-----------|--------|----------------------------|--------------------|-----------------|
|                                   | seedbed   | Spring | after each cut except last | late Feb/early Mar | mid Apr         |
| <u>Treatment crops</u>            |           |        |                            |                    |                 |
| w. rye                            |           | 100    |                            |                    |                 |
| w. barley                         |           | 100    |                            |                    |                 |
| w. oats                           |           | 100    |                            |                    |                 |
| 1st year all-grass ley            | 50        | 75     | 75                         |                    |                 |
| 1st year grass/clover ley         | 25        |        |                            |                    |                 |
| 2-3 year all grass ley            |           | 75     | 75                         |                    |                 |
| 2-3 year grass/clover ley         |           |        |                            |                    |                 |
| <u>Test crops</u>                 |           |        |                            |                    |                 |
| w. wheat <sup>(a)</sup>           |           |        |                            | 0, 40, 40, 40      | 0, 40, 120, 200 |
| w. rye <sup>(a)</sup>             |           |        |                            |                    | 0, 50, 100, 150 |

|           |                                                                                                                                                                                                                                            |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| N (33.5%) | N as ammonium nitrate (33.5% N)                                                                                                                                                                                                            |
| N (27%)   | N as calcium ammonium nitrate (Nitro-chalk; 27% N) at N0, N1, N2 and N3 levels                                                                                                                                                             |
| (a)       | Plots split in 4 during Test crop phase for 4 levels of N which rotates (N3>N2>N1>N0>N3...) from the previous time it was in the Test crop phase as per plans (note different N rates for W and R, and that N is applied in 2 splits to W) |

### Notes

Split N was tested on w. wheat in 2001-2005 (split N on no-FYM plots (-); single N on FYM plots (dr)).

**FARM DIARY**

| Date                                             |   | Application                                                                                                        | Rate | Units                |
|--------------------------------------------------|---|--------------------------------------------------------------------------------------------------------------------|------|----------------------|
| <b>W. Rye (1<sup>st</sup> year treatment)</b>    |   |                                                                                                                    |      |                      |
| 20/09/2022                                       | a | Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620                                                    | -    | -                    |
| 21/09/2022                                       | a | Cultivated/levelled using Cousins Spring Tines with JD6620                                                         | -    | -                    |
| 21/09/2022                                       | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030                                                      | 1    | L/ha                 |
| 21/09/2022                                       | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Arable Plots 35, 36, 39, 40, 45, 46, 47, 48       | 2    | L/ha                 |
| 09/11/2022                                       | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 35, 36, 39, 40, 45, 46, 47, 48      | 127  | kg/ha                |
| 28/11/2022                                       | a | Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium                                                            | -    | -                    |
| 30/11/2022                                       | a | Plough: Kuhn Powerharrow 3m with JD6145R Premium                                                                   | -    | -                    |
| 30/11/2022                                       | S | Drilled: Rye (Lunator) tr. Redigo Pro (15145) using WES Accord 4m Tine Drill with JD6830                           | 300  | seeds/m <sup>2</sup> |
| 03/04/2023                                       | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 35, 36, 39, 40, 45, 46, 47, 48        | 150  | kg/ha                |
| 03/04/2023                                       | f | Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Plots 35, 36, 39, 40, 45, 46, 47, 48                | 299  | kg/ha                |
| 03/04/2023                                       | f | Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Plots 35, 36, 39, 40, 45, 46, 47, 48                | 299  | kg/ha                |
| 14/05/2023                                       | p | Sprayed: Horus (16216) using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48                                | 1.2  | L/ha                 |
| 14/05/2023                                       | p | Sprayed: Eagle (16490) using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48                                | 40   | g/ha                 |
| 14/05/2023                                       | p | Sprayed: Biopower (A0617) using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48, 49                         | 1    | L/ha                 |
| 14/06/2023                                       | p | Sprayed: Sprinter using Agribuggy2 AB30 - Plots 35, 36, 39, 40, 45, 46, 47, 48                                     | 3    | L/ha                 |
| 14/06/2023                                       | p | Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - 35, 36, 39, 40, 45, 46, 47, 48                                 | 0.9  | L/ha                 |
| 08/09/2023                                       | a | Harvest (Combine): Haldrup C-85 2m cut                                                                             | -    | -                    |
| <b>W. Barley (2<sup>nd</sup> year treatment)</b> |   |                                                                                                                    |      |                      |
| 20/09/2022                                       | a | Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620                                                    | -    | -                    |
| 21/09/2022                                       | a | Cultivated/levelled using Cousins Spring Tines with JD6620                                                         | -    | -                    |
| 21/09/2022                                       | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030                                                      | 1    | L/ha                 |
| 21/09/2022                                       | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 1, 2, 5, 6, 9, 10, 15, 16                   | 2    | L/ha                 |
| 09/11/2022                                       | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 01, 02, 05, 06, 09, 10, 15, 16      | 127  | kg/ha                |
| 28/11/2022                                       | a | Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium                                                            | -    | -                    |
| 30/11/2022                                       | a | Plough: Kuhn Powerharrow 3m with JD6145R Premium                                                                   | -    | -                    |
| 30/11/2022                                       | S | Drilled: Winter Barley (KWS Feeris) tr. Raxil star (17805) using WES Accord 4m Tine Drill with JD6830              | 350  | seeds/m <sup>2</sup> |
| 03/04/2023                                       | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 1, 2, 5, 6, 9, 10, 15, 16             | 150  | kg/ha                |
| 03/04/2023                                       | f | Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Winter Barley Whole Plots 1, 2, 5, 6, 9, 10, 15, 16 | 299  | kg/ha                |
| 14/05/2023                                       | p | Sprayed: Presite SX (18776) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16                                | 60   | g/ha                 |
| 14/05/2023                                       | p | Sprayed: Lentyma XE (19301) using Agribuggy2 AB30 - Winter Barley Whole Plots 1, 2, 5, 6, 9, 10, 15, 16            | 1    | L/ha                 |
| 14/05/2023                                       | p | Sprayed: Stefes CCC 720 (17731) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16                            | 2    | L/ha                 |

Rothamsted Long-Term Experiments: Farm Diary and Yields 2023

2023/W/RN/3

|                                                                        |   |                                                                                                                        |      |                      |
|------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------|------|----------------------|
| 14/05/2023                                                             | p | Sprayed: Moraine (19608) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16                                       | 0.6  | L/ha                 |
| 14/05/2023                                                             | p | Sprayed: Sprinter using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16                                              | 2    | L/ha                 |
| 14/06/2023                                                             | p | Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16                                    | 0.9  | L/ha                 |
| 14/06/2023                                                             | p | Sprayed: Sprinter using Agribuggy2 AB30 - Plots 1, 2, 5, 6, 9, 10, 15, 16                                              | 3    | L/ha                 |
| 08/09/2023                                                             | a | Harvest (Combine): Haldrup C-85 2m cut                                                                                 | -    | -                    |
| <b>W. Oats (3<sup>rd</sup> year treatment)</b>                         |   |                                                                                                                        |      |                      |
| 20/09/2022                                                             | a | Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620                                                        | -    | -                    |
| 21/09/2022                                                             | a | Cultivated/levelled using Cousins Spring Tines with JD6620                                                             | -    | -                    |
| 21/09/2022                                                             | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030                                                          | 1    | L/ha                 |
| 21/09/2022                                                             | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 17, 18, 19, 20, 21, 22, 27, 28                  | 2    | L/ha                 |
| 09/11/2022                                                             | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 17, 18, 19, 20, 21, 22, 27, 28          | 127  | kg/ha                |
| 28/11/2022                                                             | a | Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium                                                                | -    | -                    |
| 30/11/2022                                                             | a | Plough: Kuhn Powerharrow 3m with JD6145R Premium                                                                       | -    | -                    |
| 30/11/2022                                                             | s | Drilled: Winter Oats (Mascani) tr. Redigo Pro (15145) using WES Accord 4m Tine Drill with JD6830                       | 350  | seeds/m <sup>2</sup> |
| 03/04/2023                                                             | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 17, 18, 19, 20, 21, 22, 27, 28            | 150  | kg/ha                |
| 03/04/2023                                                             | f | Applied: Yara Bela Extran using Cascade Spreader with JD6830 - Plots 17, 18, 19, 20, 21, 22, 27, 28                    | 299  | kg/ha                |
| 14/05/2023                                                             | p | Sprayed: Presite SX (18776) using Agribuggy2 AB30 - Plots 17, 18, 19, 20, 21, 22, 27, 28                               | 60   | g/ha                 |
| 14/05/2023                                                             | p | Sprayed: Moraine (19608) using Agribuggy2 AB30 - Plots 17, 18, 19, 20, 21, 22, 27, 28                                  | 0.6  | L/ha                 |
| 14/05/2023                                                             | p | Sprayed: Sprinter using Agribuggy2 AB30 - Plots 17, 18, 19, 20, 21, 22, 27, 28                                         | 2    | L/ha                 |
| 08/09/2023                                                             | a | Harvest (Combine): Haldrup C-85 2m cut                                                                                 | -    | -                    |
| <b>Grass ley and clover/grass leys (1<sup>st</sup> year treatment)</b> |   |                                                                                                                        |      |                      |
| 20/09/2022                                                             | a | Ploughed; thrown N using Dowdeswell 4 Furrow Plough with JD6620                                                        | -    | -                    |
| 21/09/2022                                                             | a | Cultivated/levelled using Cousins Spring Tines with JD6620                                                             | -    | -                    |
| 21/09/2022                                                             | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030; 1st Year Leys Plots 33, 34, 37, 38, 41, 42, 43, 44      | 1    | L/ha                 |
| 21/09/2022                                                             | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; 1st Year Leys Plots 33, 34, 37, 38, 41, 42, 43, 44    | 2    | L/ha                 |
| 09/11/2022                                                             | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 33, 34, 37, 38, 41, 42, 43, 44          | 213  | kg/ha                |
| 09/11/2022                                                             | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Grass Leys Plots 33, 34, 37, 38, 41, 42, 43, 44 | 140  | kg/ha                |
| 02/04/2023                                                             | f | Applied: Muriate of Potash (MOP) using Cascade Spreader with JD6830 - Grass Leys Plots 33, 34, 37, 38, 41, 42, 43, 44  | 167  | kg/ha                |
| 03/04/2023                                                             | f | Applied: Yara Bela Extran (N1) using Cascade Spreader with JD6830 - 1st Year Grass/Clover Leys Plots 33, 34, 41, 42    | 74.6 | kg/ha                |
| 03/04/2023                                                             | f | Applied: Yara Bela Extran (N2) using Cascade Spreader with JD6830 - 1st Year Grass Leys Plots 37, 38, 43, 44           | 150  | kg/ha                |
| 03/04/2023                                                             | f | Applied: Yara Bela Extran (N2) using Cascade Spreader with JD6830 - 1st Year Grass Leys Plots 37, 38, 43, 44           | 224  | kg/ha                |
| 27/04/2023                                                             | p | Sprayed: Buffalo Elite using Agribuggy2 AB30 - 1 <sup>st</sup> Year Grass Leys Plots 33, 34, 37, 38, 41, 42, 43, 44    | 1    | L/ha                 |

Rothamsted Long-Term Experiments: Farm Diary and Yields 2023

2023/W/RN/3

|                                                                                            |   |                                                                                                                                                                                           |     |       |
|--------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|
| 27/04/2023                                                                                 | p | Sprayed: Samurai (16238) using Agribuggy2 AB30 - 1 <sup>st</sup> Year Grass Leys Whole Plots 33, 34, 37, 38, 41, 42, 43, 44                                                               | 3   | L/ha  |
| 18/05/2023                                                                                 | s | Drilled: Grass (Grass only mix - RN/3), 1 <sup>st</sup> Year Grass Whole Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 37, 38, 43, 44         | 30  | kg/ha |
| 18/05/2023                                                                                 | s | Drilled: Grass (Grass Clover Mix - RN/3), 1 <sup>st</sup> Year Grass/Clover Leys Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 33, 34, 41, 42 | 30  | kg/ha |
| 18/05/2023                                                                                 | a | Cambridge/Ring roll: WES 6m Rolls with JD6145R                                                                                                                                            | -   | -     |
| 06/06/2023                                                                                 | a | Grass Harvest Cut 1 – Not mown due to insufficient growth                                                                                                                                 | -   | -     |
| 29/11/2023                                                                                 | a | Grass Harvest Cut 2 – Plots 33, 34, 37, 38, 41, 42, 43, 44                                                                                                                                | -   | -     |
| <b>Grass ley and clover/grass leys (2<sup>nd</sup> and 3<sup>rd</sup> year treatments)</b> |   |                                                                                                                                                                                           |     |       |
| 21/09/2022                                                                                 | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030; 2nd Year Leys failed Plots 3, 4, 7, 8, 11, 12, 13, 14                                                                      | 1   | L/ha  |
| 21/09/2022                                                                                 | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; 2nd Year Leys failed Plots 3, 4, 7, 8, 11, 12, 13, 14                                                                    | 2   | L/ha  |
| 09/11/2022                                                                                 | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 03, 04, 07, 08, 11, 12, 13, 14, 23, 24, 25, 26, 29, 30, 31, 32                                             | 213 | kg/ha |
| 09/11/2022                                                                                 | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14, 23, 24, 25, 26, 29, 30, 31, 32                                        | 140 | kg/ha |
| 02/04/2023                                                                                 | f | Applied: Muriate of Potash (MOP) using Cascade Spreader with JD6830 - 2nd/3rd Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14, 23, 24, 25, 26, 29, 30, 31, 32                                 | 167 | kg/ha |
| 03/04/2023                                                                                 | f | Applied: Yara Bela Extran using Cascade Spreader with JD6830 - 2nd/3rd Year Grass Leys Plots 11, 12, 13, 14, 25, 26, 31, 32                                                               | 224 | kg/ha |
| 27/04/2023                                                                                 | p | Sprayed: Buffalo Elite using Agribuggy2 AB30 - 2nd Year Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14                                                                                       | 1   | L/ha  |
| 27/04/2023                                                                                 | p | Sprayed: Samurai (16238) using Agribuggy2 AB30 - 2nd Year Grass Leys Plots 3, 4, 7, 8, 11, 12, 13, 14                                                                                     | 3   | L/ha  |
| 18/05/2023                                                                                 | s | Drilled: Grass (Grass only mix - RN/3), 2 <sup>nd</sup> Year Grass Whole Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 11, 12, 13, 14         | 30  | kg/ha |
| 18/05/2023                                                                                 | s | Drilled: Grass (Grass Clover Mix - RN/3), 2 <sup>nd</sup> Year Grass/Clover Whole Plots resown due to non-establishment using WES Accord 4m Tine Drill with JD6145R - Plots 3, 4, 7, 8    | 30  | kg/ha |
| 18/05/2023                                                                                 | a | Cambridge/Ring roll: WES 6m Rolls with JD6145R 2 <sup>nd</sup> year leys re-sown                                                                                                          | -   | -     |
| 06/06/2023                                                                                 | a | Grass Harvest Cut 1 – 3 <sup>rd</sup> Year Leys only 23, 24, 25, 26, 29, 30, 31, 32 (no cut on 2 <sup>nd</sup> year leys)                                                                 | -   | -     |
| 22/06/2023                                                                                 | f | Applied: Yara Bela Extran using By Hand, Pedestrian Operated - 3rd Year Grass Plots 25, 26, 31, 32                                                                                        | 224 | kg/ha |
| 01/08/2023                                                                                 | p | Sprayed: Samurai (16238) using Handheld Compressed Air Pesticide Sprayer; Spraying off 3 <sup>rd</sup> Year leys                                                                          | 2   | L/ha  |
| 01/08/2023                                                                                 | p | Sprayed: Buffalo Elite using Handheld Compressed Air Pesticide Sprayer; Spraying off 3 <sup>rd</sup> Year leys                                                                            | 1   | L/ha  |
| 29/11/2023                                                                                 | a | Grass Harvest Cut 2 – 2 <sup>nd</sup> Year only (Plots 03, 04, 07, 08, 11, 12, 13, 14)                                                                                                    | -   | -     |
| <b>W. Wheat (1<sup>st</sup> year test)</b>                                                 |   |                                                                                                                                                                                           |     |       |
| 20/09/2022                                                                                 | a | Plough; thrown N using Dowdeswell 4 Furrow Plough with JD6620                                                                                                                             |     |       |
| 21/09/2022                                                                                 | a | Cultivate/level using Cousins Spring Tines with JD6620                                                                                                                                    |     |       |
| 21/09/2022                                                                                 | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030                                                                                                                             | 1   | L/ha  |
| 21/09/2022                                                                                 | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                     | 2   | L/ha  |
| 02/11/2022                                                                                 | f | Applied: Muriate of Potash (MOP) by Hand; Plots 49, 50                                                                                                                                    | 151 | kg/ha |
| 02/11/2022                                                                                 | f | Applied: Muriate of Potash (MOP) by Hand; Plots 51, 52                                                                                                                                    | 211 | kg/ha |

Rothamsted Long-Term Experiments: Farm Diary and Yields 2023

2023/W/RN/3

|                                          |   |                                                                                                                                                                                                                                                                                        |     |                      |
|------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------|
| 02/11/2022                               | f | Applied: Muriate of Potash (MOP) by Hand; Plots 53, 54                                                                                                                                                                                                                                 | 251 | kg/ha                |
| 02/11/2022                               | f | Applied: Muriate of Potash (MOP) by Hand; Plots 57, 58                                                                                                                                                                                                                                 | 27  | kg/ha                |
| 02/11/2022                               | f | Applied: Muriate of Potash (MOP) by Hand; Plots 61, 62                                                                                                                                                                                                                                 | 13  | kg/ha                |
| 02/11/2022                               | f | Applied: Muriate of Potash (MOP) by Hand; Plots 63, 64                                                                                                                                                                                                                                 | 255 | kg/ha                |
| 09/11/2022                               | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                          | 127 | kg/ha                |
| 28/11/2022                               | a | Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium                                                                                                                                                                                                                                | -   | -                    |
| 30/11/2022                               | a | Plough: Kuhn Powerharrow 3m with JD6145R Premium                                                                                                                                                                                                                                       | -   | -                    |
| 30/11/2022                               | S | Drilled: Winter Wheat (KWS Zyatt) tr. <u>Beret Gold (16430)</u> using WES Accord 4m Tine Drill with JD6830                                                                                                                                                                             | 350 | seeds/m <sup>2</sup> |
| 03/04/2023                               | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                            | 150 | kg/ha                |
| 05/04/2023                               | f | Applied: NitroChalk By Hand - Sub Plots 492, 493, 494, 502, 503, 504, 512, 513, 514, 522, 523, 524, 532, 533, 534, 541, 543, 544, 551, 552, 554, 561, 563, 564, 571, 572, 573, 581, 582, 584, 591, 593, 594, 601, 603, 604, 611, 613, 614, 621, 622, 624, 631, 632, 634, 641, 643, 644 | 148 | kg/ha                |
| 14/05/2023                               | p | Sprayed: Horus (16216) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                                                    | 1.2 | L/ha                 |
| 14/05/2023                               | p | Sprayed: Eagle (16490) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                                                    | 40  | g/ha                 |
| 14/05/2023                               | p | Sprayed: Biopower (A0617) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                                                 | 1   | L/ha                 |
| 18/05/2023                               | f | Applied: Nitrochalk by hand – sub plots 493, 502, 514, 522, 533, 544, 551, 561, 573, 582, 594, 604, 613, 621, 631, 644                                                                                                                                                                 | 148 | kg/ha                |
| 18/05/2023                               | f | Applied: Nitrochalk by hand – sub plots 492, 503, 512, 524, 534, 543, 554, 563, 572, 584, 593, 603, 614, 624, 634, 641                                                                                                                                                                 | 444 | kg/ha                |
| 18/05/2023                               | f | Applied: Nitrochalk by hand – sub plots 494, 504, 513, 523, 532, 541, 552, 564, 571, 581, 591, 601, 611, 622, 632, 643                                                                                                                                                                 | 741 | kg/ha                |
| 14/06/2023                               | p | Sprayed: Sprinter using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                                                         | 3   | L/ha                 |
| 14/06/2023                               | p | Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - Plots 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64                                                                                                                                                               | 0.9 | L/ha                 |
| 08/09/2023                               | a | Harvest (Combine): Haldrup C-85 2m cut                                                                                                                                                                                                                                                 |     |                      |
| <b>W. Rye (2<sup>nd</sup> year test)</b> |   |                                                                                                                                                                                                                                                                                        |     |                      |
| 20/09/2022                               | a | Plough; thrown N using Dowdeswell 4 Furrow Plough with JD6620                                                                                                                                                                                                                          |     |                      |
| 21/09/2022                               | a | Cultivate/level using Cousins Spring Tines with JD6620                                                                                                                                                                                                                                 |     |                      |
| 21/09/2022                               | p | Sprayed: Buffalo Elite using Knight 24m Sprayer with NH T6030                                                                                                                                                                                                                          | 1   | L/ha                 |
| 21/09/2022                               | p | Sprayed: Samurai (16238) using Knight 24m Sprayer with NH T6030; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80                                                                                                                                                  | 2   | L/ha                 |
| 09/11/2022                               | f | Applied: Triple Superphosphate (TSP) using Cascade Spreader with JD6830; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80                                                                                                                                          | 127 | kg/ha                |
| 28/11/2022                               | a | Plough: Dowdeswell 4 Furrow Plough with JD6145R Premium                                                                                                                                                                                                                                | -   | -                    |
| 30/11/2022                               | a | Plough: Kuhn Powerharrow 3m with JD6145R Premium                                                                                                                                                                                                                                       | -   | -                    |
| 30/11/2022                               | S | Drilled: Rye (Lunator) tr. Redigo Pro (15145) using WES Accord 4m Tine Drill with JD6830                                                                                                                                                                                               | 300 | seeds/m <sup>2</sup> |
| 03/04/2023                               | f | Applied: Sulphate of Potash (SOP) using Cascade Spreader with JD6830 - Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80                                                                                                                                            | 150 | kg/ha                |
| 14/05/2023                               | p | Sprayed: Horus (16216) using Agribuggy2 AB30 - Winter Rye and Winter Wheat Whole Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80                                                                                                                                  | 1.2 | L/ha                 |
| 14/05/2023                               | p | Sprayed: Eagle (16490) using Agribuggy2 AB30; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80                                                                                                                                                                     | 40  | g/ha                 |
| 14/05/2023                               | p | Sprayed: Biopower (A0617) using Agribuggy2 AB30; Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80                                                                                                                                                                  | 1   | L/ha                 |

|            |   |                                                                                                                          |     |       |
|------------|---|--------------------------------------------------------------------------------------------------------------------------|-----|-------|
| 18/05/2023 | f | Applied: Nitrochalk by hand – sub plots 654, 661, 671, 683, 691, 703, 712, 723, 734, 741, 752, 764, 773, 784, 794, 801   | 185 | kg/ha |
| 18/05/2023 | f | Applied: Nitrochalk by hand – sub plots 652, 664, 673, 681, 694, 704, 711, 724, 731, 742, 753, 762, 772, 783, 792, 802   | 370 | kg/ha |
| 18/05/2023 | f | Applied: Nitrochalk by hand – sub plots 653, 663, 672, 682, 692, 702, 713, 721, 732, 744, 751, 763, 771, 782, 791, 803   | 556 | kg/ha |
| 14/06/2023 | p | Sprayed: Sprinter using Agribuggy2 AB30 - Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80           | 3   | L/ha  |
| 14/06/2023 | p | Sprayed: Lentyma EX (19301) using Agribuggy2 AB30 - Plots 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80 | 0.9 | L/ha  |
| 08/09/2023 | a | Harvest (Combine): Haldrup C-85 2m cut                                                                                   |     |       |

Notes

- Samples of grain and grass leys and grass-clover leys (1<sup>st</sup> and 2<sup>nd</sup> Cut) were taken for chemical analysis.
- Grain quality analyses completed on all grain samples.
- Soil sampling for chemical analysis and archiving: Block 2 (Treatment year 3; all plots); 0-25 and 25-41 cm depth; 14/03/2023.

## YIELDS

### TREATMENT CROPS

**ARABLE CROPS: WINTER RYE (1<sup>ST</sup> YEAR), WINTER BARLEY (2<sup>ND</sup> YEAR) AND WINTER OATS (3<sup>RD</sup> YEAR): GRAIN YIELD (t/ha; 85% DM)**

| Treatment              | Winter rye (R) |      |      | Winter barley (WB) |      |      | Winter oats (O) |      |      |
|------------------------|----------------|------|------|--------------------|------|------|-----------------|------|------|
| FYM residue            | (-)            | (dr) | Mean | (-)                | (dr) | Mean | (-)             | (dr) | Mean |
| (Ah) (AB) (ABe) AO     | 0.46           | 0.68 | 0.57 | 1.85               | 1.64 | 1.75 | 0.52            | 0.97 | 0.74 |
| (Ar) (AF) (AM) AO      | 0.52           | 0.90 | 0.71 | 2.30               | 2.34 | 2.32 | 1.59            | 1.52 | 1.56 |
| (Ar/Lu) (LLn8) AO      | 0.27           | 0.27 | 0.27 | 2.70               | 2.76 | 2.73 | 0.89            | 0.58 | 0.74 |
| (Ah/L) (LLc8) (ABe) AO | 1.17           | 0.53 | 0.85 | 3.46               | 2.68 | 3.07 | 2.37            | 2.37 | 2.37 |
| Mean                   | 0.60           | 0.60 | 0.60 | 2.58               | 2.35 | 2.47 | 1.34            | 1.36 | 1.35 |
| Grain mean DM%         | 86.3           |      |      | 86.3               |      |      | 83.7            |      |      |

**GRASS CROPS: GRASS-CLOVER LEYS AND GRASS LEYS (1<sup>ST</sup>-3<sup>RD</sup> YEARS; 1<sup>ST</sup> AND 2<sup>ND</sup> CUTS): DRY MATTER YIELD (t/ha)**

| Treatment          | Year            | 1 <sup>st</sup> Cut (06/06/2023) |      |      | 2 <sup>nd</sup> Cut (29/11/2023) |      |      | Total of 2 Cuts |      |      |
|--------------------|-----------------|----------------------------------|------|------|----------------------------------|------|------|-----------------|------|------|
| FYM residue        |                 | (-)                              | (dr) | Mean | (-)                              | (dr) | Mean | (-)             | (dr) | Mean |
| (Lu) Lc3           | 1 <sup>st</sup> | 0.00                             | 0.00 | 0.00 | 1.29                             | 0.88 | 1.08 | 1.29            | 0.88 | 1.08 |
|                    | 2 <sup>nd</sup> | 0.00                             | 0.00 | 0.00 | 1.71                             | 1.70 | 1.71 | 1.71            | 1.70 | 1.71 |
|                    | 3 <sup>rd</sup> | 2.07                             | 2.31 | 2.19 | -                                | -    | -    | -               | -    | -    |
| (L) Ln3            | 1 <sup>st</sup> | 0.00                             | 0.00 | 0.00 | 1.93                             | 2.30 | 2.12 | 1.93            | 2.30 | 2.12 |
|                    | 2 <sup>nd</sup> | 0.00                             | 0.00 | 0.00 | 1.32                             | 1.13 | 1.22 | 1.32            | 1.13 | 1.22 |
|                    | 3 <sup>rd</sup> | 5.66                             | 5.84 | 5.75 | -                                | -    | -    | -               | -    | -    |
| (L/Ah) (LLc8) Lc3  | 1 <sup>st</sup> | 0.00                             | 0.00 | 0.00 | 1.68                             | 1.19 | 1.43 | 1.68            | 1.19 | 1.43 |
|                    | 2 <sup>nd</sup> | 0.00                             | 0.00 | 0.00 | 1.48                             | 1.17 | 1.32 | 1.48            | 1.17 | 1.32 |
|                    | 3 <sup>rd</sup> | 1.93                             | 2.35 | 2.14 | -                                | -    | -    | -               | -    | -    |
| (Lu/Ar) (LLn8) Ln3 | 1 <sup>st</sup> | 0.00                             | 0.00 | 0.00 | 0.40                             | 1.77 | 1.08 | 0.40            | 1.77 | 1.08 |
|                    | 2 <sup>nd</sup> | 0.00                             | 0.00 | 0.00 | 2.02                             | 1.93 | 1.98 | 2.02            | 1.93 | 1.98 |
|                    | 3 <sup>rd</sup> | 4.17                             | 4.34 | 4.25 | -                                | -    | -    | -               | -    | -    |
| Mean               |                 | 1.15                             | 1.24 | 1.19 | 1.48                             | 1.51 | 1.49 | 1.48            | 1.51 | 1.49 |
| Mean DM %          |                 | 33.0                             |      |      | 18.4                             |      |      | 23.3            |      |      |

### Notes

- Cut 1: Cut from 3<sup>rd</sup> year leys only (Block 2). No yields from 1<sup>st</sup> or 2<sup>nd</sup> year leys (Blocks 3 and 1, respectively) due to insufficient growth, and the yields were subsequently recorded as 0 (zero). The 2<sup>nd</sup> year leys failed to establish in 2022 so were resown.
- Cut 2: Cut from 1<sup>st</sup> and 2<sup>nd</sup> year leys only (Blocks 3 and 1, respectively). No yields from 3<sup>rd</sup> year leys (Block 2) (and no total of 2 cuts consequently) due to leys having been ploughed in prior to cut.
- General: Since 2014 Ln3 (grass-only leys) have not been receiving N after the 1<sup>st</sup> cut and in some years K has not been applied after the 1<sup>st</sup> cut on both Ln and Lc (grass-clover leys).

## TEST CROPS

WINTER WHEAT (1<sup>ST</sup> YEAR): GRAIN YIELD (t/ha; 85% DM) (Means)

| Treatment / FYM residue | (-)  | (dr) | Mean |
|-------------------------|------|------|------|
| (Ar) (AF) (AM) AO       | 1.32 | 1.58 | 1.45 |
| (Ah) (AB) (ABe) AO      | 1.01 | 1.28 | 1.14 |
| (Ar/Lu) (LLn8) AO       | 1.38 | 0.91 | 1.15 |
| (Ah/L) (LLc8) (ABe) AO  | 0.99 | 0.71 | 0.85 |
| (L) Ln3                 | 2.61 | 1.65 | 2.13 |
| (Lu/Ar) (LLn8) Ln3      | 1.75 | 2.78 | 2.27 |
| (Lu) Lc3                | 2.01 | 2.95 | 2.48 |
| (L/Ah) (LLc8) Lc3       | 2.23 | 1.76 | 1.99 |
| Mean                    | 1.66 | 1.70 | 1.68 |

| Treatment / N          | 0 kg | 80 kg | 160 kg | 240 kg | Mean |
|------------------------|------|-------|--------|--------|------|
| (Ar) (AF) (AM) AO      | 0.78 | 1.50  | 1.83   | 1.68   | 1.45 |
| (Ah) (AB) (ABe) AO     | 0.38 | 1.23  | 1.68   | 1.28   | 1.14 |
| (Ar/Lu) (LLn8) AO      | 0.45 | 1.25  | 1.21   | 1.68   | 1.15 |
| (Ah/L) (LLc8) (ABe) AO | 0.14 | 0.77  | 1.03   | 1.44   | 0.85 |
| (L) Ln3                | 1.72 | 2.22  | 2.69   | 1.89   | 2.13 |
| (Lu/Ar) (LLn8) Ln3     | 1.96 | 2.04  | 2.61   | 2.45   | 2.27 |
| (Lu) Lc3               | 1.59 | 2.59  | 3.42   | 2.32   | 2.48 |
| (L/Ah) (LLc8) Lc3      | 1.41 | 2.06  | 2.43   | 2.06   | 1.99 |
| Mean                   | 1.05 | 1.71  | 2.11   | 1.85   | 1.68 |

| FYM residue / N | 0 kg | 80 kg | 160 kg | 240 kg | Mean |
|-----------------|------|-------|--------|--------|------|
| (-)             | 1.04 | 1.58  | 2.14   | 1.89   | 1.66 |
| (dr)            | 1.06 | 1.84  | 2.08   | 1.82   | 1.70 |
| Mean            | 1.05 | 1.71  | 2.11   | 1.85   | 1.68 |

| Treatment              | FYM residue / N | 0 kg  | 80 kg | 160 kg | 240 kg |
|------------------------|-----------------|-------|-------|--------|--------|
| (Ar) (AF) (AM) AO      | (-)             | 0.72  | 1.27  | 1.66   | 1.63   |
|                        | (dr)            | 0.83  | 1.74  | 2.00   | 1.73   |
| (Ah) (AB) (ABe) AO     | (-)             | 0.23  | 0.80  | 1.91   | 1.11   |
|                        | (dr)            | 0.53  | 1.67  | 1.45   | 1.46   |
| (Ar/Lu) (LLn8) AO      | (-)             | 0.48  | 1.77  | 1.31   | 1.99   |
|                        | (dr)            | 0.43  | 0.73  | 1.11   | 1.37   |
| (Ah/L) (LLc8) (ABe) AO | (-)             | 0.29  | 0.99  | 1.17   | 1.50   |
|                        | (dr)            | -0.01 | 0.56  | 0.89   | 1.38   |
| (L) Ln3                | (-)             | 1.95  | 2.49  | 3.30   | 2.70   |
|                        | (dr)            | 1.50  | 1.95  | 2.08   | 1.08   |
| (Lu/Ar) (LLn8) Ln3     | (-)             | 1.80  | 1.15  | 2.28   | 1.79   |
|                        | (dr)            | 2.12  | 2.93  | 2.95   | 3.11   |
| (Lu) Lc3               | (-)             | 1.07  | 1.91  | 3.05   | 2.02   |
|                        | (dr)            | 2.11  | 3.27  | 3.79   | 2.63   |
| (L/Ah) (LLc8) Lc3      | (-)             | 1.81  | 2.27  | 2.47   | 2.35   |
|                        | (dr)            | 1.00  | 1.85  | 2.40   | 1.77   |
| Mean                   |                 | 1.12  | 1.74  | 2.11   | 1.85   |
| Grain mean DM%         |                 |       |       |        | 87.2   |

## Notes

- Plot 491 [(Ah/L) (LLc8) (ABe) AO; (dr); N0]: Weight lost; yield estimated by ANOVA.
- Plot 644 [(Ar) (AF) (AM) AO; (-); N1]: Weight and sample lost; yield estimated by ANOVA.

**WINTER RYE (2<sup>ND</sup> YEAR): GRAIN YIELD (t/ha; 85% DM) (Means)**

| Treatment / FYM residue | (-)         | (dr)        | Mean        |
|-------------------------|-------------|-------------|-------------|
| (Ar) (AF) (AM) AO       | 0.31        | 0.30        | <b>0.31</b> |
| (Ah) (AB) (ABe) AO      | 0.47        | 0.40        | <b>0.43</b> |
| (Ar/Lu) (LLn8) AO       | 0.47        | 0.52        | <b>0.50</b> |
| (Ah/L) (LLc8) (ABe) AO  | 0.52        | 0.64        | <b>0.58</b> |
| (L) Ln3                 | 0.34        | 0.30        | <b>0.32</b> |
| (Lu/Ar) (LLn8) Ln3      | 0.33        | 0.28        | <b>0.30</b> |
| (Lu) Lc3                | 1.14        | 1.22        | <b>1.18</b> |
| (L/Ah) (LLc8) Lc3       | 1.32        | 1.25        | <b>1.28</b> |
| <b>Mean</b>             | <b>0.61</b> | <b>0.61</b> | <b>0.61</b> |

| Treatment / N          | 0 kg        | 50 kg       | 100 kg      | 150 kg      | Mean        |
|------------------------|-------------|-------------|-------------|-------------|-------------|
| (Ar) (AF) (AM) AO      | 0.27        | 0.34        | 0.31        | 0.31        | <b>0.31</b> |
| (Ah) (AB) (ABe) AO     | 0.41        | 0.44        | 0.49        | 0.39        | <b>0.43</b> |
| (Ar/Lu) (LLn8) AO      | 0.46        | 0.43        | 0.46        | 0.63        | <b>0.50</b> |
| (Ah/L) (LLc8) (ABe) AO | 0.58        | 0.48        | 0.66        | 0.59        | <b>0.58</b> |
| (L) Ln3                | 0.19        | 0.18        | 0.13        | 0.78        | <b>0.32</b> |
| (Lu/Ar) (LLn8) Ln3     | 0.24        | 0.32        | 0.27        | 0.39        | <b>0.30</b> |
| (Lu) Lc3               | 1.34        | 0.80        | 1.11        | 1.47        | <b>1.18</b> |
| (L/Ah) (LLc8) Lc3      | 1.22        | 1.21        | 1.13        | 1.56        | <b>0.31</b> |
| <b>Mean</b>            | <b>0.59</b> | <b>0.52</b> | <b>0.57</b> | <b>0.77</b> | <b>0.61</b> |

| FYM residue / N | 0 kg        | 50 kg       | 100 kg      | 150 kg      | Mean        |
|-----------------|-------------|-------------|-------------|-------------|-------------|
| (-)             | 0.63        | 0.51        | 0.54        | 0.77        | <b>0.61</b> |
| (dr)            | 0.55        | 0.54        | 0.60        | 0.76        | <b>0.61</b> |
| <b>Mean</b>     | <b>0.59</b> | <b>0.52</b> | <b>0.57</b> | <b>0.77</b> | <b>0.61</b> |

| Treatment              | FYM residue / N | 0 kg         | 50 kg       | 100 kg      | 150 kg      |
|------------------------|-----------------|--------------|-------------|-------------|-------------|
| (Ar) (AF) (AM) AO      | (-)             | 0.29         | 0.21        | 0.29        | 0.47        |
|                        | (dr)            | 0.26         | 0.47        | 0.33        | 0.15        |
| (Ah) (AB) (ABe) AO     | (-)             | 0.40         | 0.57        | 0.53        | 0.38        |
|                        | (dr)            | 0.42         | 0.30        | 0.45        | 0.41        |
| (Ar/Lu) (LLn8) AO      | (-)             | 0.56         | 0.44        | 0.48        | 0.41        |
|                        | (dr)            | 0.36         | 0.42        | 0.43        | 0.86        |
| (Ah/L) (LLc8) (ABe) AO | (-)             | 0.54         | 0.35        | 0.43        | 0.74        |
|                        | (dr)            | 0.62         | 0.61        | 0.90        | 0.43        |
| (L) Ln3                | (-)             | 0.27         | 0.17        | 0.12        | 0.81        |
|                        | (dr)            | 0.12         | 0.19        | 0.13        | 0.76        |
| (Lu/Ar) (LLn8) Ln3     | (-)             | 0.37         | 0.45        | 0.22        | 0.27        |
|                        | (dr)            | 0.11         | 0.19        | 0.32        | 0.50        |
| (Lu) Lc3               | (-)             | 1.33         | 0.74        | 1.02        | 1.47        |
|                        | (dr)            | 1.35         | 0.85        | 1.20        | 1.46        |
| (L/Ah) (LLc8) Lc3      | (-)             | 1.30         | 1.13        | 1.23        | 1.60        |
|                        | (dr)            | 1.15         | 1.28        | 1.03        | 1.53        |
| <b>Mean</b>            |                 | <b>0.54</b>  | <b>0.52</b> | <b>0.60</b> | <b>0.71</b> |
| <b>Grain mean DM%</b>  |                 | <b>85.65</b> |             |             |             |

**Notes**

- Plots 663 & 664 [(L) Ln3; (dr); N3 and N2] harvested together by mistake; yields estimated by ANOVA.
- Plots 781 & 782 [(L/Ah) (LLc8) Lc3; (-); N0 and N3] harvested together by mistake; yield estimated by ANOVA.