**Supplementary materials**

**Table 1**

N(nitrogen), P(phosphorous) and K(Potassium) applied with commercial fertilizers in cropping system A, B, C and D. N, P and K was given in a combined NPK-micro fertilizer with 11% N, 5% P and 18 % K that was complemented with ammonium nitrate and superphosphate when needed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **A** |  | **B** |  | **C** |  | **D** |
| Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |
| Barley undersown with ley | 40,15,40 |  | Barley undersown with ley | 40,15,40 |  | Barley undersown with ley | 40,15,40 |  | Barley undersown with ley | 40,15,40 |
| Ley 1 | 90,17,75 |  | Ley 1 | 90,17,75 |  | Ley 1 | 90,17,75 |  | Ley as green manure | 60,17,50 |
| Ley 2 | 90,17,75 |  | Ley 2 | 90,17,75 |  | Ley 2 | 90,17,75 |  | Barley 1 | 70,15,0 |
| Ley 3 | 150,17,75 |  | Ley 3 | 150,17,75 |  | Barley | 70,15,40 |  | Potatoes | 70,40,120 |
| Ley 4 | 150,17,75 |  | Barley | 70,15,15 |  | Potatoes | 70,40,120 |  | Barley 2 | 70,15,0 |
| Ley 5 | 150,17,75 |   | Green fodder rape/barley/peas (mixture) | 50,15,50 |   | Green fodder rape/barley/peas (mixture) | 50,15,50 |   | Potatoes | 70,40,120 |

**Table 2**

N(nitrogen), P(phosphorous) and K(Potassium) applied with commercial fertilizers in cropping system A, B, C and D from 1960-1965 in Ås, 1961-1966 in Offer, 1963-1968 in Röbäcksdalen. N was given either as Ca(N03)2 or as (NH4)2SO4 depending on the crop. Boron (2 kg/ha) was also given to barley (rotation A and C), green fodder rape (rotation B) and carrots (rotation D).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **A** |  | **B** |  | **C** |  | **D** |
| Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |
| Barley undersown with ley | 0,35, 60 |  | Barley undersown with ley | 15,35,80 |  | Barley undersown with ley | 15,35,120 |  | Barley | 30,25,60 |
| Ley 1  | 0-60\*,0,0 |  | Ley 1  | 0-60\*,0,0 |  | Ley 1  | 0-60\*,0,0 |  | Fallow | 0,0,0 |
| Ley 2  | 0-60\*,15,60 |  | Ley 2  | 0-60\*,15,60 |  | Ley 2  | 0-60\*,15,40 |  | Winter rye | 15,25,80 |
| Ley 3  | 60,15,60 |  | Ley 3  | 45,15,0 |  | Winter rye | 15,15,80 |  | Peas | 15,25,60 |
| Ley 4  | 45,15,0 |  | Pea/oats | 15,15,40 |  | Potatoes | 60,35,100 |  | Potatoes | 100,35,200 |
| Ley 5 | 60,15,40 |   | Green fodder rape | 75,20,40 |   | Pea/oats | 15,15,60 |   | Carrots | 70,35,160 |

\* 0 kg/ha of N if the ley was rich in clover, 30 kg/ha of N if clover was sparse, 60 kg/ha of N if there was no clover

**Table 3**

N(nitrogen), P(phosphorous) and K(Potassium) applied with commercial fertilizers in cropping system A, B, C and D from 1966 in Ås, 1967 in Offer, 1969 in Röbäcksdalen until 1986. N was given as a mixture of 76 % NH4NO3 and 24 % CaCO3. Boron (2 kg/ha) was also given to barley (rotation A and C), green fodder rape (rotation B) and carrots (rotation D).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **A** |  | **B** |  | **C** |  | **D** |
| Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |  | Crop | N,P,K rate (kg/ha) |
| Barley undersown with ley | 10,35, 60 |  | Barley undersown with ley | 15,35,80 |  | Barley undersown with ley | 15,35,120 |  | Barley undersown with ley | 30,25,60 |
| Ley 1  | 30-90\*,0,0 |  | Ley 1  | 30-90\*,0,0 |  | Ley 1  | 30-90\*,0,0 |  | Green manure ley | 30-60\*,0,0 |
| Ley 2  | 30-90\*,15,60 |  | Ley 2  | 30-90\*,15,60 |  | Ley 2  | 30-90\*,15,40 |  | Winter rye | 15,25,80 |
| Ley 3  | 90,15,60 |  | Ley 3  | 90,15,0 |  | Winter rye | 15,15,80 |  | Peas | 15,25,80 |
| Ley 4  | 90,15,0 |  | Pea/oats | 15,15,40 |  | Potatoes | 75,35,100 |  | Potatoes | 100,35,200 |
| Ley 5  | 90,15,40 |   | Green fodder rape | 120,20,40 |   | Pea/oats | 15,15,60 |   | Carrots/swedes | 75,35,140 |

\* 30 kg/ha of N if the ley contained more than 50% clover, 60-90 kg/ha of N if the ley contained less than 50% clover. For the highest fertilization treatment 30-60 kg N was given in spring and 30 kg after the first harvest.