

Nitrogen recommendations for Cereals, Oilseed Rape and Potatoes

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- New nitrogen recommendations take account of N released from previous crop residues, grass leys and N available from reserves in different soil types.
- Nitrogen recommendations for spring barley are adjusted for sowing date.
- Guidance on preparing a Nitrogen Fertiliser and Manure Plan is provided.
- Nitrogen available in Spring from livestock manure application is calculated.

Introduction

Nitrogen (N) recommendations for cereals, oilseed rape and potatoes have been updated in the light of recent trials results and advisory experience. The previous system of N recommendations based on Soil Nitrogen Status has been replaced. New tables have been produced that take account of N released from previous crop residues, grass leys and N available from reserves in different soil types. The recommendations are those that give the best financial return for the farmer. Adoption of the recommendations will also reduce the risk of applying more fertiliser N than the crop needs and will minimise losses of N to the environment. The Nitrogen and Phosphorus supplement of the Code of Good Practice for the Prevention of Environmental Pollution from Agricultural Activity (PEPFAA) provides further guidance on steps that can be taken to reduce the risk of nitrate leaching.

N recommendations for different crops

In order to assess the fertiliser N required for each crop in each field, the following factors need to be taken into account:

| | |
|---|-----------------|
| Soil type | Table 1 |
| Previous crop | Table 2 |
| Previous grass/clover management | Table 3 |
| Crop to be grown and intended market | Tables 4 to 10 |
| Winter rainfall | Tables 4 to 10 |
| Rainfall between first and final spring N dressings | Tables 4 to 10 |
| Livestock manure application | Tables 11 to 14 |
| Previous livestock manure application | Tables 11 to 14 |

N residues from different soil types and assessment of texture

Nitrogen residues from soil reserves have been arranged into six soil types (see Table 1). “Shallow” means any mineral soil with less than 40 cm depth between the soil surface and the underground rock. Types of mineral soils can be identified by hand texturing. Take about a dessertspoonful of soil. If dry, wet up gradually kneading thoroughly between finger and thumb until aggregates are broken down. Enough moisture is needed to hold the soil together and for the soil to exhibit its maximum cohesion. There are 2 questions to be answered:

Question 1 Is it difficult to roll the moist soil into a ball?

Answer YES, then the soil type is “Sand”; NO, then ask the second question.

Question 2 Does the moist soil feel smooth and silky as well as gritty?

Answer NO, then the soil type is “Sandy loam”; YES, then the soil type is “Other mineral soil”.

“Humose” and “Peaty soils” are identified by percent organic matter, which can be confirmed by laboratory analysis.

Where more than one soil type occurs within a field it may be practical to alter the rate of fertiliser N to suit the different soil types. If this is not practical and the field is to be treated uniformly, select the soil type that covers the largest part of the field. In mineral soils of low organic matter content, the amount of available N residues is relatively small, whereas in humose and peaty sites low N malting barley is not encouraged as N release occurs late in the season and ends up in the grain.

N residues from previous crops

The last crop grown has been allocated into one of five Previous Crop Groups. These Groups are numbered 1 to 5 in ascending order of residual available N in the soil following harvest of the previous crop (see Table 2). Residual available N in the soil following harvest will vary depending on the crop type grown. Residues following cereals are generally lower than those following break crops. The management and performance of the previous crop can have a significant effect on the actual level of N residues. Residues are expected to be lower in a high yielding season or where N application has been less than normal, but may be higher than average if the crop has performed badly due to problems such as disease or drought. In tables of N requirements in this Note it is assumed that all previous crops have been managed well and that previous N fertiliser use has been close to the recommended rate, taking account of any use of organic manures. In Group 5 N residues can be very variable. Analysis of the crop debris for total N and C content along with an estimate of the quantity ploughed down is recommended in order to help predict release of available N for the next crop.

N residues from previous grass/clover swards

Nitrogen fertiliser and manure use in the last 2 years of the grassland, and grazing management during the months immediately prior to ploughing out grassland will have a significant effect on the level of N residues. Managements of the previous grass/clover sward have been allocated into one of five Groups. These Groups are numbered 2 to 6 in ascending order of residual available N in the soil following ploughing out of the grassland (see Table 3). Groups 2 to 5 have the same N residues as Groups 2 to 5 in the Previous Crop Groups (Table 2), whereas Group 6 has a higher residue of available N. N residues can be very variable in Groups 5 and 6. Analysis of the sward for total N and C content along with an estimate of the quantity of sward ploughed down is recommended in order to help predict release of available N for the next crop. Time of ploughing also influences the available N for the next crop. Spring residues of N are larger with spring than autumn ploughing of grassland. The higher N recommendations for Groups 5 and 6 for spring sown or planted crops are based on ploughing out grassland in November, December or March/April, immediately prior to sowing. Where grassland is ploughed out in January or February use the lower N recommendation, in the absence of sward analysis.

Table 1 Description of soil types

| | |
|---------------------------|--|
| Shallow soils (SS) | All mineral soils which are less than 40cm deep, between soil surface and underground rock. |
| Sands (S) | Soils which are sand and loamy sand textures to a depth more than 40cm. |
| Sandy loams (SL) | Soils which are sandy loam texture to a depth of more than 40cm. |
| Other mineral soils (OMS) | Soils with less than 15 percent organic matter that do not fall into the sandy or shallow soil category i.e. silty and clay soils. |
| Humose soils (HS) | Soils with between 15 and 35 percent organic matter. These soils are darker in colour, stain the fingers black or grey, and have a silky feel. |
| Peaty soils (PS) | Soils that contain more than 35 percent organic matter. |

Table 2 Previous Crop Groups in ascending order of residual available N in the soil following harvest

| Group | Previous Crop |
|-------|--|
| 1 | spring barley (SB), spring oats (SO), spring wheat (SW), winter barley (WB), winter oats (WO), winter wheat (WW), triticale (T), carrots (C), swedes (SR), turnips removed (TR), linseed (L). |
| 2 | rotational set-aside (natural regeneration) (SNR), harvested fodder (whole crop) (HFW), spring oilseed rape (SOSR), hemp (H). |
| 3 | harvested fodder (root only)(HFR), seed potatoes (SP), rotational set-aside (good clover cover) (SGC), rotational set-aside (stemmy cover) (SSC), winter oilseed rape (WOSR), whole crop lupins (WCL). |
| 4 | peas (P), beans (B), ware potatoes (WP), grain lupins (GL). |
| 5 * | leafy brassica vegetables (LBV), leafy non-brassica vegetables (LNV), grazed fodder (GF). |

* N residues can be variable in this Group. Analysis of the crop debris for total N and C content prior to ploughing down is recommended in order to help predict release of available N for the next crop.

Table 3 Previous Grass/Clover Groups in ascending order of residual available N in the soil following ploughing out.

| Group | Previous Grass/Clover management |
|-------|--|
| 2 | 1-2 year low N* leys and not grazed within 2 months of ploughing out (1LNG) |
| 3 | 1-2 year low N leys and grazed within 2 months of ploughing out (1LG) 1-2 year high N leys and not grazed within 2 months of ploughing out (1HNG) |
| 4 | 1-2 year high N leys and grazed within 2 months of ploughing out (1HG) 3-5 year low N leys and not grazed within 2 months of ploughing out (3LNG) |
| 5** | 3-5 year high N leys and not grazed within 2 months of ploughing out (3HNG) 3-5 year low N leys and grazed within 2 months of ploughing out (3LG) |
| 6** | 3-5 year high N leys and grazed within 2 months of ploughing out (3HG), permanent grass (PG), long leys with short arable breaks (LL) |

* Low N means less than 150 kg/ha/year fertiliser N used on average in last 2 years.
High N means more than 150 kg/ha/year fertiliser N used on average in last 2 years, or high clover content.

** N residues can be very variable in these Groups. Analysis of the sward for total N and C content prior to ploughing out is recommended in order to help predict release of available N for the next crop. Soil mineral N testing is not recommended in established grassland, nor in the first year after ploughing out grassland, but may be useful in the second year.

Soil mineral N testing is not recommended for use in established grassland, nor in the first year after ploughing out grassland. Soil mineral N testing can be used one year after ploughing out grassland in order to help predict release of available N for the second crop after grass. This available N can often lead to an increase in yield of the second and subsequent crops after grass without altering the optimum rate of N fertiliser. In ley-arable rotations where the grass is down for 3 or more years, the most useful N is released within the first 2 seasons after ploughing out, although some N may be released for the 3rd and 4th crop.

Winter rainfall

The drier the winter and the greater the soil capacity to hold water, the smaller the proportion of N from crop residues that will be washed out of the soil before crop growth starts in the spring. If winter rainfall between 1 October and 1 March is more than 450mm (18 inches) then standard N recommendations should be adjusted according to the information in the crop Tables 4 to 10.

Rainfall between first and final spring N dressings

The amount of N lost from the soil profile between first and final spring N dressings will depend on the amount of rain that falls once the soil is already at water-holding capacity, the crop cover and rooting depth, and the form of N applied. Rain falling as

sudden storms may wash out less N, because a proportion of rainwater may run off rather than leach N through the soil. If the amount is more than 200mm (8 inches) then standard N recommendations should be adjusted according to the information in the crop Tables 4 to 10.

Winter cereals (Tables 4 and 5)

Autumn nitrogen is NOT generally recommended as profitable responses are not normally attained and the practice will increase N losses to watercourses. Responses to autumn N have been recorded on sites with sandy soils of high pH and low manganese content. There is also a possible N requirement in some winter barley that has been direct drilled or established following minimum cultivation.

Spring N is best applied as a split dressing. In general a 33%/67% (one-two thirds) split between the start of spring growth and growth stage 30-31 is recommended. A 20/80 split will improve bread-making quality and help to prevent lodging, a 50/50 split will help to reduce grain N% for malting or distilling. For wheat grown for breadmaking the additional 30 kg/ha, as shown in Table 4, should be applied either as a solid fertiliser as soon as the flagleaf is fully emerged, or as a foliar spray at the milky ripe stage in order to increase grain protein. These adjustments in timing should be used in conjunction with adjustments in the amount of N applied.

Table 4 Winter wheat : N recommendations in kg/ha

| Previous crop or grass group (Table 2 or 3) | 1 | 2 | 3 | 4 | 5 | 6 |
|--|-----|-----|-----|-----|---------|--------|
| Sands and shallow soils | 210 | 200 | 190 | 170 | 140-110 | 100-60 |
| Sandy loams and other mineral soils | 200 | 190 | 180 | 160 | 130-100 | 90-50 |
| Humose soils | 140 | 130 | 120 | 100 | 70-40 | 30-0 |
| Peaty soils | 80 | 70 | 60 | 40 | 10-0 | 0 |
| Adjustments: | | | | | | |
| Breadmaking | +30 | +30 | +30 | +30 | +30 | +30 |
| Grain distilling | 0 | 0 | 0 | 0 | 0 | 0 |
| Take-all expected | +20 | +20 | +20 | +20 | +20 | +20 |
| Deduct N from residues of manures (Tables 11-14) | | | | | | |
| Winter rainfall (1 Oct – 1 Mar) | | | | | | |
| More than 450mm (18 inches) | | | | | | |
| Sands, sandy loams, shallow soils | 0 | +10 | +20 | +20 | +20 | +20 |
| All other soils | 0 | +10 | +10 | +10 | +10 | +10 |
| Rainfall between first and final spring N dressings | | | | | | |
| More than 200mm (8 inches) | | | | | | |
| Sands and shallow soils | +15 | +15 | +15 | +15 | +15 | +15 |
| Sandy loams | +10 | +10 | +10 | +10 | +10 | +10 |
| Triticale : use winter wheat recommendation -20 kg/ha | | | | | | |

Table 5 Winter barley : N recommendations in kg/ha

| Previous crop or grass group (Table 2 or 3) | 1 | 2 | 3 | 4 | 5 | 6 |
|--|-----|-----|-----|-----|--------|-------|
| Sands and shallow soils | 190 | 180 | 170 | 150 | 120-90 | 80-40 |
| Sandy loams and other mineral soils | 180 | 170 | 160 | 140 | 110-80 | 70-30 |
| Humose soils | 120 | 110 | 100 | 80 | 50-20 | 10-0 |
| Peaty soils | 80 | 70 | 60 | 40 | 10-0 | 0 |
| Adjustments: | | | | | | |
| Malt for distilling | -50 | -50 | -50 | -50 | -50 | -50 |
| Malt for brewing | -30 | -30 | -30 | -30 | -30 | -30 |
| Grain distilling | 0 | 0 | 0 | 0 | 0 | 0 |
| Deduct N from residues of manures (Tables 11-14) | | | | | | |
| Winter rainfall (1 Oct – 1 Mar) | | | | | | |
| More than 450mm (18 inches) | | | | | | |
| Sands, sandy loams, shallow soils | 0 | +10 | +20 | +20 | +20 | +20 |
| All other soils | 0 | +10 | +10 | +10 | +10 | +10 |
| Rainfall between first and final spring N dressings | | | | | | |
| More than 200mm (8 inches) | | | | | | |
| Sands and shallow soils | +15 | +15 | +15 | +15 | +15 | +15 |
| Sandy loams | +10 | +10 | +10 | +10 | +10 | +10 |
| Winter oats : use winter barley recommendation, - 40 kg/ha N for all mineral soils, - 30 kg/ha N for humose and peaty soils | | | | | | |

Spring cereals (Tables 6 and 7)

Nitrogen recommendations should be reduced for crops which are sown ten days or more after the optimum sowing period. Pressure of spring work and adverse weather can often account for delays in excess of ten days. In these circumstances the N recommendation should be reduced after the optimum sowing period by approximately 1.5 kg/ha/day for each day of delay for feed or high N malting and 2.25 kg/ha/day for low N malting.

For crops sown up to the beginning of April apply half fertiliser N to seedbed and half at 2-3 leaf stage for low N malting and start of tillering for feed and High N malting crops. From beginning of April onwards, all may be applied to seedbed.

Combine drilling is recommended for early sown crops and crops grown in high soil pH (>6.4). Combine drilling of urea is NOT recommended as close contact with germinating seed can be damaging. Limit combine-drilled fertiliser to 150 kg/ha N + K₂O on sands and sandy loams.

Table 6 Spring barley (FEED or HIGH N MALTING): N recommendations (kg/ha)

| Previous crop or grass group (Table 2 or 3) | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-----|-----|-----|-----|-------|------|
| Sands and shallow soils | 150 | 140 | 130 | 110 | 80-50 | 40-0 |
| Sandy loams and other mineral soils | 130 | 120 | 110 | 90 | 60-30 | 20-0 |
| Humose soils | 80 | 70 | 60 | 40 | 10-0 | 0 |
| Peaty soils | 50 | 40 | 30 | 10 | 0 | 0 |
| Adjustments: | | | | | | |
| Undersown crop | -25 | -25 | -25 | -25 | -25 | -25 |
| Deduct N from residues of manures (Tables 11-14) | | | | | | |
| Delayed sowing – | | | | | | |
| Reduce by 1.5 kg/ha/day for each day of delay after your optimum sowing period | | | | | | |
| Winter rainfall (1 Oct – 1 Mar) | | | | | | |
| More than 450mm (18 inches) | | | | | | |
| Sands, sandy loams, shallow soils | 0 | +10 | +20 | +20 | +20 | +20 |
| All other soils | 0 | +10 | +10 | +10 | +10 | +10 |
| Rainfall between first and final N dressings | | | | | | |
| More than 200mm (8 inches) | | | | | | |
| Sands and shallow soils | +20 | +20 | +20 | +20 | +20 | +20 |
| Sandy loams | +10 | +10 | +10 | +10 | +10 | +10 |
| Spring oats : use SB (FEED or HIGH N MALTING) recommendations – 30 kg/ha N | | | | | | |

Table 7 Spring barley (LOW N MALTING) : N recommendations (kg/ha)

| Previous crop or grass group (Table 2 or 3) | 1 | 2 | 3 | 4 | 5 | 6 |
|--|-----|-----|-----|---|---|---|
| Sands and shallow soils | 130 | 120 | 110 | * | * | * |
| Sandy loams and other mineral soils | 110 | 100 | 90 | * | * | * |
| Humose soils | * | * | * | * | * | * |
| Peaty soils | * | * | * | * | * | * |
| Adjustments: | | | | | | |
| Undersown crop | -25 | -25 | -25 | * | * | * |
| Deduct N from residues of manures (Tables 11-14) | | | | | | |
| Delayed sowing – | | | | | | |
| Reduce by 2.25 kg/ha/day for each day of delay after your optimum sowing period | | | | | | |
| Winter rainfall (1 Oct – 1 Mar) | | | | | | |
| More than 450mm (18 inches) | | | | | | |
| Sands, sandy loams, shallow soils | 0 | +10 | +20 | * | * | * |
| All other soils | 0 | +10 | +10 | * | * | * |
| Rainfall between first and final N dressings | | | | | | |
| More than 200mm (8 inches) | | | | | | |
| Sands and shallow soils | +20 | +20 | +20 | * | * | * |
| Sandy loams | +10 | +10 | +10 | * | * | * |
| * avoid growing low N malting barley after crops in groups 4 – 6 and humose/peaty soils that leave high N residues | | | | | | |

Winter oilseed rape (Table 8)

Winter barley is the most suitable crop for early entry. It leaves low N residues. Rotational set-aside is expected to leave 10-20 kg/ha more N residue, depending on cover (select the appropriate Previous Crop Group for your set-aside from Table 2). Where crops are sown into cold silty and heavy clay soils, higher N is recommended in the seedbed, compared with the lighter soils. Autumn sown rape can produce about 20-25 t/ha fresh material by December. N top dressing in spring is best split, applying half at the start of spring growth and half prior to stem elongation.

Spring oilseed rape (Table 9)

Spring sown crops generally utilise soil N more efficiently than winter crops. Their requirement for N coincides with the normal period of soil N release in May and June whereas winter crops require N when the soil is still too cold for soil N release in March. Trials have confirmed that optimum N rates can be substantially reduced for 'swede' types and further reduced by 20 kg/ha for turnip rapes, compared to N rates for winter oilseed rape.

| Previous crop or grass group (Table 2 or 3) | 1 | 2 | 3 | 4 | 5 | 6 |
|--|----------|----------|----------|----------|----------|----------|
| Seedbed : | | | | | | |
| Sands, sandy loams, humose soils and peaty soils. | 30 | 20 | 10 | 0 | 0 | 0 |
| Shallow soils and other mineral soils | 50 | 40 | 30 | 20 | 0 | 0 |
| Spring: | | | | | | |
| All mineral soils | 180 | 170 | 160 | 140 | 110-80 | 70-30 |
| Humose soils | 120 | 110 | 100 | 80 | 50-20 | 10-0 |
| Peaty soils | 80 | 70 | 60 | 40 | 0 | 0 |
| Adjustments: | | | | | | |
| Deduct N from residues of manures (Tables 11-14) | | | | | | |
| Winter rainfall (1 Oct – 1 Mar) | | | | | | |
| More than 450mm (18 inches) | | | | | | |
| Sands, sandy loams, shallow soils | 0 | +10 | +20 | +20 | +20 | +20 |
| All other soils | 0 | +10 | +10 | +10 | +10 | +10 |
| Rainfall between first and final spring N dressings | | | | | | |
| More than 200mm (8 inches) | | | | | | |
| Sands and shallow soils | +15 | +15 | +15 | +15 | +15 | +15 |
| Sandy loams | +10 | +10 | +10 | +10 | +10 | +10 |

| Previous crop or grass group (Table 2 or 3) | 1 | 2 | 3 | 4 | 5 | 6 |
|---|----------|----------|----------|----------|----------|----------|
| All mineral soils | 100 | 90 | 80 | 60 | 30 | 0 |
| Humose soils | 50 | 40 | 30 | 10 | 0 | 0 |
| Peaty soils | 20 | 10 | 0 | 0 | 0 | 0 |
| Adjustments: | | | | | | |
| Turnip rape | -20 | -20 | -20 | -20 | -20 | -20 |
| Deduct N from residues of manures (Tables 11-14) | | | | | | |
| Winter rainfall (1 Oct – 1 Mar) | | | | | | |
| More than 450mm (18 inches) | | | | | | |
| Sands, sandy loams, shallow soils | 0 | +10 | +20 | +20 | +20 | +20 |
| All other soils | 0 | +10 | +10 | +10 | +10 | +10 |
| Rainfall between first and final N dressings | | | | | | |
| More than 200mm (8 inches) | | | | | | |
| Sands and shallow soils | +20 | +20 | +20 | +20 | +20 | +20 |
| Sandy loams | +10 | +10 | +10 | +10 | +10 | +10 |

Potatoes (Table 10)

Nitrogen requirement depends primarily on the length of growing season but also the intended market and variety. Specialist guidance may be needed when making decisions for specific crops.

N increases haulm growth and persistence. The increase in haulm growth is accompanied by delayed tuber initiation and growth. The main benefit of high N is the greater length of the tuber bulking period, linked to improved haulm persistence. Only moderate amounts of N are required for maximum bulking rates up to the normal 'burning off' dates for

specialist seed production. N usually increases tuber yield more than tuber number, hence average tuber size is increased as is the proportion of 'ware' in the crop. For these reasons the amount of N recommended increases as the expected burning off date is delayed.

No adjustment is required for irrigated crops. Irrigation should be applied according to a recognised scheduling system, which minimises the risk of returning soils to field capacity and triggering leaching. For crops grown on sands, sandy loam and shallow soils apply half to two-thirds of the N recommendation in the seedbed and the remainder at tuber initiation.

Table 10 Potatoes : N recommendations in kg/ha

| Crop type | Typical max. yield (t/ha) | Previous crop or grass groups (Table 2 or 3) | | | | | |
|--|---------------------------|--|-----|-----|-----|---------|--------|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Seed | 30 | 90 | 80 | 70 | 50 | 20-0 | 0 |
| Ware | 60 | 225 | 215 | 205 | 185 | 155-120 | 115-75 |
| Dual Purpose | 40 | 160 | 150 | 140 | 120 | 90-60 | 50-10 |
| Punnets | 25 | 80 | 70 | 60 | 40 | 10-0 | 0 |
| Adjustments: | | | | | | | |
| Sands and shallow soils | | +20 | +20 | +20 | +20 | +20 | +20 |
| Deduct N from residues of manures (Tables 11-14) | | | | | | | |
| <i>Winter rainfall (1 Oct – 1 Mar)</i> | | | | | | | |
| <i>More than 450mm (18 inches)</i> | | | | | | | |
| Sands, sandy loams, shallow soils | | 0 | +10 | +20 | +20 | +20 | +20 |
| All other soils | | 0 | +10 | +10 | +10 | +10 | +10 |
| <i>Rainfall between first and final N dressings</i> | | | | | | | |
| <i>More than 200mm (8 inches)</i> | | | | | | | |
| Sands and shallow soils | | +20 | +20 | +20 | +20 | +20 | +20 |
| Sandy loams | | +10 | +10 | +10 | +10 | +10 | +10 |
| Variety | | | | | | | |
| Varieties exhibiting vigorous and prolonged haulm growth (indeterminate varieties) e.g. Maris Piper, Saturna, Cultra – reduce by 10% | | | | | | | |
| Cara (very indeterminate variety) – reduce by 25-30% | | | | | | | |
| Varieties producing small and short lived canopies (determinate varieties) e.g. Estima, Maris Peer, Saxon – increase by 10% . | | | | | | | |

N available from livestock manure applications (Tables 11-14)

The amount of N available to the crop following the application of manure depends on the type of manure, method of application, soil type and month of application. Tables 11-14 will enable you to calculate how much to reduce your fertiliser N inputs after application of livestock manures. Laboratory analysis of your manure can be used instead of the typical values in the tables. It is advisable to have several analyses since N contents vary and obtaining a representative sample is difficult. Applications of organic manure to individual fields should not exceed 250 kg/ha per year of total N from the organic manure. The area of the field used to calculate the 250 kg/ha limit should exclude any areas where manures are not spread. Information on N contents of other organic wastes can be found in SAC Technical Notes T450 "Use of sewage sludge on agricultural land" and T459 "Use of non-agricultural wastes on farmland"

N available from previous livestock manure applications (Tables 11-14)

Available N is released slowly from the organic N content of manures over a period of months to years. Where this available N is not taken up by the crop in the season following application, it may be lost by leaching during the following winter, or can accumulate in soil organic matter allowing further long-term savings in N fertiliser inputs. Assume 10% of the total N content of livestock manures becomes available for the second crop following application, and deduct from the fertiliser N requirement.

Table 11 Percentage of total nitrogen available in SPRING following application of CATTLE and PIG FYM (% of total N)*

| Manure type | Ref. no. | Incorporation time ** | Total N kg/tonne | Dry matter % | Time of application | | | | Spring Feb-Apr |
|--------------------------------------|----------|-----------------------|------------------|--------------|--------------------------------|---------------------|--------------------------------|---------------------|----------------|
| | | | | | Autumn Aug-Oct | | Winter Nov-Jan | | |
| | | | | | sands/ sandyloams/ shallow % N | all other soils % N | sands/ sandyloams/ shallow % N | all other soils % N | |
| | | | | | | | | | |
| Cattle FYM stored under cover | 1 | within 24 hrs | 6 | 25 | 5 | 10 | 15 | 20 | 25 |
| Cattle FYM stored under cover | 2 | over 24 hrs | 6 | 25 | 5 | 10 | 10 | 15 | 20 |
| Cattle FYM stored uncovered, outside | 3 | within 24 hrs | 5 | 25 | 5 | 10 | 15 | 20 | 25 |
| Cattle FYM stored uncovered, outside | 4 | over 24 hrs | 5 | 25 | 5 | 10 | 10 | 15 | 20 |
| Pig FYM stored under cover | 5 | within 24 hrs | 7 | 25 | 5 | 10 | 15 | 20 | 25 |
| Pig FYM stored under cover | 6 | over 24 hrs | 7 | 25 | 5 | 10 | 10 | 15 | 20 |
| Pig FYM stored uncovered, outside | 7 | within 24 hrs | 6 | 25 | 5 | 10 | 15 | 20 | 25 |
| Pig FYM stored uncovered, outside | 8 | over 24 hrs | 6 | 25 | 5 | 10 | 10 | 15 | 20 |

* Values for % N in the table are estimates for the east of Scotland. Lower values should be used in most years for the wetter west of Scotland.

** The values assume incorporation by ploughing. Cultivation using discs or tines is likely to be less effective in minimising ammonia losses and intermediate values of nitrogen availability should be used.

Previous manure: assume 10% of the total nitrogen content of manures become available for the second crop following application and deduct from N crop requirement in Tables 4 to 10.

Table 12 Percentage of total nitrogen available in SPRING following application of POULTRY MANURES (% of total N)*

| Manure type | Ref. no. | Incorporation time ** | Total N kg/tonne | Dry matter % | Time of application | | | | Spring Feb-Apr |
|---|----------|-----------------------|------------------|--------------|--------------------------------|---------------------|--------------------------------|---------------------|----------------|
| | | | | | Autumn Aug-Oct | | Winter Nov-Jan | | |
| | | | | | sands/ sandyloams/ shallow % N | all other soils % N | sands/ sandyloams/ shallow % N | all other soils % N | |
| | | | | | | | | | |
| Layer manure stored under cover | 9 | within 24 hrs | 16 | 30 | 10 | 20 | 20 | 30 | 50 |
| Layer manure stored under cover | 10 | over 24 hrs | 16 | 30 | 10 | 15 | 15 | 25 | 35 |
| Layer manure stored uncovered, outside | 11 | within 24 hrs | 14 | 30 | 10 | 20 | 20 | 30 | 50 |
| Layer manure stored uncovered, outside | 12 | over 24 hrs | 14 | 30 | 10 | 15 | 15 | 25 | 35 |
| Broiler/turkey litter stored under cover | 13 | within 24 hrs | 30 | 60 | 10 | 20 | 20 | 30 | 45 |
| Broiler/turkey litter stored under cover | 14 | over 24 hrs | 30 | 60 | 10 | 15 | 15 | 20 | 30 |
| Broiler/turkey litter stored uncovered, outside | 15 | within 24 hrs | 25 | 60 | 10 | 20 | 20 | 30 | 45 |
| Broiler/turkey litter stored uncovered, outside | 16 | over 24 hrs | 25 | 60 | 10 | 15 | 15 | 20 | 30 |

* Values for % N in the table are estimates for the east of Scotland. Lower values should be used in most years for the wetter west of Scotland.

** The values assume incorporation by ploughing. Cultivation using discs or tines is likely to be less effective in minimising ammonia losses and intermediate values of nitrogen availability should be used.

Previous manure: assume 10% of the total nitrogen content of manures become available for the second crop following application and deduct from N crop requirement in Tables 4 to 10.

Table 13 Percentage of total nitrogen available in SPRING following application of CATTLE SLURRY (% of total N)*

| Slurry type | Ref. no | Incorporation time ** | Total N kg/tonne | Dry matter % | Time of application | | | | |
|---------------------------|---------|-----------------------|------------------|--------------|---------------------------------|---------------------|---------------------------------|---------------------|----------------|
| | | | | | Autumn applied Aug-Oct | | Winter Nov-Jan | | Spring Feb-Apr |
| | | | | | sands/ sandy loams/ shallow % N | all other soils % N | sands/ sandy loams/ shallow % N | all other soils % N | all soils % N |
| | | | | | | | | | |
| Dairy – high dry matter | 17 | within 6 hrs | 4.0 | 10 | 5 | 10 | 15 | 25 | 30 |
| Dairy – medium dry matter | 18 | within 6 hrs | 3.0 | 6 | 5 | 15 | 20 | 30 | 40 |
| Dairy – low dry matter | 19 | within 6 hrs | 1.5 | 2 | 5 | 15 | 25 | 35 | 50 |
| Dairy – high dry matter | 20 | over 6 hrs | 4.0 | 10 | 5 | 10 | 10 | 15 | 20 |
| Dairy – medium dry matter | 21 | over 6 hrs | 3.0 | 6 | 5 | 10 | 20 | 25 | 30 |
| Dairy – low dry matter | 22 | over 6 hrs | 1.5 | 2 | 5 | 15 | 25 | 30 | 40 |
| Young cattle (250kg) | 23 | within 6 hrs | 5.0 | 10 | 5 | 10 | 15 | 25 | 30 |
| Young cattle (250kg) | 24 | within 6 hrs | 3.5 | 6 | 5 | 15 | 20 | 30 | 40 |
| Young cattle (250kg) | 25 | within 6 hrs | 2.0 | 2 | 5 | 15 | 25 | 35 | 50 |
| Young cattle (250kg) | 26 | over 6 hrs | 5.0 | 10 | 5 | 10 | 10 | 15 | 20 |
| Young cattle (250kg) | 27 | over 6 hrs | 3.5 | 6 | 5 | 10 | 20 | 25 | 30 |
| Young cattle (250kg) | 28 | over 6 hrs | 2.0 | 2 | 5 | 15 | 25 | 30 | 40 |
| Fattening cattle (400kg) | 29 | within 6 hrs | 3.5 | 10 | 5 | 10 | 15 | 25 | 30 |
| Fattening cattle (400kg) | 30 | within 6 hrs | 2.5 | 6 | 5 | 15 | 20 | 30 | 40 |
| Fattening cattle (400kg) | 31 | within 6 hrs | 1.5 | 2 | 5 | 15 | 25 | 35 | 50 |
| Fattening cattle (400kg) | 32 | over 6 hrs | 3.5 | 10 | 5 | 10 | 10 | 15 | 20 |
| Fattening cattle (400kg) | 33 | over 6 hrs | 2.5 | 6 | 5 | 10 | 20 | 25 | 30 |
| Fattening cattle (400kg) | 34 | over 6 hrs | 1.5 | 2 | 5 | 15 | 25 | 30 | 40 |

* Values for % N in the table are estimates for the east of Scotland. Lower values should be used in most years for the wetter west of Scotland.

** The values assume incorporation by ploughing. Cultivation using discs or tines is likely to be less effective in minimising ammonia losses and intermediate values of nitrogen availability should be used.

Previous manure: assume 10% of the total nitrogen content of manures become available for the second crop following application and deduct from N crop requirement in Tables 4 to 10.

Table 14 Percentage of total nitrogen available in SPRING following application of SEPARATED CATTLE SLURRIES AND PIG SLURRY (% of total N)*

| Slurry type | Ref. no. | Incorporation time** | Total N kg/tonne | Dry matter % | Time of application | | | | |
|----------------------------------|----------|--------------------------------|------------------|--------------|---------------------------------|---------------------|---------------------------------|---------------------|----------------|
| | | | | | Autumn applied Aug-Oct | | Winter Nov-Jan | | Spring Feb-Apr |
| | | | | | sands/ sandy loams/ shallow % N | all other soils % N | sands/ sandy loams/ shallow % N | all other soils % N | all soils % N |
| | | | | | | | | | |
| <i>Separated cattle slurries</i> | | | | | | | | | |
| Strainer box | 35 | surface or rapid incorporation | 1.5 | 1.5 | 5 | 15 | 25 | 30 | 40 |
| Weeping wall | 36 | surface or rapid incorporation | 2.0 | 3.0 | 5 | 15 | 25 | 30 | 40 |
| Mechanical separator | 37 | surface or rapid incorporation | 3.0 | 4.0 | 5 | 15 | 25 | 30 | 40 |
| Pig slurry - high dry matter | 38 | within 6 hrs | 5.0 | 6 | 5 | 15 | 20 | 35 | 45 |
| Pig slurry - medium dry matter | 39 | within 6 hrs | 4.0 | 4 | 5 | 15 | 25 | 40 | 50 |
| Pig slurry - low dry matter | 40 | within 6 hrs | 3.0 | 2 | 5 | 20 | 30 | 45 | 60 |
| Pig slurry - high dry matter | 41 | over 6 hrs | 5.0 | 6 | 5 | 10 | 15 | 25 | 35 |
| Pig slurry - medium dry matter | 42 | over 6 hrs | 4.0 | 4 | 5 | 15 | 20 | 35 | 45 |
| Pig slurry - low dry matter | 43 | over 6 hrs | 3.0 | 2 | 5 | 20 | 25 | 40 | 55 |

* Values for % N in the table are estimates for the east of Scotland. Lower values should be used in most years for the wetter west of Scotland.

** The values assume incorporation by ploughing. Cultivation using discs or tines is likely to be less effective in minimising ammonia losses and intermediate values of nitrogen availability should be used.

Previous manure: assume 10% of the total nitrogen content of manures become available for the second crop following application and deduct from N crop requirement in Tables 4 to 10.

N fertiliser and manure plan

Two forms are provided for further guidance on steps to be carried out:

Assessment of crop requirement for N fertiliser Form 1

Livestock manure applications and N available in spring for crops. Form 2

These forms may be photocopied or extra forms obtained from your local SAC office.

STEP 1 : Record soil and cropping details for each field in Form 1.

STEP 2 : Assess N residue Groups 1 to 6 for each field using the relevant previous crop (Table 2) or previous grass/clover management (Table 3).

STEP 3 : Assess the N requirement of each crop in each field using the relevant crop tables and taking account of soil type.

STEP 4 : Adjust the N requirement for intended market, undersowing or delayed sowing.

STEP 5 : Using Form 2 calculate N available in Spring from livestock manure applications (if no manure has been applied for the proposed crop, then go to STEP 6).

For each field which has received manure, record the actual applications in Form 2. This recording should be done as soon as possible after the manure is spread.

- Enter IACS field no. (or other) in first column.
- Indicate with ✓ each field where main soil type in the field is sandy or shallow (Table 1).
- Enter reference number for the type of manure. Refer to Tables 11 to 14 for list of types with appropriate reference numbers 1 to 43.
- Record the month(s) in which the manure was applied.
- Record the total quantity applied (tonnes or m³). 1m³ = 1000 litres = 220 gallons.
- Enter the field area in hectares, excluding any non-spreading areas
- Divide the amount of manure applied by the area spread and enter this value in column a.
- Enter the total N content in column b for the type of manure applied. (Laboratory analysis of your manure can be used instead)
- Multiply the application rate by the total N content to obtain the total N rate and enter into column c.
- Enter in column d the percentage of manure N available to the crop in Spring. Take into account the manure type, the method of application, month of application and soil type.
- Multiply total N application rate by available N %, divide by 100 and enter this value of N available to the crop (kg/ha) in column e.

- Transfer the value in column e of Form 2 into column c of Form 1. This value has to be deducted from the fertiliser recommendation in column a in Form 1, and should be entered in as a negative number (see example 2 in Form 1).

STEP 6 : Calculate N available from previous manures (if livestock manures were not applied for the previous crop go to STEP 7)

Assume 10% of the total N in manures applied for the previous crop will become available for the next crop.

- Multiply total N content of previous manure by application rate, divide by 10 and round to the nearest whole number.
- Enter as a negative number in column d in Form 1.

STEP 7 : Calculate total N adjustments to N required for planned crop in Form 1.

STEP 8 : Calculate the required rate of N fertiliser (kg/ha)

STEP 9 : Adjust for winter rainfall

If actual winter rainfall between 1 October and 1 March is more than 450mm (18 inches) then :

- Enter in column g the N adjustment to the N rate using relevant soil type and crop table.
- Add this figure from column g to the N rate in column f to give adjusted rate to be applied.
- Enter this figure in column h.

STEP 10 : Adjustment for rainfall between first and final spring N dressings.

If actual rainfall between first and final spring N dressings is more than 200mm (8 inches) then :

- Enter in column i the N adjustment to the final N rate using relevant soil type and crop table.

Example 1 : Winter oilseed rape is to be grown on a sandy loam following winter barley which was sown after 3-year grass. Winter rainfall is 500mm and 150mm rain fell between 1st and 2nd spring top dressings. No livestock manure applied during last two years. The assessment for N fertiliser is shown in Form 1.

Example 2 : Spring barley is to be grown for feed in a 4.08 ha field on a heavy soil following seed potatoes. 115m³ of dairy slurry of medium dry matter content were applied by vacuum tanker in early March and left on surface for more than 6 hours. Slurry was not applied to an area of 0.25 ha along the side of a burn. 115m³ of similar dairy slurry was applied the previous February prior to planting the seed potatoes. Winter rainfall prior to sowing the spring barley was 550mm and 40mm fell between 1st and 2nd N applications. The barley was sown about 10 days later than the optimum sowing date for the area. The assessment for N fertiliser is shown in Form 1. The calculation of N available in spring from the manure application is shown in Form 2.

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