

REVISED EDITION



MANURE PLANNING in NVZs – England

DEFRA
Department for
Environment,
Food & Rural Affairs

*Nitrate
Vulnerable
Zones*

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MANURE PLANNING IN NVZs

NITRATE VULNERABLE ZONES – England

INTRODUCTION

1 This booklet should be read in conjunction with the booklet ‘*Guidelines for Farmers in NVZs – England*’ (NVZ 4), which explains all the NVZ Action Programme rules. This supplementary booklet has been prepared to help livestock farmers, and those arable farmers importing organic manures, comply with the requirements of the Action Programme measures which must be followed from 19 December 1998/2002¹ within Nitrate Vulnerable Zones designated under the EC Nitrate Directive. For organic manures, the Action Programme places:

- i) Limits on the quantities of organic manure which may be applied to agricultural land;
- ii) Restrictions on the time of application of some manures; and
- iii) A requirement that full allowance is made for nitrogen (N) available from organic manures and other organic materials containing N when calculating fertiliser requirements.

2 These guidelines will deal with the three aspects in turn:

Part A Is enough land available for spreading all manure?

Part B Is there enough storage for slurry?

Part C How much will manure applications reduce the requirement for fertiliser N?

Part A need only be done once, unless your farm system changes with respect to farm area, livestock numbers or area of grassland.

Part B is for farmers with slurry systems and helps you decide whether you need additional storage in order to avoid applications of slurry during closed periods.

Part C needs to be completed annually as manure applications and crop rotations will vary from year to year.

¹For NVZs designated in 1996, the NVZ Action Programme came into force on 19 December 1998. For NVZs designated in 2002, the NVZ Action Programme comes into force on 19 December 2002.

3 The guidance given may not cover every circumstance on your farm and you may need to seek advice. Details of where you can obtain further advice are given in the booklet '*Guidelines for Farmers in NVZs – England*' (see paragraph 46).

A computer based NVZ Decision Support System (DSS) '*Your Farm and NVZs – Do you comply?*' has been designed to provide a simple, user-friendly system to help you assess if your farm complies with the NVZ Action Programme rules. The software is an alternative to this booklet and will carry out all the necessary calculations for your farm. The DSS is available on CD-ROM free of charge. If you would like a copy telephone 0845 6023864 (NVZ technical advice helpline).

PART A

IS ENOUGH LAND AVAILABLE FOR SPREADING ALL MANURE?

- 4 The rules for Nitrate Vulnerable Zones set a limit for organic manure (nitrogen) loadings of 250 kg/ha of total N on grassland, and 210 kg/ha of total N on land in non-grass crops, averaged over all agricultural land within the NVZ on your farm. You should note that the loading limit for land in non-grass crops in NVZs reduces to 170 kg/ha N after the first four years of the Action Programme¹. The limits *include* manure deposited by grazing animals and N in imported organic materials. These are annual limits which apply from 19 December to 18 December in the following year. The amount of N produced as livestock excreta depends on the number and type of livestock on your farm.
- 5 Additionally, no individual field should receive organic manure applications (which *excludes* manure deposited by grazing animals) which supply more than 250kg/ha of total N in any 12 month period, or supply available N in excess of the crop requirement.
- 6 The following steps will allow you to check that you have enough land to comply with the requirements of the NVZ Action Programme.

NB. Rented land: Land under short term rental agreement (usually two years or less) should be counted as part of the leasor's farm; land under longer term rental agreements should be counted by the farm using the land.

Step 1

Calculate the permitted manure total N capacity for your farm

- 7 This allowance depends on the area of land on the farm within the NVZ. Complete **Tables 1a** (grassland) and **1b** (non-grass crops), listing all fields on your farm. Your IACS map may be helpful at this stage.

Column 1 Field name or number

Column 2 Crop to be grown (to make planning of manure spreading easier)

Column 3 The area in hectares. Add up the total areas (A and B).

Note: If you only know areas in acres you will need to convert them to hectares. To do this multiply the number of acres by 0.405, e.g. 276 acres = 112 ha. A conversion table is contained in Appendix D.

¹The reduced limit applies from 19 December 2002 for designations with the NVZ Action Programme beginning on 19 December 1998; and 19 December 2006 for designations with the NVZ Action Programme beginning on 19 December 2002.

Column 4 Is for future reference when planning manure applications. Note the months when manure applications are permitted and likely to be practicable, for each field.

8 On sandy or shallow soils the NVZ Action Programme imposes a closed period of three months (1 August to 1 November) when no slurry, poultry manures or liquid digested sewage sludge may be applied to land which is not in grass nor to be sown with an autumn sown crop. The closed period for land in grass or to be sown with an autumn sown crop is 1 September to 1 November. These closed periods do not apply to FYM (straw-based manures) or other forms of sewage sludge or other organic materials.

9 Identify areas where spreading may be difficult at certain times, e.g. due to:

- Growing crops
- Poor trafficability (e.g. on clay soils in winter)
- Risk of run-off (e.g. on clay soils, significant slopes*)

*applications are not permitted on steep slopes at any time.

10 The Code of Good Agricultural Practice for the Protection of Water gives further guidance on the timing of manure applications to avoid the risk of direct pollution of streams and other watercourses. You are encouraged to develop a Farm Waste Management Plan to help you decide when, where and at what rate to spread organic manures on your farm.

11 Finally, calculate the permitted manure total N capacity for your grassland (C) and land in non-grass crops (D_1 , or D_2 for post December 2002/2006¹). Add these figures together to obtain the permitted manure total N capacity for your farm (E_1 , or E_2 for post December 2002/2006¹).

¹See footnote to paragraph 4 (page 5) for the year which applies to your farm.

Summary of Tables 1a and 1b

Permitted manure total N capacity
for your farm:

$$= C + D_1 = \boxed{E_1} \quad \text{or, for post 2002/2006} \quad \boxed{E_2}$$
$$= C + D_2 =$$

kg N per year

The figure E_2 indicates your situation after December 2002/2006 (providing your area of non-grass crops remains the same) when the allowance on land in non-grass crops reduces to 170 kg/ha of total N.

Step 2**Calculate the amount of N produced as livestock excreta on your farm**

- 12** This calculation ensures that no more than the permitted quantities of manure are applied and deposited on your farm each year. Fill in Table 2. For each livestock unit:
- Column 1** Find the appropriate livestock units and record their number in Column 2.
- Column 2** Multiply the number of livestock units in Column 2 by the factor in Column 3, to calculate the total N produced as livestock excreta. These factors are based upon standard figures for the estimated N excretion by different classes of livestock¹.
- Column 4** Enter the results in Column 4. Add up Column 4 and record the total (F). This is the total N produced on your farm by livestock. Compare this with the permitted manure total N capacity for your land (E_1 or E_2 from Step 1).
- 13** If you are producing more N from livestock than the permitted quantity, i.e. F is bigger than E_1 , you should make arrangements to export the excess manure for use on another farm or dispose of it in another environmentally acceptable way. When disposing of excess manure you should always comply with the Codes of Good Agricultural Practice for the Protection of Water, Soil and Air. For future planning beyond December 2002/2006 compare F with E_2 .
- 14** If you are exporting livestock manures off the farm, it is a legal requirement that you maintain acceptable records, including details of the quantities, dates of export, and details of the recipient (see paragraphs 38 and 39 of the booklet 'Guidelines for Farmers in NVZs – England'). You must keep these records for at least five years. An example form for recording movements of livestock manures off the farm can be found at *Appendix B*. You may find it helpful to use photocopies of this form. Typical nitrogen contents of organic manures are given in Tables 5, 6 and 7.
- 15** The risk of spreading animal disease while transporting manures to other farms is reduced by providing secure containment, *cleaning the exterior of the vehicle used for transport before leaving the originating premises*, and spreading on arable land or on grassland used for forage conservation. Advice on applying manures to grazing land is contained in booklet No. 2 'Making better use of livestock manures on grassland' – see 'Guidelines for Farmers in NVZs – England', paragraph 52, for further details.

¹If you have good evidence that different figures should be used on your holding (e.g. use of low N diets) these may be substituted. If you opt to use different figures you should keep adequate records to support your actions. If you are currently exporting manures you should take this into account. Output figures should also be adjusted if percentage occupancy or length of the production cycle differ from the standard values in the table.

Table 2 *Standard figures for total nitrogen produced as livestock excreta*

Column 1	2	3	4
Livestock unit	Number of livestock units	Total N produced by 1 livestock unit (kg/year)	Total N produced by all these animals (kg/year)
1 Dairy Cow (650kg)		X 116 =	
1 Dairy Cow (550kg)		X 96 =	
1 Dairy Cow (450kg)		X 76 =	
1 Dairy heifer replacement over 24 months (500 kg)		X 58 =	
1 Suckler Cow		X 58 =	
1 Cattle grower/fattener over 24 months (500kg)		X 58 =	
1 Cattle grower/fattener 12-24 months (400kg)		X 47 =	
1 Young cattle 6-12 months ¹		X 12 =	
1 Bull beef cattle 6-13.5 months		X 23 =	
1 Calf (to 6 months) ¹		X 7 =	
1 Bull for breeding (1350 kg, alter figures for breed)		X 58 =	
1 Sheep		X 9 =	
1 Fattening Lamb 6 – 12 months ¹		X 3.2 =	
1 Fattening Lamb 0 – 6 months ¹		X 1.2 =	
1 Breeding Sow place (includes piglets to 3.5 weeks) ²		X 19.5 =	
1 Maiden gilt place ²		X 13 =	
1 Boar place		X 16 =	
For pigs fattened from 3.5 weeks:			
– Number of pigs finished at 7.5 weeks/18 kg ³		X 0.28 =	
– Number of pigs finished at 11 weeks/35 kg ³		X 0.77 =	
– Number of pigs finished at 20 weeks/85 kg ³		X 2.5 =	
– Number of pigs finished at 23 weeks/105 kg ³		X 3.36 =	
For pigs fattened from 7.5 weeks:			
– Number of pigs finished at 11 weeks/35 kg ³		X 0.49 =	
– Number of pigs finished at 20 weeks/85 kg ³		X 2.22 =	
– Number of pigs finished at 23 weeks/105 kg ³		X 3.08 =	
1000 Laying Hens (98% occupancy)		X 660 =	
1000 Broiler Places (76% occupancy)		X 495 =	
1000 Broiler Breeder (77% occupancy)		X 975 =	
1000 Pullets (38% occupancy)		X 125 =	
1000 Male Turkeys Places (140 days) ⁴		X 1390 =	
1000 Female Turkeys Places(120 days) ⁵		X 650 =	
1000 Fattening Duck Places (50 days) ⁶		X 900 =	
Total N produced		F =	

¹ Presumes kept for only 6 months.

² Average number on unit at any time during the year.

³ Total number normally finished in a year assuming pigs are on the farm from 3.5 weeks or 7.5 weeks. Figures for pigs finished after import at other ages can be calculated by subtraction. E.g. If pigs are imported at 35 kg and kept until 105 kg subtract total N produced by pigs finished at 35 kg (0.77) from total N produced by pigs finished at 105 kg (3.36) and use the figure of 2.59 in column 3.

⁴ Male turkeys, assuming 2.1 crops per year; 80% occupancy.

⁵ Female turkeys, assuming 2.4 crops per year; 80% occupancy.

⁶ Ducks, assumes 85% occupancy.

Include cockerels, drakes etc. in hen/duck numbers.

N.B. An alternative method of calculating the N excreted by pigs based on 'pig places' is given in 'Guidelines for Farmers in NVZs – England'.

Step 3

Guidelines for spreading imported livestock manures, sewage sludge or other imported organic materials

16 You only need to read this page if you wish to bring livestock manures from other farms, sewage sludge or other organic materials *onto* your farm. The risk of spreading animal disease while transporting manures from other farms is reduced by providing secure containment, cleaning the exterior of equipment and spreading on arable land or on grassland used for forage conservation. You will need to keep records of the application of imported materials on your field record sheets. Advice on applying manures to grazing land is contained in booklet No. 2, ‘*Making better use of livestock manures on grassland*’. See ‘*Guidelines for Farmers in NVZs – England*’, paragraph 52, for further details.

17 The limit on total N as organic manure applies to *all sources* of organic N. Therefore you should only import organic manures or organic materials containing nitrogen to your farm if you have more land suitable for spreading than you need for the manure from your own livestock (i.e. E is larger than F).

Permitted manure total N capacity for your farm (Step 1)	Total N produced by farm livestock (Step 2)	Total N in organic manures which can be imported on to the farm
E <input type="text"/> kg/year	less F <input type="text"/> kg/year	= <input type="text"/> kg/year

18 A single application of sewage sludge normally contains 200 kg/ha N or more. However sludge N contents vary, and the supplier should provide you with an analysis and interpretation. Some examples of the rates of different sludges which supply 250 kg/ha N, based upon typical N contents, are shown below:

Type of sewage sludge	Total N content kg/tonne or kg/m ³	Rate of application supplying 250 kg/ha of total N
Liquid digested	2.0	125 m ³ /ha
Sludge cake digested	7.5	33 t/ha
Thermally dried	35	7 t/ha
Lime stabilised	6	42 t/ha

PART B

IS THERE ENOUGH STORAGE FOR SLURRY?

- 19** Part B applies **ONLY** to farmers within NVZs producing liquid slurries for which additional storage may be required in order to comply with the following rules on the timing of the application of manures.
- 20** On sandy (sometimes called light sand soils)¹ or shallow² soils, slurries, poultry manures or liquid digested sewage sludge may not be applied:
Between 1 September and 1 November to fields in grass or to be sown with an autumn sown crop, or
Between 1 August and 1 November to fields not in grass, nor to be sown with an autumn sown crop.
- 21** This section, together with your experience of spreading during winter (see paragraphs 29 and 30), will enable you to estimate the number of months of storage of slurry you will need to comply with the NVZ requirements and minimise the risk of causing pollution. You will need to include dirty water from fouled yard areas and dairy/parlour wash water only in those cases where it drains to the slurry store.
- 22** Liquid effluents from weeping-wall stores, strainer boxes, slurry separators and silage effluents are rich in nitrogen and are regarded as slurries under NVZ rules.

NB. Dirty water (rainwater which has passed across fouled concrete in a farmyard or wash water from a dairy/parlour) which is collected separately from slurry is not regarded as slurry under NVZ rules and can be applied at any time on any soil subject to standard guidelines as given in the Code of Good Agricultural Practice for the Protection of Water.

¹A sandy soil (also known as light sand soil) has a sand, loamy sand or sandy loam topsoil to 40cm depth overlying a sand or loamy sand subsoil to 80 cm depth. The topsoil will contain less than 8.5% organic matter (5.0% organic carbon).

²A shallow soil is less than 40 cm deep over rock which is commonly chalk, limestone or sandstone in NVZs.

Step 4**Calculating the months of storage available**

23 You may already know how many months of slurry production you can store on your farm. If so, record this at Box Z and move to **Step 5**.

24 If you *do not* know how many months' storage you have, this can be estimated by following the steps below. To calculate storage available you need to know:

1. The capacity of existing slurry storage facilities (in cubic metres).
2. The area of open yards, silage clamps etc. which drain into the slurry store (in square metres).
3. The average annual rainfall for your farm (in millimetres).

These conversion factors may be useful in these calculations:

1000 gallons = 4.55 m³ (cubic metres)
1 square yard = 0.84 m² (square metres)
1 inch = 25.4 mm (millimetres)

25 To calculate the monthly volume of slurry produced fill in Table 3. Record the following:

Column 1 The number of livestock units on slurry or part slurry based systems.

Column 2 If some of the excreta are collected as solid manures and stored separately estimate the proportion handled as slurry in this column. Otherwise ignore this column or set it equal to 1.

Column 3 This is the multiplication factor to give monthly volumes.

Column 4 Multiply together Columns 1, 2 and 3 and enter the results in this column. Add up the figures in Column 4 and enter into Box S, the total volume of slurry produced per month.

Table 3 *Slurry production per month (based on undiluted slurry¹)*

Column	1	2	3	4
Livestock unit on slurry based system	Number of livestock units on slurry or part slurry-based system	Proportion of waste collected as slurry e.g Half = 0.5, All = 1.0	Volume per livestock unit per month m ³	Total volume produced each month m ³
Cattle				
1 Dairy Cow (650 kg)	X	X	1.93	=
1 Dairy Cow (550 kg)	X	X	1.61	=
1 Dairy Cow (450 kg)	X	X	1.28	=
1 Dairy heifer replacement over 24 months (500 kg)	X	X	0.98	=
1 Suckler cow	X	X	0.98	
1 Cattle, grower/fattener over 24 months (500 kg)	X	X	0.98	=
1 Cattle, grower/fattener 12-24 months (400 kg)	X	X	0.79	=
1 Young cattle, 6–12 months	X	X	0.40	=
1 Bull beef cattle 6-13.5 months	X	X	0.64	=
1 Calf (to 6 months)	X	X	0.21	=
1 Breeding bull (1350 kg, output will depend on breed)	X	X	0.98	=
Pigs				
1 Breeding Sow Place (& piglets to 3.5 weeks)	X	X	0.33	=
1 Maiden Gilt place (90-130 kg)	X	X	0.22	=
1 Boar Place	X	X	0.27	=
1 Weaner Place (7 to 18 kg)	X	X	0.04	=
1 Grower Pig Place (18 to 35 kg)	X	X	0.08	=
1 Light Cutter Pig Place (35-85 kg, dry meal fed)	X	X	0.13	=
1 Bacon Pig Place (35-105 kg, dry meal fed)	X	X	0.14	=
1 Bacon Pig Place (35-105 kg, liquid fed)	X	X	0.22	=
Total monthly volume of slurry			S	= m ³

¹10% dry matter except for sows, maiden gilts and liquid fed when the dry matter is 6%

26 Calculate rain falling directly onto the slurry store and onto concrete areas draining to the slurry store (monthly basis)

Area of slurry store plus concrete surface area	Average annual rainfall	Monthly rainfall volume onto slurry store
<input type="text"/> m ²	x <input type="text"/> mm	÷ 10 000 = T <input type="text"/> m ³

Example: A concrete plus store area of 1 000 m² in a region with 800 mm annual rainfall will typically collect 80 m³ of water per month. This calculation takes account of higher winter rainfall.

NB. Include all fouled concrete areas, areas of uncovered silage clamps and dungsteads if the run-off drains to the slurry store. Exclude run-off from clean yard areas and roof areas if rain falling on these is collected and discharged to a clean drain, but include such yard and roof water if it drains to the slurry store.

27 Calculate dirty water¹ production from the dairy and milking parlour (only if it goes into your slurry store)

No. of dairy cows	Dirty water per month
<input type="text"/>	x 0.55 = W <input type="text"/> m ³
Monthly volume of slurry to store	S + T + W = X <input type="text"/> m ³

NB. If you know how much dirty water is produced per month from the dairy and milking parlour, enter the amount in cubic metres directly into Box W. Use the calculation as a check.

28 Calculate the months of storage available

You will need to assess existing slurry storage capacity, including any indoor storage under slats:

For a store which is square or rectangular with vertical walls multiply its length (metres) by its width (metres) by its height (metres). Its height should be reduced by 0.3 metres to allow for freeboard.

¹Dirty water is defined as 'rainwater which has passed across a farmyard and/or wash water from a dairy/parlour'. It does not include liquids from weeping wall stores, strainer boxes, slurry separators and silage effluents which are rich in N – these are regarded as slurries.

For a circular store, measure the distance around the outside (circumference) accurately. You can do this by counting the number of steel/concrete panels and multiplying by the width (metres) of each panel. Calculate the diameter (D) of the store by dividing the circumference by 3.142. Then calculate the floor area of the store by multiplying the diameter (metres) by the diameter (metres) by 0.785 (i.e. D x D x 0.785). Finally, multiply the floor area (square metres) by the height (metres) of the store. The height should be reduced by 0.3 metres to allow for freeboard.

For an earth banked lagoon estimate its length (metres) and width (metres) and average depth (metres) from the top of the bank to the base of the lagoon. Reduce the depth by 0.75 metres to allow for freeboard and to give the working depth. You will also need to reduce the length and width of a lagoon measured from the inside of the bank top to allow for the sloping sides. Finally multiply your estimate of its length by its width by its working depth to obtain the storage capacity in cubic metres.

Safety note: *do not attempt to measure the depth of a lagoon while it contains any liquid.*

Existing storage capacity	Monthly volume of slurry to store	Months of storage available
<input type="text"/> m ³	<input type="text"/> X <input type="text"/> m ³	= <input type="text"/> Z <input type="text"/>

Step 5

Calculate the number of months' storage needed to hold slurry

29 Identify times of year when slurry can be spread safely and reliably. On sandy or shallow soils, the Action Programme sets a closed period of **three months** when no slurry or poultry manures may be applied to land which is not in grass or not to be sown to an autumn sown crop (1 August to 1 November); and **two months** (1 September to 1 November) for land in grass or which is to be sown to an autumn sown crop. You will need at least enough storage to cover these periods.

You may require additional storage if there are other periods when manure cannot be applied to some of your land.

(Dirty water, which has passed only across a farm yard or from the dairy/parlour and is collected and stored separately from slurry, is exempt from these rules as long as they do not include liquids from weeping wall stores, strainer boxes, slurry separators and silage effluent which are rich in N and are regarded as slurries under the NVZ rules.)

30 Check whether there is enough land available each month for spreading that month's slurry production

Plan which fields you intend to apply slurry to each month, and in what quantities. Within NVZs, organic manures should not be applied within 10 metres of watercourses. Where fields border watercourses you should therefore subtract the area of the 10 metre buffer strip from the field area to obtain the area available for spreading. Check that the field is likely to be suitable for spreading in that month (see Table 1, Column 4). Ensure that intended application rates comply with the NVZ limits for total N content and that the available N does not exceed the foreseen crop requirement. This planning process may require several attempts before you arrive at the best solution.

As a rough guide, the area of land required per month, during the time when livestock are housed, if the relevant maximum of 250 kg/ha N as manure is applied, can be calculated as:

For all land:	Total manure N from Step 2		Area required per month
	<input type="text" value="F"/>	kg/yr	÷ 250 ÷ 12 =
			<input type="text" value=""/>
			ha/month

Where you have a mixture of grassland and arable land you will need to make a decision as to which land is to receive organic manure in different months.

Extra slurry storage in addition to that required under the NVZ rules may be needed if much of the land to be used for spreading is unavailable during part of the winter. Normally you would be expected to show that you have a need for less than four months' storage if a new or extended slurry store is planned. A Farm Waste Management Plan may help decision making.

31 If the Action Programme requires you to make changes to, or increase, your storage facilities you may be eligible for a grant under the NVZ Farm Waste Grant Scheme. For NVZs designated in 2002, grant will be available after the zones have been formally designated. Further information about the scheme is available from the East Midlands Rural Development Service, DEFRA, Government Buildings, Chalfont Drive, Nottingham, NG8 3SN; telephone 0115 9291191. Please contact them if you would like a copy of the booklet '*Farm Waste Grant Scheme – England: Nitrate Vulnerable Zones*', NVZ1. (PB 2529). You should also contact your local Environment Agency office about any plans for waste storage facilities and must notify it prior to bringing the facilities into use to ensure that they meet the requirements of The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 (amended 1997). A list of Environment Agency Offices is included at *Appendix A*.

PART C

HOW MUCH WILL MANURE APPLICATIONS REDUCE THE REQUIREMENT FOR FERTILISER N?

32 The amount of N available to the crop following the application of manure depends on the type of manure, the timing and the method of application. Ammonia loss can be reduced by rapidly incorporating manures into the soil after application. For slurries, injection or band spreading is also effective. Manures spread in winter and spring will supply more N than those spread in autumn, because less is lost by leaching over winter. Fertiliser N applications (i.e. manufactured nitrogen fertilisers) must be reduced to allow for N supplied by manures or other organic nitrogen sources. You must not apply more available N in organic manure than the crop needs.

Because manure applications under NVZ rules may have to take place later in the year than you are accustomed to, you may need to make more allowance for manure N than previously was the case.

The following steps will enable you to calculate how much to reduce your fertiliser inputs.

Manure applications are recorded in Table 4, and N contents of manure are given in Tables 5 (solid manures), 6 (cattle slurry) and 7 (pig slurry). *Appendix C* gives some examples.

Alternatively, you may use one of the commercially available fertiliser planning services which take into account the N contributed by organic manures. The MANNER (Manure Nitrogen Evaluation Routine) Decision Support System is particularly appropriate. See paragraph 51 of the NVZ Farmer Guidelines for further information.

Step 6

Note details of manure applications and calculate total and available N applied

33 In Table 4, for each field which receives manure, record:

Column 1 Field name or number.

Column 2 The soil type: sandy/shallow soils or other.

Column 3 The type of manure (refer to Tables 5, 6 and 7 for list of types).

Once you have applied manure, record:

Column 4 The month applied.

Column 5 The total quantity applied (m³ or tonnes).

Column 6 The field area in hectares, excluding any non-spreading areas.

Column 8 Find out the total N content of the manure by referring to the type of manure you used in Tables 5, 6 and 7 and write the associated total N content value in this column.

Manures: adjustment for dry matter content

34 Tables 5, 6 and 7 give typical dry matter contents for manures. If your manure differs markedly from this, the N content will differ in proportion. The calculation below makes this adjustment.

Total N content for standard manure <i>Tables 5, 6 or 7: Col B</i>	Actual dry matter content	Standard dry matter content <i>Tables 5, 6 or 7: Col C</i>	Actual total N content
<input type="text"/> kg/m ³	x <input type="text"/> %	÷ <input type="text"/> %	= <input type="text"/> kg/m ³

Analysis of manures

35 Results of your own analysis of your manure can be used in Table 4, Column 8 instead of the typical figures from Tables 5, 6 or 7. It is advisable to have several analyses since N contents vary and obtaining a representative sample is difficult.

NB. In this case, no further adjustment for dry matter content is needed.

Column 9 Divide the quantity in Column 5 by the area in Column 6 to obtain the manure application rate (Column 7). Multiply the rate in Column 7 by the total N content in Column 8 to obtain the total N application rate and enter into Column 9. Check that this value does not exceed the overall NVZ field limit (250 kg/ha total N).

Column 10 Look up the percentage of manure N available to the crop in Tables 5, 6 or 7. Take into account the soil type (Table 4, Column 2), manure type (Table 4, Column 3), month of application (Table 4, Column 4) and the method of application (Table 5, 6 or 7, Column A); availability of N is greater if manure is injected or rapidly incorporated within six hours. For each manure application, enter the appropriate value in Table 4, Column 10.

Column 12 Multiply total N applied from Column 9 by available N % (Column 10). Divide by 100 (Column 11). This gives the N available to the crop in kg/ha. Enter the result in Column 12.

The crop requirement for fertiliser N, taking into account the release of N by the soil and from crop residues, must be reduced by the amount of N supplied by the organic manure application. The amount of available N must not exceed the N requirement of the crop.

Examples of calculations for manure applications equal to the NVZ field-based limit of 250 kg/ha total N are given in *Appendix C*.

Table 5 *Standard figures for N available to crops from solid organic manures*

A Manure type	B Total N content kg/t	C Dry matter %	Percentage of total N available in year of application					
			Autumn Aug – Oct ⁽¹⁾		Winter Nov – Jan ⁽¹⁾		Spring Feb – Apr ⁽¹⁾	Summer grass ⁽¹⁾
			<i>Sandy/ shallow</i> ⁽²⁾	<i>Medium/ heavy</i> ⁽²⁾	<i>Sandy/ shallow</i> ⁽²⁾	<i>Medium/ heavy</i> ⁽²⁾	All soils	All soils
SURFACE APPLICATION								
Cattle FYM – fresh ⁽³⁾	6.0	25	5	10	10	15	20	N/A
Cattle FYM – old ⁽³⁾	6.0	25	5	10	10	10	15	N/A
Pig FYM – fresh ⁽³⁾	7.0	25	5	10	10	15	20	N/A
Pig FYM – old ⁽³⁾	7.0	25	5	10	10	10	15	N/A
Duck FYM – fresh ⁽³⁾	6.5	25	5	10	10	15	20	N/A
Duck FYM – old ⁽³⁾	6.5	25	5	10	10	10	15	N/A
Layer manure	16.0	30	10	20	15	30	35	N/A
Broiler/turkey litter	30.0	60	10	20	15	25	30	N/A
SOIL INCORPORATED 24 HOURS AFTER APPLICATION⁽⁴⁾								
Cattle FYM – fresh ⁽³⁾	6.0	25	5	10	15	20	25	N/A
Cattle FYM – old ⁽³⁾	6.0	25	5	10	10	15	20	N/A
Pig FYM – fresh ⁽³⁾	7.0	25	5	10	15	20	25	N/A
Pig FYM – old ⁽³⁾	7.0	25	5	10	10	15	20	N/A
Duck FYM – fresh ⁽³⁾	6.5	25	5	10	15	20	25	N/A
Duck FYM – old ⁽³⁾	6.5	25	5	10	10	15	20	N/A
Layer manure	16.0	30	10	25	20	40	50	N/A
Broiler/turkey litter	30.0	60	10	25	20	40	45	N/A

N/A: Not applicable

Notes to Table 5

- (1) The nitrogen availability estimates assume 350 mm of rainfall after autumn application and 200 mm after winter application, up to the end of soil drainage (usually end of March). Where rainfall differs from these amounts, intermediate values of nitrogen availability should be used. Reduce the values by half on medium/heavy soils where rainfall is much greater than 350 mm following autumn application (i.e. over 500 mm). For spring or summer applications, rainfall is not likely to cause movement of nitrogen below crop rooting depth.
- (2) Sandy/shallow means light sands and shallow soils over rock. Medium/heavy means medium, deep fertile silts and deep clay soils. Use this category for organic and peaty soils.
- (3) Fresh FYM means manure which has not been stored prior to land application and has an estimated ammonium-N content of 25% of the total N. Old FYM means manure which has been stored for 3 months or more and has an estimated ammonium-N content of 10% of total N.
- (4) 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.

Table 6 Standard figures for N available to crops from cattle slurry

A Slurry type	B Total N content kg/m ³	C Dry matter %	Percentage of total N available in year of application					
			Autumn Aug – Oct ⁽¹⁾		Winter Nov – Jan ⁽¹⁾		Spring Feb – Apr ⁽¹⁾	Summer grass ⁽¹⁾
			Sandy/ shallow ⁽²⁾	Medium/ heavy ⁽²⁾	Sandy/ shallow ⁽²⁾	Medium/ heavy ⁽²⁾	All soils	All soils
SURFACE APPLICATION								
Dairy – 2% DM	1.5	2	5	20	25	40	50	35
– 6% DM	3.0	6	5	15	20	30	35	20
– 10% DM	4.0	10	5	10	10	15	20	10
Beef – 2% DM	1.0	2	5	20	25	40	50	35
– 6% DM	2.3	6	5	15	20	30	35	20
– 10% DM	3.5	10	5	10	10	15	20	10
Separated slurry ⁽³⁾	1.5 – 3.0	1.5 – 4	5	20	25	40	50	35
SOIL INCORPORATED WITHIN 6 HOURS OF APPLICATION⁽⁴⁾								
Dairy – 2% DM	1.5	2	5	20	25	45	55	N/A
– 6% DM	3.0	6	5	20	20	35	45	N/A
– 10% DM	4.0	10	5	15	15	30	35	N/A
Beef – 2% DM	1.0	2	5	20	25	45	55	N/A
– 6% DM	2.3	6	5	20	20	35	45	N/A
– 10% DM	3.5	10	5	15	15	30	35	N/A
Separated slurry ⁽³⁾	1.5 – 3.0	1.5 – 4	5	20	25	45	55	N/A
DEEP INJECTED (25-30 cm)								
Dairy – 2% DM	1.5	2	5	10	15	35	60	60
– 6% DM	3.0	6	5	10	15	30	50	50
– 10% DM	4.0	10	5	10	15	25	45	45
Beef – 2% DM	1.0	2	5	10	15	35	60	60
– 6% DM	2.3	6	5	10	15	30	50	50
– 10% DM	3.5	10	5	10	15	25	45	45
Separated slurry ⁽³⁾	1.5 – 3.0	1.5 – 4	5	10	15	35	60	60

N/A: Not applicable

Notes to Table 6

- (1) The nitrogen availability estimates assume 350 mm of rainfall after autumn application and 200 mm after winter application, up to the end of soil drainage (usually end of March). Where rainfall differs from these amounts, intermediate values of nitrogen availability should be used. Reduce the values by half on medium/heavy soils where rainfall is much greater than 350 mm following autumn application (i.e. over 500 mm). For spring or summer applications, rainfall is not likely to cause movement of nitrogen below crop rooting depth.
- (2) Sandy/shallow means light sands and shallow soils over rock. Medium/heavy means medium, deep fertile silts and deep clay soils. Use this category for organic and peaty soils.
- (3) Typical dry matter and total N contents for the liquid portion of separated cattle slurries are: strainer box, 1.5 kg/m³N and 1.5%DM; weeping wall, 2.0 kg/m³N and 3%DM; mechanical separator, 3.0 kg/m³N and 4%DM.
- (4) 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. Where slurry has been applied in spring or summer using shallow injection or band spreading methods, nitrogen availability will be intermediate between 'surface applied' and 'deep injected'.

Table 7 Standard figures for N available to crops from pig slurry

A Slurry type	B Total N content kg/m ³	C Dry matter %	Percentage of total N available in year of application					
			Autumn Aug – Oct ⁽¹⁾		Winter Nov – Jan ⁽¹⁾		Spring Feb – Apr ⁽¹⁾	Summer grass ⁽¹⁾
			<i>Sandy/ shallow⁽²⁾</i>	<i>Medium/ heavy⁽²⁾</i>	<i>Sandy/ shallow⁽²⁾</i>	<i>Medium/ heavy⁽²⁾</i>	<i>All soils</i>	<i>All soils</i>
SURFACE APPLICATION								
Pig – 2% DM	3.0	2	5	25	30	50	60	40
– 4% DM	4.0	4	5	20	25	40	50	30
– 6% DM	5.0	6	5	15	20	30	40	25
SOIL INCORPORATED WITHIN 6 HOURS OF APPLICATION⁽³⁾								
Pig – 2% DM	3.0	2	5	25	25	55	65	N/A
– 4% DM	4.0	4	5	20	20	45	55	N/A
– 6% DM	5.0	6	5	20	20	40	50	N/A
DEEP INJECTED (25-30 cm)								
Pig – 2% DM	3.0	2	5	10	15	40	70	70
– 4% DM	4.0	4	5	10	15	35	65	65
– 6% DM	5.0	6	5	10	15	30	60	60

N/A: Not applicable

Notes to Table 7

- (1) The nitrogen availability estimates assume 350 mm of rainfall after autumn application and 200 mm after winter application, up to the end of soil drainage (usually end of March). Where rainfall differs from these amounts, intermediate values of nitrogen availability should be used. Reduce the values by half on medium/heavy soils where rainfall is much greater than 350 mm following autumn application (i.e. over 500 mm). For spring or summer applications, rainfall is not likely to cause movement of nitrogen below crop rooting depth.
- (2) Sandy/shallow means light sands and shallow soils over rock. Medium/heavy means medium, deep fertile silts and deep clay soils. Use this category for organic and peaty soils.
- (3) 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. Where slurry has been applied in spring or summer using shallow injection or band spreading methods, nitrogen availability will be intermediate between 'surface applied' and 'deep injected'.

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Record of livestock manures exported off the farm

APPENDIX B

Type	Quantity (tonnes or m ³)	Total N content kg/t or kg/m ³	Date moved	Recipient Name	Address

Examples of N available to crops from applications containing 250 kg/ha total N, applied to the soil surface and not incorporated, using figures from Tables 5, 6 and 7.

APPENDIX C

Manure type	Dry matter (%)	Application rate (t/m ³ /ha)	N available in year of application kg/ha ¹					
			Autumn Aug – Oct		Winter Nov – Jan		Spring Feb – Apr	Summer grass
			Sandy/shallow	Other	Sandy/shallow	Other	All soils	All soils
Solid manures								
Cattle FYM – fresh	25	42	10	25	25	35	50	N/A
Pig FYM – fresh	25	36	10	25	25	35	50	N/A
Layer manure	30	16	2.5	50	35	75	90	N/A
Broiler/turkey litter	60	8	2.5	50	35	60	75	N/A
Slurries								
Dairy	6	83	10	35	50	75	85	50
Dairy – Weeping Wall	3	125	10	50	60	100	125	85
Dairy – Strainer box	1.5	167	10	50	60	100	125	85
Dairy – Mechanical Separator	4	83	10	50	60	100	125	85
Pig	4	63	10	50	60	100	125	75

For slurries an adjustment should be made if dry matter is very different from 6% for dairy or 4% for pigs.

If other rates, within those allowed, have been applied these figures should be changed proportionately.

¹ Figures rounded down to the nearest 5 kg/ha.

Examples of N available to crops from applications containing 250 kg/ha total N, and soil incorporated, using figures from Tables 5, 6 and 7. APPENDIX C-cont.*

Manure type	Dry matter (%)	Application rate (t/m ³ /ha)	N available in year of application kg/ha ¹					
			Autumn Aug – Oct		Winter Nov – Jan		Spring Feb – Apr	Summer grass
			Sandy/shallow	Other	Sandy/shallow	Other	All soils	All soils
Solid manures								
Cattle FYM – fresh	25	42	10	25	35	50	60	N/A
Pig FYM – fresh	25	36	10	25	35	50	60	N/A
Layer manure	30	16	2.5	60	50	100	125	N/A
Broiler/turkey litter	60	8	2.5	60	50	100	110	N/A
Slurries								
Dairy	6	83	10	50	50	85	110	N/A
Dairy – Weeping Wall	3	125	10	50	60	110	135	N/A
Dairy – Strainer box	1.5	167	10	50	60	110	135	N/A
Dairy – Mechanical Separator	4	83	10	50	60	110	135	N/A
Pig	4	63	10	50	50	110	135	N/A
Deep injected (25-30 cm)								
Dairy	6	83	10	25	35	75	125	125
Pig	6	63	10	25	35	85	160	160

* For solid manures this means incorporation within 24 hours and for slurries this is incorporation within 6 hours by ploughing; if cultivated into the soil, levels of available nitrogen are likely to be lower.

For slurries an adjustment should be made if dry matter is very different from 6% for dairy or 4% for pigs.

If other rates, within those allowed, have been applied these figures should be changed proportionately.

¹ Figures rounded down to the nearest 5 kg/ha.

Metric to Imperial	
1 tonnes/ha	0.4 tons/acre
100 kg/ha	80 units/acre
1 kg/tonne	2 units/ton
10 cm	4 inches
1 m ³	220 gallons
1 m ³ /ha	90 gallons/acre
1 kg/m ³	9 units/1000 gallons
1 kg	2 units

Note: A 'unit' is 1% of 1 hundredweight, or 1.12 lb.

Imperial to metric	
1 ton/acre	2.5 tonnes/ha
100 units/acre	125 kg/ha
1 unit/ton	0.5 kg/tonne
1 inch	2.54 cm
1000 gallons	4.55 m ³
1000 gallons/acre	11 m ³ /ha
1 unit/1000 gallons	0.11 kg/m ³
1 unit	0.5 kg

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