

## Livestock manure nitrogen efficiency

A key aim of the revised Action Programme is to maximise the efficiency of livestock manure use. Applications in the autumn and winter result in a small percentage of the total nitrogen applied being taken up by the crop. For example, an autumn (August to October) application of 6% dry matter cattle slurry surface applied on a sandy loam soil, will result in as little as 5% of the total nitrogen becoming available to the crop. In comparison, 35% of the total nitrogen would become available if the same application were made in the spring. Incorporating the spring application by ploughing it in would increase the amount recovered in the crop to 40% and injecting it would increase this further to 45%. There is therefore a clear environmental and financial benefit in making more efficient use of the nitrogen available from livestock manure applications.

Default minimum efficiency values have therefore been introduced with the intention of minimising the inefficient use of livestock manure. The default values represent the values that can be achieved if applications are made in the spring using the most efficient methods of application.

If you are not applying livestock manures at the optimal time of year using the most efficient methods of application you may not be able to supply the optimum nitrogen requirement of your crop. This is because the default efficiency value may result in a reduction in the balance of manufactured nitrogen that can be applied. The situations where this is likely to occur have been highlighted in red in Appendix 1

The default minimum efficiency values are set out in the table below. **Note that these values apply to all soil types and all methods of application.**

Type of livestock manure	Percentage content of nitrogen taken up by crop on and from 1st January 2014
Cattle slurry	40%
Pig slurry	50%
Poultry manure or litter	30%
Solid manure	10%

### Appendix 1: Livestock Manures, Typical Standard Values per Manure Type

Farmyard manure (FYM) - Percentage of nitrogen available to next crop following FYM applications (all crops and all soil types)

FYM type	Manure Reference Number	Total N (kg/t)	Dry Matter %	% N available to following crop
Cattle FYM	1	6	25	10
Separated solids from cattle slurry	2	4	40	10
Pig FYM	3	7	25	10
Separated solids from pig slurry	4	5	40	10
Sheep FYM	5	7	25	10
Duck FYM	6	6.5	25	10
Horse FYM	7	7	30	10

Poultry manure – Percentage of nitrogen available to next crop following Poultry Manure applications (use the value in brackets for grassland and winter oilseed rape cropping)

Manure Type	Manure Reference Number	Incorporation time*	Total N (kg/t)	Dry Matter %	Autumn		Winter		Spring	Summer use on Grassland
					August- October	November-January	February -April			
Layer manure	8	Over 24 hrs	19	35	30 (30)	30	30	35	35	35
Layer manure	9	Within 24 hrs	19	35	30 (30)	30	30	40	50	N/A
Broiler/Turkey litter	10	Over 24 hrs	30	60	30 (40)	30	30	30	30	30
Broiler/Turkey litter	11	Within 24 hrs	30	60	30 (35)	30	30	30	40	N/A
					<b>% Nitrogen Available to the Following Crop</b>					

\*These 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.

**Cattle and Dirty Water – Percentage of nitrogen available to next crop following Cattle Slurry and Dirty Water applications (use the value in brackets for grassland and winter oilseed rape cropping)**

Manure Type	Dry Matter %	Ref No.	Incorporation time/method	Total N (kg/t)	Autumn		Winter		Spring	Summer use on Grassland	
					August-October		November-January				Feb - April
					Sands Sandy Loams Shallow	All other soils	Sands Sandy Loams Shallow	All other soils			
<b>% Nitrogen Available to the Following Crop</b>											
Cattle slurry – Surface applied	2	12	Not incorporated	1.6	40	40 (40)	40	40	45	40	
Cattle slurry – Surface applied	6	13	Not incorporated	2.6	40	40 (40)	40	40	40	40	
Cattle slurry – Surface applied	10	14	Not incorporated	3.6	40	40 (40)	40	40	40	40	
Cattle slurry – ploughed in	2	15	Within 6 hrs	1.6	40	40 (40)	40	40	50	N/A	
Cattle slurry – ploughed in	6	16	Within 6 hrs	2.6	40	40 (40)	40	40	40	N/A	
Cattle slurry – ploughed in	10	17	Within 6 hrs	3.6	40	40 (40)	40	40	40	N/A	
Cattle slurry – Band-spread	2	18	Band-spread	1.6	40	40 (40)	40	40	50	40	
Cattle slurry – Band-spread	6	19	Band-spread	2.6	40	40 (40)	40	40	40	40	
Cattle slurry – Band-spread	10	40	Band-spread	3.6	40	40 (40)	40	40	40	40	
Cattle slurry - shallow injected	2	21	Shallow injected	1.6	40	40 (40)	40	40	55	45	
Cattle slurry - shallow injected	6	22	Shallow injected	2.6	40	40 (40)	40	40	45	40	
Cattle slurry - shallow injected	10	23	Shallow injected	3.6	40	40 (40)	40	40	40	40	
Separated - Strainer box	*	24		1.5							
Separated - Weeping wall	*	25	Select from above	2							
Separated - Mechanical	*	26		3							
<b>Dirty Water</b>	<b>0.5</b>	<b>27</b>	<b>Not incorporated</b>	<b>0.5</b>	<b>40</b>	<b>40 (40)</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>40</b>	

\*Use the appropriate values for 2% dry matter cattle slurry

**Pig Slurry – Percentage of nitrogen available to next crop following Pig Slurry applications (use the value in brackets for grassland and winter oilseed rape cropping)**

Manure Type	Dry Matter %	Ref No.	Incorporation time/ method	Total N (kg/t)	Autumn		Winter		Spring	Summer use on Grassland
					August-October		November-January			
					Sands Sandy Loams Shallow	All other soils	Sands Sandy Loams Shallow	All other soils		
<b>% Nitrogen Available to the Following Crop</b>										
Pig slurry – surface applied	2	28	Not incorporated	3.0	50 (50)	50	50	55	55	55
Pig slurry – surface applied	4	29	Not incorporated	3.6	50 (50)	50	50	50	50	50
Pig slurry – surface applied	6	30	Not incorporated	4.4	50 (50)	50	50	50	50	50
<b>Pig slurry – ploughed in</b>	<b>2</b>	<b>31</b>	<b>Within 6 hrs</b>	<b>3.0</b>	<b>50 (50)</b>	<b>50</b>	<b>50</b>	<b>65</b>	<b>65</b>	<b>N/A</b>
<b>Pig slurry – ploughed in</b>	<b>4</b>	<b>32</b>	<b>Within 6 hrs</b>	<b>3.6</b>	<b>50 (50)</b>	<b>50</b>	<b>50</b>	<b>60</b>	<b>60</b>	<b>N/A</b>
<b>Pig slurry – ploughed in</b>	<b>6</b>	<b>33</b>	<b>Within 6 hrs</b>	<b>4.4</b>	<b>50 (50)</b>	<b>50</b>	<b>50</b>	<b>55</b>	<b>55</b>	<b>N/A</b>
Pig slurry – Band-spread	2	34	Band-spread	3.0	50 (50)	50	50	60	60	60
Pig slurry – Band-spread	4	35	Band-spread	3.6	50 (50)	50	50	55	55	55
Pig slurry – Band-spread	6	36	Band-spread	4.4	50 (50)	50	50	50	50	50
<b>Pig slurry - shallow injected</b>	<b>2</b>	<b>37</b>	<b>Shallow injected</b>	<b>3.0</b>	<b>50 (50)</b>	<b>50</b>	<b>50</b>	<b>65</b>	<b>65</b>	<b>65</b>
<b>Pig slurry - shallow injected</b>	<b>4</b>	<b>38</b>	<b>Shallow injected</b>	<b>3.6</b>	<b>50 (50)</b>	<b>50</b>	<b>50</b>	<b>60</b>	<b>60</b>	<b>60</b>
<b>Pig slurry - shallow injected</b>	<b>6</b>	<b>39</b>	<b>Shallow injected</b>	<b>4.4</b>	<b>50 (50)</b>	<b>50</b>	<b>50</b>	<b>55</b>	<b>55</b>	<b>55</b>
Mechanical separator	**	40	Select from above	3.6						

\*\*Use the appropriate value for 2% dry matter pig slurry

## Protocol for Sampling Slurry and Solid Manure for Analysis

### Why correct sampling matters

The nutrient content of slurry can vary considerably within a store due to settlement and crusting. Similarly, the composition of solid manure in a heap can vary depending on the amount of bedding and losses of nutrients during storage.

It is important that the sample taken represents an 'average' of what is found in the store or heap.

### General principles of sampling

It is important, where this is practical and safe, to take a number of samples. **If you are unable to take such samples safely you will need to use standard values for manure nutrient content.**

Take samples from a range of positions within the store or heap, bulk them together, mix them and then take a representative sub-sample.

The final sample can be sent to the laboratory for total nitrogen analysis. It would be advisable to obtain other analyses at the same time in order to make best use of manures and save you money on fertiliser costs.

### Slurries

You must take at least five sub-samples of 2 litres. Pour into a larger container, stir thoroughly and pour a 2 litre sample immediately into a smaller clean container to provide the sample for analysis.

#### Above-ground stores

Ideally, slurry should be fully agitated and sub-samples taken from the reception pit. If this is not possible, **and provided there is safe access from an operator's platform**, the five sub-samples can be taken at a range of positions, using a weighted 2 litre container attached to a rope.

#### Below-ground pits

It may be possible to obtain sub-samples at various positions using a weighted container as above, but **never enter the pit**, as lethal gases may be present. **Do not attempt to take samples during or soon after slurry agitation** as large amounts of lethal gases may be released from the stirred slurry.

#### Earth-banked lagoons

If the slurry has been well agitated, sub-samples can be obtained from the tanker or irrigator as outlined below. **Do not attempt to sample direct from the lagoon** unless there is an operator's secure platform that provides safe access.

#### Sampling while spreading

If the tanker is fitted with a suitable valve, it may be possible to take five sub-samples from the stationary slurry tanker at intervals while field spreading is in progress. Or, trays placed in the field can be used to collect samples while the material is being spread.

## Solid manures

You must take at least 10 sub-samples of 1 kg each, taken as described below, and place on a clean, dry tray or sheet. Break up any lumps and thoroughly mix the sample. Then take a representative sample of around 2 kg for analysis (you should check the weight required with the laboratory).

### Manure heaps

Provided the manure is **dry and safe to walk on**, identify at least ten locations which appear to be representative of the heap. Having cleared away any weathered material with a spade or fork, dig a hole approx. 0.5m deep and take a 1 kg sample from each point. Alternatively, take sub-samples from the face of the heap at various stages during spreading.

### Pig and poultry manure heaps only

For permanently housed pig and poultry enterprises that **only produce solid manures**, you may wish to provide samples to check compliance with the Livestock Manure N Farm Limit in Nitrate Vulnerable Zones. You must provide 4 samples for analysis in a calendar year (one in each quarter) by following the advice for manure heaps, but the manure heaps must not be more than 12 months old.

### Weeping-wall stores

Do not attempt to take samples before the store is emptied as it is **not safe to walk on the surface of the stored material**. Sub-samples may be taken from the face of the heap once emptying has commenced.

### Sampling during spreading

Trays placed in the field can be used to collect samples while the material is being spread. **Take care to avoid the possibility of injury** from stones and other objects which may be flung out by the spreading mechanism.

## Storage and analysis

Slurry samples sent to a laboratory for analysis should be dispatched in clean screw-topped 2 litre plastic containers. Leave at least 5 cm of airspace to allow the sample to be shaken in the laboratory. For solid manures, use 500-gauge polythene bags and expel excess air from the bag before sealing.

Clearly label the samples on the outside of the container or bag and dispatch them immediately or within a maximum of seven days if kept in a refrigerator.