National Farm Survey of Manure Application and Storage Practices on Irish Farms

Thia Hennessy, Cathal Buckley, Michael Cushion,

Anne Kinsella and Brian Moran

Published

June 2011

teagasc

AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

The Irish Agriculture and Food Development Authority

ACKNOWLEDGEMENTS

The authors wish to thank all who contributed to this survey - the farmers who participate voluntarily, the Central Statistics Office who select the sample and provide the population weights. Grateful acknowledgement is due to the Teagasc research staff involved in the collection and validation of the farm data: P. Bryce, P.J. Burke, M. Corcoran, M. Cushion, L. Deane, L. Delaney, P. Harnett, P. Hayes, P. Healy, P. Madden, E. McGrath, J. McWeeney, M. Nicholson, J. Robinson, J. Teehan, G. Quinlan and to M. Moloney for the administration of the survey. Thanks are also due to Mark Gibson, Stan Lalor, Ger Shortle and David Wall for their input into the development of the questionnaire and their comments on the final report.

Table of Contents **Page**

1. Introduction

The EU Nitrates Directive (91/676/EEC) was introduced in 1991 with the objective of reducing water pollution caused or induced by nitrates from agriculture and preventing further such pollution, with the primary emphasis being on the management of livestock manures and other fertilisers.

The Nitrates Directive requires Member States to:

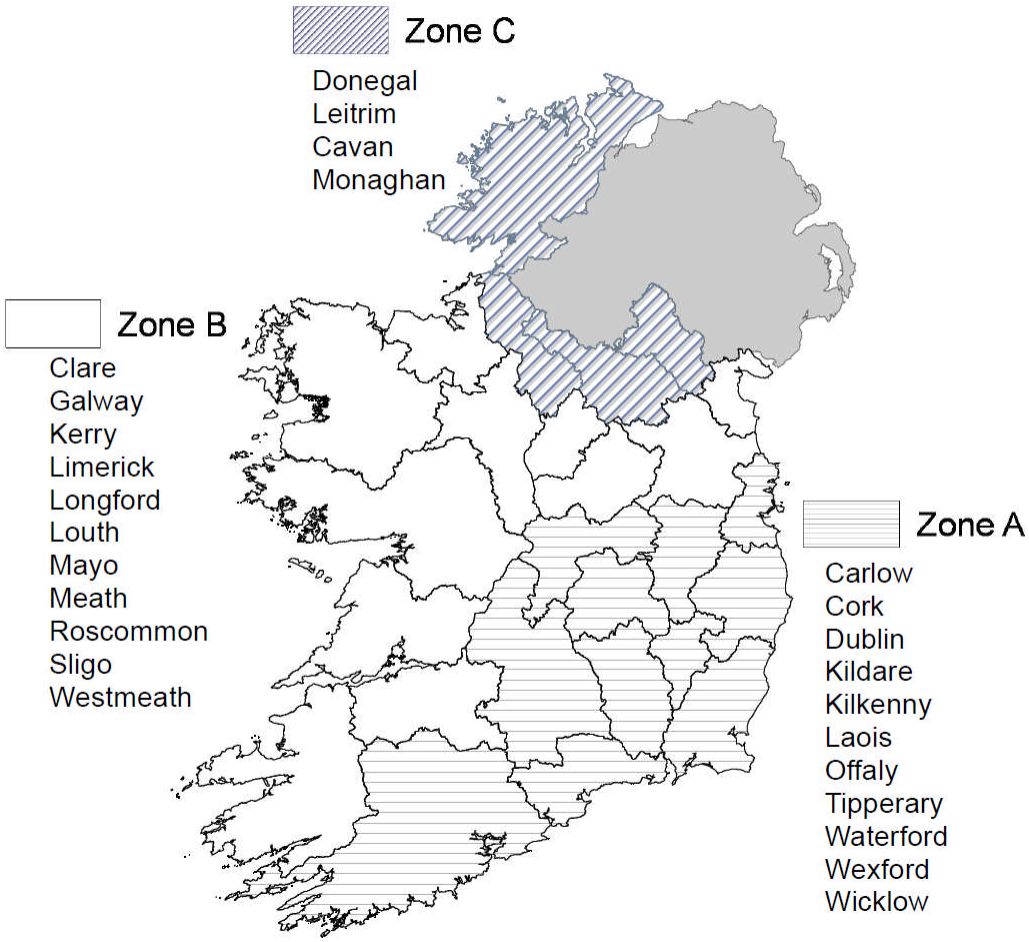
- monitor and identify waters which are polluted or are liable to pollution by nitrates from agriculture
- establish a code of good agricultural practice to protect waters from such pollution
- promote the application of a code of good agricultural practice by farmers
- designate areas to which an action programme should be applied to protect waters from pollution by nitrates from agriculture
- develop and implement action programmes to reduce and prevent such pollution in the designated areas
- monitor the effectiveness of the action programme
- report to the EU Commission on progress.

In 2003 Teagasc, in conjunction with the Department of Agriculture, Fisheries and Food (DAFF), conducted a national Farm Facilities Survey (Hyde et al., 2003). The objective of this survey was to establish the baseline position in relation to the situation on farm facilities and managements relating to manure, dirty water and fodder systems. In 2010 Teagasc was approached by DAFF and requested to conduct an update of this initial review so that developments in relation to facilities and management practices could be recorded. Specifically this additional survey was to focus on slurry spreading and storage practices on farms. The ensuing report summarises the main results of the 2010 survey.

2. Contextual Background

The National Action Programme under the Nitrates Directive was implemented on a whole territory basis in Ireland and the national territory was sub-divided into three zones (groups of counties) by reference mainly to soil type, rainfall and length of growing season. The zones are outlined in Figure 1 below.

Figure 1: Zone designations



Regulations giving statutory effect to certain elements of Ireland's first National Action Programme were first enacted in 2005. Ireland's second National Action Programme is implemented at national level through statutory instrument No. 610 of 2010, Good Agricultural Practice for Protection of Waters (GAP) Regulations (Minister for the Environment, Heritage and Local Government, 2010). The GAP Regulations encompass rules on slurry storage capacity, application of inorganic and organic fertilisers, livestock stocking densities and farm facilities. Under the GAP

Regulations storage capacity on farm holdings across all zones must be sufficient for the full housing period and should provide an adequate level of storage for difficult years.

The following minimum storage capacity for bovine livestock manure are set down:

- 16 weeks in Zones A
- 18 weeks in Zone B, and
- 20 or 22[1] weeks in Zone C.

The periods during which the application of organic fertiliser are prohibited (both dates inclusive) are outlined in Table 1 below.

Table 1: Prohibition periods for spreading organic fertilisers

Zone	All Organic Fertilisers Excluding Farmyard Manure	Farmyard Manure
A	15 Oct. to 12 Jan.	1 Nov. to 12 Jan.
B	15 Oct. to 15 Jan	1 Nov. to 15 Jan.
C	15 Oct. to 31 Jan.	1 Nov. to 31 Jan.

Greater details of these Regulations are contained in Appendix 1.

[1] Recognising the high water quality in counties Donegal and Leitrim and the lower intensity of agricultural production, the required minimum storage period was set at 20 weeks. The minimum storage period for counties Cavan and Monaghan was designated at 22 weeks

3. Materials and Methods

The National Farm Survey (NFS) conducts an annual survey of a randomly selected sample of approximately 1,100 farms. The sample is selected to be nationally representative of the farming population. In 2009 the sample of 1,029 farms represented a population of 102,270 farms. Each farm surveyed is assigned a national aggregation factor allowing the sample to be aggregated to reflect the total population of farms. The NFS is a member of the Farm Accountancy Data Network (FADN) of the EU, a network of similar surveys conducted across the European Union.[2] The NFS collects detailed information on the farm business. Interviews are undertaken on site by a team of trained NFS recorders. For this survey of manure application and storage practices instructions were provided (see appendix 2 and 3 for questionnaire and survey instructions) to ensure a standardised approach was adopted to data collection. Where possible, comparisons are drawn between the results of the 2003 farm facilities survey and this research. However, it should be noted that sample selection between the two surveys is different so direct comparisons cannot be regarded as statistically robust.

The survey on slurry storage and spreading practices was conducted in the autumn of 2010 but the data recorded pertains to the 2009 year. Data was recorded on a sub-sample of the full NFS sample. In total 878 completed questionnaires were returned and analysed. This sample was weighted to reflect a population of approximately 96,000 farms. Table 2 presents details of the sample by system of farm. The system titles refer to the predominant enterprise in each group. Dairy farms include all farms in the sample that have a dairy enterprise and deliver milk for sale. Cattle farms refer to farms where the predominant enterprise is a cattle rearing or fattening one and on these farms it is possible that there are other enterprises, such as sheep or tillage. Likewise the sheep and tillage systems include farms where the predominant enterprise is sheep and crops respectively.

[2] The Farm Accountancy Data Network, established in 1965, is a data analysis tool designed to evaluate the income of agricultural holdings or farms across the EU. FADN consists of a network of data collection agencies in each Member State that are responsible for collecting the harmonised farm data.

Table 2: Details of the sample by farm system

	Dairy	Cattle	Sheep	Tillage	Total
Sample Numbers	292	411	106	69	878
Population Represented	20,012	53,750	16,369	5,949	96,081

Source: National Farm Survey (2010)

Table 2 shows the sample numbers and population size of each farm system. It should be noted that the NFS does not record data on pigs or poultry farms.

The survey representation in the various zones is presented in Table 3. Approximately 42 percent of the population is in Zone A with the same proportion in Zone B. Only 16 percent of the population is in Zone C. Zone A has the highest proportion of dairy and tillage farms, while Zone C has the highest proportion of sheep farms. Cattle farming is the predominant system in all zones.

Table 3: Details of the sample by zone

	Zone A	Zone B	Zone C
Sample Numbers	452	310	116
Population *(%)*	40,604 *(42)*	40,487 *(42)*	14,990 *(16)*
Farm System Composition of Zones			
Dairy (%)	32	17	15
Cattle (%)	46	65	56
Sheep (%)	8	17	28
Tillage (%)	14	2	1

While the survey does not specifically record data on the quantities of slurry stored on the farm and spread, it is possible to estimate the total quantity of storage required by using data on the type and number of animals on the farm over the closed period for the application of organic manure on land. The quantity of slurry stored on each farm was estimated by applying the weekly slurry storage capacity requirements per animal type as specified in the Good Agricultural Practice Regulations (Table 29 in Appendix 1) to the number of animals on each farm over the duration of the closed period as recorded by the National Farm Survey. Animal numbers were taken as the total number of cattle and sheep on the farm on December 31st in 2009. This provides an estimate of the weekly storage requirements for each farm for the length of the relevant closed period. Under the Good Agricultural Practice Regulations, each farm must have a minimum storage capacity depending on the zone they are located in (16 weeks in Zone A, 18 weeks in

Zone B and 20 or 22 weeks in Zone C)[3]. The total storage requirement for each farm was estimated by applying the zone requirements to the weekly requirements, as estimated by animal numbers. This estimate of the total storage requirement per farm is used as a proxy for the total amount of slurry stored on the farm throughout the closed period. It is possible that some farms have a storage deficit, as confirmed in the 2003 study, or that others have more than the minimum requirement. As the actual storage capacity of a farm was not included in the survey, it is not possible to determine the magnitude of storage surpluses or deficits. As such the methodology described here provides the closest possible estimate of storage requirement. It's assumed that all manure is stored as slurry and not farm yard manure which generally includes a straw component and is difficult to quantify.

Table 4 presents estimates of the total quantities of slurry storage required by zone and system of farming; the results are weighted to reflect the full population of farms.[4]

Table 4: Estimate of total quantities of slurry storage required ('000s cubic meters) by farm system and zone*

	Zone A	Zone B	Zone C	Total
Dairy	5,305	3,351	949	9,605
Cattle	3,091	4,644	1,274	9,008
Sheep	536	896	346	1,779
Tillage	563	185	30	778
Total	9,496	9,076	2,598	21,170

** Figures may not sum exactly as they are rounded*

As can be seen dairy and cattle farms account for relatively equal quantities of required slurry storage capacity and together account for over 90 percent of all slurry. The estimates of slurry stored on sheep and tillage farms relate to the number of livestock on these farms in December 2009. The estimated quantities of slurry stored in Zones A and B are broadly similar with Zone C accounting for only 12 percent of the national quantity of slurry. The majority of slurry in Zone A comes from dairy farms, 56 percent, while the majority in Zone B comes from cattle farms, 51 percent.

[3] Some farmers are exempt from the minimum requirement if they are out-wintering livestock. See appendix 1 for more details.

[4] As there were some missing variables in the data it was only possible to estimate the quantity variable for 850 sample farms or a weighted population of 92,431 farms.

4. Overview of Survey Results

1. 87 percent of all farms produced and spread slurry and/or farmyard manure in 2009. Half of all farms applied a combination of both slurry and FYM in 2009.
2. In the vast majority of cases where a combination of both slurry and FYM was applied, slurry constituted over half of the total application.
3. Half of all sheep farms and 45 percent of tillage farms applied only FYM in 2009.
4. Across all farm systems approximately 60 percent of total slurry is applied to conservation ground (hay/silage), 37 percent to grazing land with the remaining 3 percent applied to maize or tillage crops.
5. Of farms applying organic manure to tillage crops almost 98 per cent used ploughing as the method of incorporation. 65 per cent of this cohort had a timing of incorporation greater than 48 hours after organic manure application.
6. 52 percent of all slurry was applied between the end of the closed period in January and April 30th. A further 36 percent, in total volume terms, was spread during 1st May and July 31st and 12 percent was applied between August 1st and October 15th.
7. The majority (50 percent) of FYM was spread between August 1st and the start of the close of the spreading period on November 1st.
8. Slurry application by tanker with a splashplate was the principle method across 97 percent of all relevant farms. However, 6 percent or dairy farms used the trailing shoe method.
9. A total of 57 percent of farms with farmyard manure used a side discharge rotary system for application. A further 27 percent used a rear discharge system.
10. Approximately one-third of all farmers used a contractor to spread all of their slurry and/or farmyard manure and further one-third used a contractor for partial application.
11. 4 percent of all farmers imported slurry and/or farmyard manure and 1 percent exported slurry and/or farmyard manure. Of those importing, three-quarters reported importing pig slurry.
12. Tillage farm systems are the most likely to be importing, almost 20 percent of tillage farmers reported importing organic fertilisers in 2009.
13. It is estimated that 652,000 tonnes of slurry and 25,500 tonnes of farm yard manure were imported by farmers in 2009. The vast majority of this was pig slurry; the survey only records this slurry as imports as there is no information collected on the exporting practices of pig or poultry farms.

14. It is estimated that dairy, cattle and sheep farms exported 260,000 tonnes of slurry and 10,000 tonnes of farm yard manure in 2009. The survey did not collect data on pig or poultry farms.
15. One-third of all farms have no storage facilities for soiled water on their farms. These farms are predominately sheep and tillage farms and therefore are less likely to produce soiled water.
16. 4 percent of dairy farms have no storage facilities for soiled water. However, the average herd size for this cohort was 12 cows.
17. 96 percent of all soiled water is applied to land by a vacuum tanker (contractor or farmer).
18. 46 percent of farmers used a contractor for soil water application to land.

5. Slurry and Farm Yard Manure

Farmers participating in the survey were questioned about their slurry and farm yard manure application practices. The survey included detail on the quantities applied, the time of application, crop types used for application as well as the method of application. The following sections of the report summarise the main findings in relation to these questions.

5.1 Production and application of slurry and farm yard manure

Farmers in the survey were initially questioned about whether they had produced and/or spread slurry or solid farm yard manure (FYM) in 2009. For the purposes of the survey the Nitrates Regulations definition of slurry was used. Slurry is defined as excreta produced by livestock while in a building or yard and a mixture of excreta with rainwater, washings or other extraneous material or any combination of these, of a consistency that allows it to be pumped or discharged by gravity at any stage in the handling process but does not include soiled water. Farm yard manure is defined as a mixture of bedding material and animal excreta in solid form arising from the housing of cattle, sheep and other livestock excluding poultry.

Table 5 presents the percentage of farms by system producing and applying slurry or FYM in 2009.

Table 5: Percentage of farms producing and applying slurry and/or Farm Yard Manure

	Dairy (%)	Cattle (%)	Sheep (%)	Tillage (%)	All (%)
Produced and applied	98	89	74	60	87
None produced some applied	0	0	0	2	1
Produced but not applied	0	1	12	0	2
None produced or applied	2*	10	14	38	10

* Relate to very small dairy farms with an average herd size of 12 cows.

The vast majority of farms, 87 percent of all farms, produce and apply slurry or FYM. As expected almost all dairy farms (98 percent) and a significant proportion of cattle farms (89 percent) produce and spread slurry or FYM. The rates are lower, although still large, for sheep and tillage farms. It should be borne in mind that a large number of specialist tillage farms also have a livestock enterprise.

Less than 1 percent of farms apply but do not produce slurry or FYM and these are almost entirely tillage farms. Just 2 percent of all farms in the population surveyed produced slurry or FYM but did not apply it in 2009. This may be because it is exported or because it is still held in inventory at the end of the year. It should be noted that the survey does not include the pigs and poultry sector and these are the farm systems that are most likely to be exporting slurry.

Almost 10 percent of farms report that they did not produce or spread slurry and/or FYM in 2009. As expected, this is most common for tillage farms however a significant number of cattle farms are also in this position. A total of 38 percent of tillage farms reported not producing of spreading manure, however, it should be noted that two-third of this cohorts have no livestock and the remaining one-third averaged 12 livestock units. Cattle farms engaged in summer grazing enterprises are less likely to produce slurry and FYM, additionally a cohort of extensive livestock farms are out-wintering their livestock as allowed under the Regulations (see appendix 1).

Table 6 presents estimates of the total quantity of slurry stored on farms that indicated that they produced slurry. The estimates are based on the required slurry storage capacity on each farm using the methodology outlined in section 3 above. It should be noted that these quantities should only be interpreted as a proxy for the actual quantity of slurry stored as outlined in section 3. The results in this table differ slightly from the quantities presented in Table 4 above as Table 6 presents results for the farms that indicated that they produced and stored slurry. Relatively similar amounts of total slurry are stored in Zones A (45 percent) and B (42 percent), with Zone C accounting for just 13 percent of all slurry stored.

Table 6: Estimates of slurry stored on farms ('000s cubic meters) by farm system and zone*

	Zone A	Zone B	Zone C	Total
Dairy	5,251	3,351	948	9,551
Cattle	3,044	4,387	1,267	8,698
Sheep	528	815	338	1,681
Tillage	555	185	30	769
Total	9378	8,739	2,583	20,699

** Figures may not sum exactly as they are rounded*

In the survey farmers were asked to specify the proportions of their total manures which were spread as either slurry or FYM. Table 7 shows the distribution of slurry and FYM and application patterns across farm systems.

Table 7: Distribution of slurry and FYM and application patterns across farm systems: (Percentage of farms)

	Dairy (%)	**Cattle (%)**	**Sheep (%)**	**Tillage (%)**	**All (%)**
Spreading only Slurry	14	34	19	12	26
Spreading only FYM	9	22	50	45	24
Spreading slurry and FYM	77	44	31	43	50
*Percentage of Farms Spreading slurry and FYM**					
>50% of total spread is slurry	*97*	*95*	*93*	*79*	*95*
>50% of total spread is FYM	*3*	*5*	*7*	*21*	*5*

*Figures below only relate to farms spreading slurry and FYM

Half of all farms applied both slurry and FYM in 2009. This practice was more common on dairy farms where over three quarters of all dairy farms applied both slurry and FYM. In the vast majority of cases where both slurry and FYM was applied, slurry constituted over half of the total application. Almost half of all sheep and tillage farms applied only FYM in 2009. These farm systems are more likely to have less winter housing requirements and have greater access to straw for bedding respectively.

The percentage of farms applying slurry and FYM is presented by zone in Table 8. The spreading of only slurry is more common in Zones B and C (35 percent of farms) than in Zone A, where only 13 percent of farms are spreading exclusively slurry. There is no particular pattern in the exclusive application of FYM with about a quarter of farms in all three zones applying only FYM.

Table 8: Percentage of farms and composition of the application by Zone

	Zone A	Zone B	Zone C	All
Spreading Only Slurry	13	35	35	26
Spreading only FYM	25	22	21	24
Spreading slurry and FYM	62	43	44	50
Percentage of Farms Spreading slurry and FYM				
>50% of total spread is slurry	*92*	*98*	*96*	*95*
>50% of total spread is FYM	*8*	*2*	*4*	*5*

5.2 Analysis of application patterns –crop types

According to the survey, nearly 90 percent of the farming population apply either slurry or FYM on their farms. Information on the crop types used for the application of slurry and FYM on these farms was also collected. Farmers were asked to specify the total percentage of their slurry and FYM application spread on four crop types: grazing land, land for hay or silage, maize and other tillage crops. These results can be reported as the percentage of farmers applying manure to each crop (see Table 11) or in relation to slurry, these results can be weighted to reflect the number and type of livestock on each farm. The data in Table 9 provides estimates of the share of the total quantities of slurry applied to various crop types. These estimates are based on the estimated quantities stored on each farm (as set out in Table 6) and the percentage application rate to various crop types provided by farmers in the survey.

Table 9: Estimated percentage share of the total quantities of slurry applied to various crop types by farm system

	Grazing	Hay/Silage	Maize	Tillage
Dairy	37	60	2	1
Cattle	36	63	0	1
Sheep	34	66	0	0
Tillage	42	33	6	19
All Farms	37	60	2	1

The majority of slurry (60 percent) was applied to grassland for hay and/or silage conservation. Application to grass for grazing was the second most common with 37 percent of all slurry being applied to this land use. Only tillage farms apply a

significant amount of slurry to tillage land. About 19 percent of all slurry stored on tillage farms is applied to tillage crops. But only about 1 percent of all slurry is applied to tillage crops across all farm systems. The proportion applied to maize land is also low at just 2 percent.

Table 10 also presents estimates of slurry applied to various crop types but this data is disaggregated by zones rather than farm system. Across the three zones the majority of slurry is again applied to grassland for hay and silage. However, the majority is slightly smaller in Zone A, where 58 percent of slurry is applied to hay and silage land compared to 65 percent in zone C and 60 percent nationally.

Table 10: Estimated percentage of slurry applied to various crop types by zone

	Grazing	Hay/Silage	Maize	Tillage
Zone A	38	58	2	2
Zone B	36	61	2	0
Zone C	34	65	1	0
Nationally	37	60	2	1

The 2003 survey also recorded information on the land types used for slurry application. A comparison between the 2003 survey and the average percentages reported by farmers in the 2009 survey reveals that applications to hay and silage land has decreased. In 2003 just over 80 percent of the slurry applications was to hay and silage land. By 2009 this had decreased to 60 percent and the practice of applying slurry to grazing land has increased. This suggests there has been a redistribution of slurry away from hay and silage conservation ground towards grazing land as outlined by Table 11 below. 37 percent of slurry was reported as being applied to grazing land in 2009 compared to 16 per cent in 2003.

Table 11: Crop types used for slurry application: mean percentage values for 2003 and 2009

	2003 (% of slurry)	2009* (% of slurry)
Hay & Silage	81	61
Grazing	16	37
Maize	2	1
Other Tillage	1	1

** Note these figures differ to those reported for all farms in Table 9 as the Table 9 figures are based on estimated quantities of slurry on the farm*

Table 12 shows the percentage application of FYM to the various crop types. Unlike slurry applications, it is more common for FYM to be applied to grazing land than land for hay or silage. On average across all farm systems about two-thirds of FYM is applied to grazing land, a further 20 percent is applied to grassland for hay and silage conservation with the remaining 10 percent being applied to tillage crops. Only tillage farmers apply a significant proportion of their FYM to tillage crops.

Table 12: Crop types used for FYM: mean percentage values

	Dairy	Cattle	Sheep	Tillage	All
	Percentage of FYM				
Grazing	70	69	77	27	67
Hay & Silage	27	29	21	6	22
Maize	2	0	0	3	1
Other Tillage	1	2	2	64	9

Farmers applying organic fertilisers to tillage crops were questioned on their method and timing of incorporation. Only 128 farmers (equivalent to 9 percent of the total population) provided a response to this question. In terms of organic fertilisers spread on tillage ground about 20 percent of farmers had incorporated organic fertilisers within 24 hours or less or spreading, about 15 percent within 24 to 48 hours while the remaining 65 percent had a timing of incorporation of over 48 hours. The main method of incorporation was ploughing as almost 98 percent used this as their main method, about 2 percent used tilling or disking while only 1 percent used injection.

5.3 Analysis of application patterns – timing of applications

Farmers were also asked about the timing of slurry and FYM application. The year was broken up into three periods: period 1 (end of closed season[5] to April 30th), period 2 (May 1st to July 31st) and period 3 (August 1st to the start of the closed period[6]). The proportion of slurry and FYM applied in the different periods was recorded as a percentage of the total spread on the farm for the year. Table 13 presents estimates of the percentages of the total slurry applied in the various spreading seasons by farm system, while Table 14 displays the data by zone.

Table 13: Estimated percentage of total slurry applied in various periods by farm system

	Close to April 30th	May 1st to July 31st	August 1st to Close
Dairy	52	35	13
Cattle	52	39	9
Sheep	48	36	16
Tillage	62	18	20
All Farms	52	36	12

52 percent of all slurry is applied in the first period, 36 percent in the second and 12 percent in the third. Tillage farms were applying a higher percentage of total slurry in the first period (62 percent) compared to the national average but overall the application profile is relatively uniform across the various farm systems as seen from Table 13.

Table 14 reveals that there is a similar pattern across zones in relation to the timing of slurry application. The majority of slurry is applied in the first period across all zones, 49 to 52 percent. The 2003 survey found that the majority of slurry was applied in the spring (35%) and summer (44%). This suggests that there has been a move toward greater application of slurry in the early season in line with best practice for maximum nitrogen recovery from slurry and overall optimum nutrient use efficiency.

[5] The closed period where it is prohibited to spread slurry on land finishes for Zone A on January 12th, January 15th for Zone B and January 31st for Zone C.
[6] Closed period for slurry begins on October 15th and for FYM on November 1st across all zones.

Table 14: Estimated percentage of total slurry applied in various periods by zone

	Close to April 30th	May 1st to July 31st	August 1st to Close
Zone A	52	35	14
Zone B	53	36	11
Zone C	49	43	8
National	52	36	12

Table 15 shows the typical timing of FYM applications. Data on the quantities of FYM applied is not available and instead the percentage of the total application spread in the different periods, as reported by the farmer, is presented in Table 15. Hence the results in Table 15 do not allow for differences in scale across farms. Unlike slurry spreading, the majority of FYM is spread in the last period, i.e. from August 1st to the start of the closed period. Typically over 50 percent of FYM is spread during this period. This pattern is consistent across all farm systems.

Table 15: Average timing of farm yard manure spreading

	Dairy	Cattle	Sheep	Tillage	All
	Percentage of FYM				
Close to April 30	27	42	30	40	35
1 May to 31 July	14	15	23	10	15
1 August to close	59	43	47	50	50

5.4 Methods of Application

Details of the percentage of slurry applied by different mechanical methods were recorded in the survey. First farmers were asked whether they used a tanker or umbilical system for spreading slurry. Then they were asked about the type of spreading mechanism applied to the tanker or umbilical system. The mechanisms included in the survey were: splashplate, bandspreader, trailing shoe, shallow injection (less than 10 cm deep) or deep injection (more than 10 cm deep). About 76 percent of the sample provided information about the method of slurry application (n=677). Across the sample 99 percent of farms exclusively use a tanker system. The use of umbilical systems is very limited with only 13 farmers out of 677 indicating that they used the system.

Table 16 presents the results on the use of various mechanisms in conjunction with the tanker system. The percentage of farmers using each mechanism, for at least 50 percent of their application, is presented.

Table 16: Slurry application method (tanker system)

	Dairy	**Cattle**	**Sheep**	**Tillage**	**All**
	Percentage of Farms				
Splashplate	93	99	99	97	97
Bandspreader	1	1	0	0	1
Trailing shoe	6	0	1	3	2
Shallow injection	0	0	0	0	0
Deep injection	0	0	0	0	0

Application by tanker with a splashplate is by far the most commonly used system accounting for application on over 97 percent of all farms. The trailing shoe is the second most used system although is only used on 2 percent of farms, most of these are dairy farms. This finding is in keeping with the 2003 survey which found that the preferred slurry application method was the splashplate accounting for 98 percent of the slurry applied.

Data was also collected on the methods used for spreading FYM. Farmers were asked to select the predominant method used from: rear discharge, side discharge (rotary), side discharge (impeller) or any other form. About 70 percent of the sample provided

information about the method of FYM application (n=630). The vast majority of farmers used only one method of application.

Table 17: Farm yard manure application method (Percentage of farms)

	Dairy	Cattle	Sheep	Tillage	All
Side discharge (rotary)	55	60	53	65	57
Rear discharge	35	23	19	27	27
Side discharge (impeller)	2	2	5	0	2
Other	8	15	23	8	14

Table 17 shows the predominant method of farm yard manure application. The side discharge (rotary type) is the most common method, used by 57 percent of all farmers. The rear discharge is the next most common method used on 27 percent of farms. The use of side discharge (impeller types) is limited. Again these results are similar to the 2003 survey, although the use of rear discharge has increased over the period. According to the 2003 survey 80 percent of farmers used the side discharge (rotary type) for FYM applications and only 8 percent used rear discharge.

Details were also recorded in relation to the use of contractors for the application of slurry and FYM. Across all farm types, about one-third of farmers apply all of their slurry using their own machinery, see Table 18. This is most common on dairy farms where almost 50 percent of dairy farms spread all of their slurry using their own machinery. Sheep and tillage farmers are least likely to apply all of their own slurry. About one-third of all farmers use contractors to spread all of their slurry. This is similar to the findings of the 2003 survey which found that 40 percent of farmers use contractors for all slurry application.

Table 18: Use of contractors for application of slurry

	Dairy	Cattle	Sheep	Tillage	All
	Percentage of Farms				
All contractor	30	43	26	10	36
Some contractor	25	31	63	66	27
All farmers' own machinery	45	26	11	24	37

As can be seen in Table 19 the patterns of contractor use are similar for FYM. About one-third of farmers use contractors for all of their applications

Table 19: Use of contractors for application of FYM

	Dairy	**Cattle**	**Sheep**	**Tillage**	**All**
	Percentage of Farms				
All contractor	46	25	30	14	30
Some contractor	16	41	40	45	36
All farmers' own machinery	38	34	30	41	34

6. Importing and exporting of organic fertilisers

Farmers were asked whether they imported or exported slurry or farm yard manure on their farms. Pig slurry and poultry manure are the main manure types that are normally imported and/or exported by farmers.

Table 20: Importing and exporting of organic fertilisers by farm system (Percentage of farms)

	Dairy (%)	Cattle (%)	Sheep (%)	Tillage (%)	All (%)
None	94	96	96	81	95
Imported	2	3	1	19	4
Exported	4	1	3	0	1

The vast majority of farmers neither import nor export organic fertilisers. As can be seen only 4 percent of all farmers import slurry or farmyard manure and just 1 percent export it. The tillage farm system are the most likely to be importing, almost 20 percent of tillage farmers (1,124 farms nationally weighted) report that they imported organic fertilisers in 2009.

Pig slurry is the most common type of organic fertiliser to be imported. Of the 878 farmers interviewed for the survey 43 reported importing organic fertilisers in 2009, this is the equivalent of about 4 percent of the weighted population. Of these farms, 72 percent had imported pig slurry in 2009, 20 percent had imported cattle slurry while the remaining 8 percent had imported poultry manure. From this survey it is estimated that 652,000 tonnes of slurry and 25,500 tonnes of farm yard manure were imported by farmers nationally in 2009. However, it should be noted that pig and poultry production systems are concentrated in the north-east and border counties and the spatial distribution of slurry exports is likely to reflect this, hence, the quantities imported are likely to be under reported in this survey due to this spatial effect.

In terms of quantities exported from farmers participating in the survey it is estimated that 260,000 tonnes of slurry and 10,000 tonnes of farm yard manure were exported in 2009.

Table 21: Percentage of farms importing and exporting organic fertilisers by zone

	Zone A (%)	Zone B (%)	Zone C (%)	All (%)
None	92	97	95	95
Imported	4	3	2	4
Exported	4	0	3	1

The data on importing and exporting of organic fertilisers is presented for the various zones in Table 21. As can be seen importing and exporting is slightly more common in Zone A than the other two zones. Approximately 4 percent of farms in Zone A imported and exported organic fertilisers. Nationally, 4 per cent of farms indicated importing and 1 per reported exporting.

7. Soiled Water

The most common sources of soiled water on farms are milking parlour washings and water coming from dirty yards/collection yards. For the purposes of the Nitrates Regulations "soiled water" is defined as including water from concreted areas, hard standing areas, holding areas for livestock and other farmyard areas where such water is contaminated by contact with any of the following substances:

(i) livestock faeces or urine or silage effluent,
(ii) chemical fertilisers,
(iii) washings such as vegetable washings, milking parlour washings or washings from mushroom houses,
(iv) water used in washing farm equipment

The definition of "soiled water" does not include any liquid where such liquid has either, (a) a biochemical oxygen demand exceeding 2,500 mg per litre, or (b) a dry matter content exceeding 1% (10 g/L).

7.1 Storage of Soiled Water

Farmers participating in the survey were asked to specify their main forms of storage for soiled water and the proportion of water being stored in each type. Table 22 presents an overview of soiled water storage facilities on farms.

Table 22: Soiled Water Storage Facilities: (Percentage of farms)

	Dairy (%)	Cattle (%)	Sheep (%)	Tillage (%)	All (%)
No soiled water storage	4	34	49	54	33
One type of storage	79	62	50	41	60
More than one type of storage	17	4	1	5	7

One-third of all farms have no storage facilities for soiled water on their farms. As can be seen this is most common on tillage and sheep farms. Although one-third of cattle farmers do not have soiled water storage facilities either. However, it should be noted that these farm systems are potentially less likely to require soiled water storage under the definition in the Regulations.

Only 4 percent of dairy farms have no storage facilities for soiled water. Further examination of the dairy farms without soiled water storage reveals that they are typically very small dairy farms, with an average herd size of just 12 cows. The vast majority of farms have just one type of water storage facility with only 7 percent of all farms recorded as having more than one type of water storage.

While some farms have no storage facilities, as they may not require storage, and others have more than one type of water storage facility, Table 23 presents data on the predominant type of soiled water storage on farms that are reported as having storage.

Table 23: Soiled Water Storage Facilities: (Percentage of farms)

	Dairy	Cattle	Sheep	Tillage	All
	%				
Soiled Water Tank	56	20	27	55	33
Slurry Tank	35	68	67	33	57
Silage Effluent Tank	4	8	5	12	6
Lined Lagoon	3	2	0	0	2
Unlined Lagoon	0	1	1	0	1
Reedbed	1	0	0	0	0
Other	1	1	0	0	1

Soiled water tanks and slurry tanks are the most common types of storage followed by silage effluent tanks. The use of the other forms of storage is limited.

The 2003 survey of farm facilities also recorded data on storage facilities for soiled water. The data was reported for dairy farms and non-dairy farms separately. A comparison of the storage facilities on these two groups of farms in 2003 and 2009 is presented in Tables 24 and 25. Farmers were not asked about their use of reedbed storage in the 2003 survey so this is contained in the other category in the Table 24.

Table 24: Soiled water storage facilities on non-dairy farms: 2003 and 2009

	2003 (% of farms)	2009 (% of farms)
Soiled Water Tank	10	15
Slurry Tank	37	38
Silage Effluent Tank	6	6
Lined Lagoon	1	1
Unlined Lagoon	5	1
Other	6	2
None	35	37

In 2003 over one-third of non-dairy farmers (35 percent) had no storage facilities for soiled water. The result was similar in 2009 when 37 percent of farmers reported having no storage facilities. Across the two surveys slurry tanks were the most commonly used forms of soiled water storage on non-dairy farms. Thirty seven percent of farms were recorded as having slurry tanks in 2003 and 38 percent in 2009. The use of lagoons and other facilities was limited in 2003 and had not increased by 2009. The data shows that the use of such alternative facilities actually declined over the period, however this is most likely due to sampling issues as the number in these categories are quite low.

In 2003, 50 percent of dairy farmers used a slurry tank to contain soiled water, this dropped to 36 percent in 2009 as soiled water tanks are more prevalent in the 2009 survey. A total of 56 percent of dairy farmers indicated using a designated soiled water tank in 2009 compared to 17 percent in 2003. The use of unlined lagoons seems to have almost discontinued in 2009 compared to 18 per cent in 2003 as indicated by Table 25. This suggests that dairy farms have invested significantly in soiled water storage structures in the intervening period.

Table 25: Soiled water storage facilities on dairy farms: 2003 and 2009

	2003 (% of farms)	2009 (% of farms)
Soiled water Tank	17	56
Slurry Tank	50	35
Silage Effluent Tank	6	4
Lined Lagoon	3	3
Unlined Lagoon	17	0
Other	7	2

Table 26 presents the data on soiled water storage facilities by zone. As can be seen there is a greater proportion of farms in Zone B without any soiled water storage facilities compared to the national average. Almost two-thirds of farms in Zone B are cattle farms and it is possible that they are of a smaller and less intensive scale than the farms in Zone A and may not require soiled water storage under the definition of the Regulations. Only 20 percent of farms report having no storage facility in Zone C compared to 32 percent nationally.

Table 26: Soiled water storage facilities on farms by zone: (Percentage of farms)

	Zone A (%)	Zone B (%)	Zone C (%)	All (%)
No storage facility	30	40	20	33
One form of water storage	63	53	72	60
Two forms of water storage	7	7	8	7

7.2 Spreading of Soiled Water

Farmers that had stored some soiled water in 2009 were questioned on the methods they used to spread the soiled water. About two thirds of farmers spread soiled water in 2009. Generally there are two main systems of spreading soiled water: (i) with a tractor and vacuum tanker or (ii) the water is pumped via a hose to the field where it is spread using a sprinkler or self travelling irrigator. Table 27 presents the predominant types of soiled water spreading methods used by the two thirds of farmers that engaged in spreading.

Table 27: Soiled water spreading methods

	Dairy	Cattle	Sheep	Tillage	All
	% of farms				
Own vacuum tanker	71	40	35	80	50
Contractor tanker	24	56	63	18	46
Pump & flow	0	1	0	0	1
Pump & sprinkler	3	0	0	0	1
Pump & self travel	1	0	0	0	0
Other	1	3	2	2	2

The majority of farmers use their own vacuum tanker or a contractor tanker to spread their soiled water. The use of other methods is limited. Just 2 percent of farms use some form of a pumped method. Data was collected on soiled water spreading practices in the 2003 survey of farm facilities. Table 28 compares this data to the data collected in 2009.

Table 28: Soiled Water Spreading

	2003	2009
	% of farms	
Own vacuum tanker	64	50
Contractor tanker	27	46
Pump & flow	2	1
Pump & sprinkler	2	1
Pump & self travel	1	0
Other	4	2

The use of the farmers' own vacuum tankers remains the most common method of spreading soiled water, although it has decreased slightly over the years from 64 percent in 2003 to 50 percent of farms in 2009. The use of contractors has increased from 27 percent in 2003 to 46 percent in 2009. The use of pump methods was very limited in 2003 and remains so in 2009.

8. References

Hyde, B., Carton, O., and Murphy, W., 2008. Teagasc Farm Facilities Survey – Ireland 2003. Report produced for the Department of Agriculture, Fisheries and Food.

Minister for the Environment, Heritage and Local Government, 2010. Statutory Instrument No. 610 of 2010. European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2010. Available: http://www.environ.ie/en/Legislation/Environment/Water/FileDownLoad,25133,en.pdf

Department of Agriculture and Food, 2006. Explanatory Handbook for the Good Agricultural Practice Regulations. Availabe: http://www.agriculture.gov.ie/media/migration/ruralenvironment/environment/nitrates/revisedhandbook2008.pdf

APPENDIX 1

Appendix 1: Good Agricultural Practice Regulations

The Good Agricultural Practice (GAP) Regulations cover a wide range of farm based measures (for the comprehensive detail refer to Statutory Instrument No. 610 of 2010). However, this audit focuses extensively on farm facilities and management relating to organic fertilisers and dirty water systems.

The National Action Programme (NAP) under the Nitrates Directive was implemented on a whole territory basis in the Republic of Ireland. For the purposes of the NAP the national territory was sub-divided into three zones (groups of counties) by reference mainly to soil type, rainfall and length of growing season. The zones are as follows:–

- Zone A comprises the counties of Carlow, Cork, Dublin, Kildare, Kilkenny, Laois, Offaly, Tipperary, Waterford, Wexford and Wicklow.

- Zone B comprises the counties of Clare, Galway, Kerry, Limerick, Longford, Louth, Mayo, Meath, Roscommon, Sligo and Westmeath.

- Zone C comprises the counties of Cavan, Donegal, Leitrim, and Monaghan.

Storage Capacity

Under the GAP Regulations storage capacity on farm holdings across all zones must be sufficient for the full housing period and should provide an adequate level of storage for difficult years. Organic fertiliser is deemed to mean slurry, farmyard manure, sewage sludge, industrial sludges etc. Until they are ready to be applied to land, all organic fertilisers, effluents and soiled waters must be collected in a way that will prevent runoff or seepage, directly or indirectly, into groundwaters or surface water.

The following minimum storage capacity for bovine livestock manure is set down:

- 16 weeks in Zones A

- 18 weeks in Zone B, and

- 20 or 22 weeks in Zone C.

Recognising the high water quality in counties Donegal and Leitrim and the lower intensity of agricultural production, the required minimum storage capacity was set at 20 weeks. The minimum storage capacity for counties Cavan and Monaghan was designated at 22 weeks.

Storage capacity of 6 weeks was required in all areas in respect of sheep, goats and deer. Storage capacity of 26 weeks was generally required in all areas in relation to pig and poultry units (except where pig numbers are less than 100 and poultry places are less than 2,000 and there is sufficient land to spread the manure produced).

Under the GAP Regulations storage facilities shall be maintained free of structural defect and be of such standard as is necessary to prevent water pollution by run-off or seepage, directly or indirectly, into groundwater or surface water bodies.

Table 29 below outlines slurry storage capacity requirements.

Table 29: Slurry storage capacity requirements

Livestock Type	**Volume (m^3/week)**
Dairy cow	0.33
Suckler cow	0.29
Cattle > 2 years	0.26
Cattle (18-24 months old)	0.26
Cattle (12-18 months old)	0.15
Cattle (6-12 months old)	0.15
Cattle (0-6 months old)	0.08
Lowland ewe	0.03
Mountain ewe	0.02
Lamb-finishing	0.01
Poultry - layers per 1,000 birds	0.81

* An additional 200mm freeboard must be provided in all covered tanks and 300mm freeboard in all uncovered tanks. Allowance must also be made for net rainfall during the specified storage period for uncovered tanks.

Table 30 below details dungstead storage capacity requirements.

Table 30: Dungstead storage capacity requirements

Livestock Type	Solid Fraction (m^3/week)	Seepage Fraction (m^3/week)
Dairy cow	0.28	0.04
Suckler cow	0.25	0.03
Cattle > 2 years	0.23	0.02
Cattle (18-24 months old)	0.23	0.02
Cattle (12-18 months old)	0.13	0.01
Cattle (6-12 months old)	0.13	0.01
Cattle (0-6 months old)	0.07	0.01

Farmyard manure may be stockpiled on land during the permitted spreading period prior to landspreading. It shall not be stockpiled on land within:

- 250 metres of any surface water body or borehole, spring or well used for the abstraction of drinking water for human consumption in public or group water schemes i.e. schemes supplying more than $10m^3$ per day or serving more than 50 persons,

- 50 metres of a borehole, spring or well used as a drinking water source (e.g. private well)

- 50 metres of exposed cavernous (karstified) limestone features such as swallow holes and collapse features,

- 20 metres of a lake,

- 10 metres of a surface water body (other than a lake),

Storage facilities (including out-wintering pads, earthen-lined stores, integrated constructed wetlands) shall be designed, sited, constructed, maintained and managed so as to prevent run-off or seepage, directly or indirectly, into groundwater.

Storage capacity of at least 10 days is required for soiled water. Storage facilities for silage effluent shall equal or exceed the capacities as outlined in Table 31 below.

Table 31: Storage required for ensiled forage effluent

Crop	**Minimum storage required (m^3/100 tonnes)**	
	Short term storage*	Full storage
Grass	7	21
Arable silage	7	21
Maize	4	10

* Vacuum tanker or irrigation system must be available on farm

Where the grassland stocking rate does not exceed 140kg nitrogen per hectare / annum, storage is not required in respect of sheep, goats and/or deer out-wintered at a grassland stocking rate not exceeding 130 kg N/ha on any day during the prohibited spreading period. Additionally, storage is not required for other livestock (does not apply in case of dairy cows) out-wintered at a grassland stocking rate not exceeding 85 kg nitrogen/ha on any day during the prohibited period for organic fertiliser. In determining the adequacy of storage capacity account is also taken of where the holding has a contract for exclusive access to storage capacity off the holding; where the holding has a contract with a manure processing facility, or can otherwise demonstrate access to an approved treatment or recovery outlet.

The storage capacity required for pigs had to be in place no later than 31 December 2006. All the required storage capacity had to be in place by 31st December 2008.

Application of organic fertilisers

The periods during which the application of organic fertiliser are prohibited (both dates inclusive) are outlined in Table 32 below.

Table 32: Prohibition periods for applying organic fertilisers

Zone	All Organic Fertilisers Excluding Farmyard Manure	Farmyard Manure
A	15 Oct. to 12 Jan.	1 Nov. to 12 Jan.
B	15 Oct. to 15 Jan	1 Nov. to 15 Jan.
C	15 Oct. to 31 Jan.	1 Nov. to 31 Jan.

Under the GAP Regulations livestock manure, other organic fertilisers and soiled water cannot be applied to land within the buffer zones set out in Table 33.

Table 33: Buffer zones for spreading organic fertilisers

Water body/Feature	Buffer zone
Any water supply source providing 100m3 or more of water per day, or serving 500 or more people	200 metres (or as little as 30 metres where a local authority allows)
Any water supply source providing 10m3 or more of water per day, or serving 50 or more people	100 metres (or as little as 30 metres where a local authority allows)
Any other water supply for human consumption	25 metres (or as little as 15 metres where a local authority allows)
Lake shoreline	20 metres
Exposed cavernous or karstified limestone features (such as swallow holes and collapse features)	15 metres
Any surface watercourse where the slope towards the watercourse exceeds 10%	10 metres
Any other surface waters	5 metres
Any open drain or where the area of land adjacent to the watercourse is a narrow parcel of land less than 50 metres wide and not more than 1 hectare in area	3 metres

* A Local Authority may also specify a greater buffer width from those specified above in the case of water for human consumption,

The land application of liquid livestock manure (slurry) by a high trajectory splash plate or sludge irrigator (rain gun) is also prohibited.

Soiled water shall not be applied to land at any one time in quantities exceeding 50,000 litres of soiled water per hectare. A period of at least 42 days shall be left between applications.

Stocking rate

The GAP Regulations specifies the maximum amount of livestock manure which may be applied is 170 kg of nitrogen per hectare / annum based on standard livestock manure generating guidelines as set out in Table 34 below.

Table 34: Total nitrogen and phosphorus equivalents produced by grazing livestock

Livestock Type*	Total Nitrogen kg/year	Total Phosphorus kg/year
Dairy cow	85	13
Suckler cow	65	10
Cattle (0-1 year old)	24	3
Cattle (1-2 years old)	57	8
Cattle (> 2 years)	65	10
Mountain ewe & lambs	7	1
Lowland ewe & lambs	13	2
Mountain hogget	4	0.6
Lowland hogget	6	1

*See Table 6 of S.I No. 610 of 2010 (Minister for the Environment, Heritage and Local Government, 2010) for excretion rates for other livestock.

A member state may fix a rate other than 170 kgs N Ha^{-1}provided that the different amounts do not prejudice the achievement of the objectives of the Nitrates Directive and can be justified by reference to objective criteria such as long growing seasons, crops with high nitrogen uptake, high net precipitation and soils with exceptionally high denitrification capacity. The Irish Government secured approval from the EU Commission for a derogation up to 250 kgs N Ha^{-1}per annum. However, a farmer has to specifically apply for this derogation and must meet certain requirements and criteria (DAFF, 2010). If a farm stocking rate exceeds 250 kgs N Ha^{-1} alternative arrangements must be undertaken such as exporting livestock manure. This is particular relevant to intensive pig and poultry units.

All soils are deemed to be P index 3 unless a soil test dictates otherwise (refer to S.I. for details of allowances).

APPENDIX 2
Copy of Questionnaire

NFS ADDITIONAL SURVEY 2010

FARM CODE CARD REC

					1		

Q1 (a): Was animal slurry or solid manure (FYM) produced or spread on farm in 2009?

1= Produced and spread; 2 = No production but spread (e.g. imported slurry/inventory); 3= Not produced or spread; 4 = Produced but not spread (e.g. exported/inventory)

If Code 1 or 2 ask Q. 1(b) to 1(g)

If Code 3 or 4 go to Q. 2

	Slurry %			FYM %		
Q1 (b): % of total **spread** as slurry or FYM in 2009 (see notes)						

Q1 (c) : % of total **spread** in each period in 2009	Slurry %			FYM %		
End of closed period - 30 April						
1 May - 31 July						
1 August - Start closed period						
Total = 100%	1	0	0	1	0	0

Q1 (d): Crops: slurry/FYM applied to in 2009 (%)	Slurry %			FYM %		
Grass – grazing						
Grass – hay or silage						
Maize						
Other Tillage crops						
Total = 100%	1	0	0	1	0	0

Tillage crops – method of incorporation

(1 = Ploughing; 2 = Tilling/Disking; 3 = Injection; 4 = None)

Tillage crops – Timing of incorporation (after spreading)

(1= Between 0-4hrs; 2 = 4-12hrs; 3 = 12-24hrs; 4 = 24-48hrs, 5 =More than 48hrs)

2

Q1 (e): Who spreads slurry / FYM?	Slurry %			FYM %		
% Spread by Contractor						
% Spread by Farmer owned machinery						

Q1 (f): Slurry – Spreading Method (code)	**Tanker %**	**Unbilical %**

% of total slurry spread by method (see photos)

	Method	Spread %
Splashplate		
Bandspreader		
Trailing shoe		
Shallow injection (<10 cm deep)		
Deep injection (>10 cm deep)		

Q1 (g): Solid manure (FYM) – spreading method (code)

Method spread by type (code 2 main types)
1 = Rear discharge; 2 = Side discharge (rotary e.g. Howard); 3 = Side discharge (impeller); 4 = Other (specify

Method 1		
Method 2		

Q2 (a): How is soiled water stored? (see definition)
1=Soiled water tank; 2=Silage effluent tank; 3 = Slurry tank; 4 = Lined lagoon; 5 = Unlined lagoon; 6 = Reedbed;7 = Other (specify); 8 = No storage

	Type	Stored %
1st Type		
2nd Type		

3

Q2 (b): Method(s) of spreading soiled water/effluent to land in 2009
1= own vacuum tanker; 2 = contractor tanker; 3 = pump & overland flow; 4= pump & sprinkler gun; 5 = pump & self travelling irrigation; 6 = Other method; 7= None

	Method	Spread %
No 1		
No 2		

Q3 (a): Were organic fertilisers (slurry/FYM) imported or exported onto or from **Farm in 2009**
1 = Imported; 2 = Exported; 3 = Imported & exported; 4 = No imports/exports

Q3 (b) Manure type: *1 = Cattle; 2 = Pig; 3 = Poultry; 4 = Other*

		Tonnes
Imports	Slurry	
(Quantity)	FYM	
	Other (specify)	
Exports	Slurry	
(Quantity)	FYM	
	Other (specify)	

APPENDIX 3
Copy of Notes for Survey

NOTES: ADDITIONAL NFS SURVEY – 2010

Q1: (a) On the majority of livestock farms slurry or solid manure will be produced during the Winter and spread during the growing season. Where a farm is engaged in Summer grazing of cattle there may be no production or spreading**. If No Spreading in 2009,** go directly to **Q2**.

For the Nitrates Regulations **slurry** is defined as:
(*a*) excreta produced by livestock while in a building or yard, and
(*b*) a mixture of such excreta with rainwater, washings or other extraneous material or any combination of these, of a consistency that allows it to be pumped or discharged by gravity at any
stage in the handling process but does not include soiled water;

"**farmyard manure" (FYM)** means a mixture of bedding material and animal excreta in solid form arising from the housing of cattle, sheep and other livestock excluding poultry.

Q1: (b) % of total spread as slurry or solid manure (FYM) should be estimated on the basis of animal numbers (and age of these animals) generating slurry/solid manure rather than volume of slurry/solid manure (as FYM is bulky). The two boxes should sum to 100%.

Q1: (c) The closed period for spreading slurry extends from 15 October to the following 12/15/31 January **depending on county that the farm is located in**. The closed period for spreading FYM extends from 1st November to following 12/15/31 January. The two columns should each sum to 100%.

Q1: (d) The two columns (slurry and FYM) should each sum to 100%.

Q1: (e) The two columns (slurry and FYM) should each sum to 100%.

Q1: (f) Each column does not have to sum to 100% but the sum of all the methods under tanker and umbilical should = 100%

A **tanker system** is where a tractor hauls the slurry to the field in a tanker. That tanker will be fitted with a splashplate or trailing shoe etc mechanism for spreading the slurry.
An **umbilical system** is where the slurry is pumped via a long pipe for spreading in the field by a tractor with a splashplate or trailing shoe etc mechanism for spreading the slurry (see pictures).

Q1: (g) See pictures of different machine types.

Q2: The most common forms of **Soiled Water** are parlour/dairy washings and water coming off **dirty** yards/collection yards.
For the purposes of the Nitrates Regulations the following definition applies;
"**soiled water**" includes, water from concreted areas, hard standing areas, holding areas
for livestock and other farmyard areas where such water is **contaminated by contact with** any of the following substances—
(i) livestock faeces or urine or silage effluent, (ii) chemical fertilisers,
(iii) washings such as vegetable washings, milking parlour washings or washings from mushroom houses,

(iv) water used in washing farm equipment."soiled water" does not include any liquid where such liquid has either—
(i) a biochemical oxygen demand exceeding 2,500 mg per litre, or
(ii) a dry matter content exceeding 1% (10 g/L).

Q2: There are two main systems of spreading soiled water, (1) with a tractor and vacuum tanker or alternatively (2) the water is pumped via a hose to the field where it is spread using a sprinkler gun or self traveling irrigator (see pictures).

Q3: Pig slurry and poultry manure are the main manure types that are imported/exported.
Note: poultry manure is considered as slurry.

Q5: Enter investment (€'000) and code if investment was to comply with Nitrates Directive/Good Agricultural Practice (GAP).