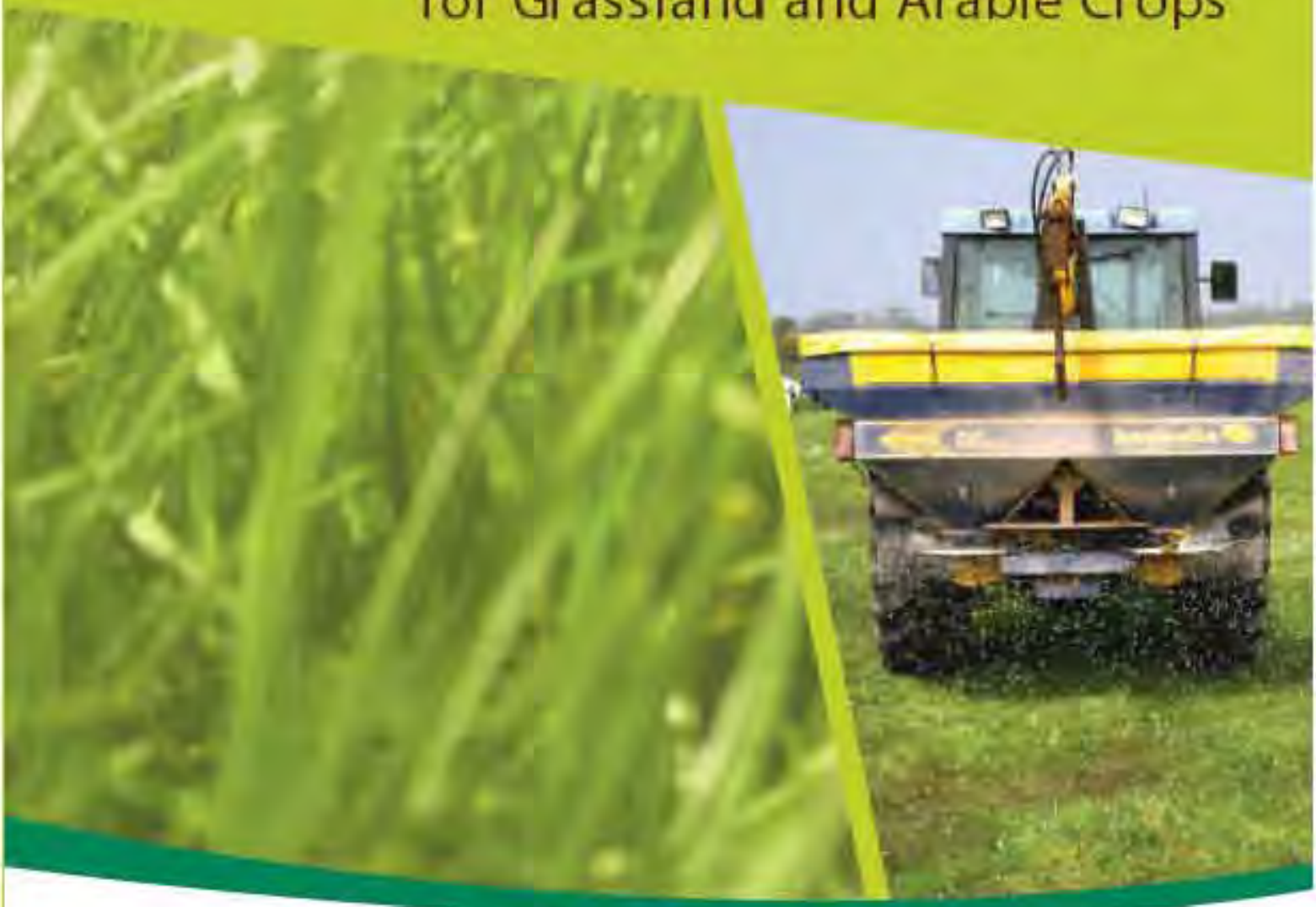
A Survey of Fertilizer Use in Ireland from 2004-2008 for Grassland and Arable Crops



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A SURVEY OF FERTILIZER USE IN IRELAND FROM 2004-2008 FOR GRASSLAND AND ARABLE CROPS

PROJECT REPORT

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EXECUTIVE SUMMARY

1. *National Farm Survey:* Farm management data for the years 2004-2008 from the Teagasc National Farm Survey (NFS) were used as the basis for this fertilizer use survey. The farms that took part in the survey were a stratified random sample selected to represent the major farm systems and sizes. Farms were classified into 6 main farm systems namely: dairying, dairying with other enterprises, cattle rearing, cattle with other systems, mainly sheep and tillage systems. These systems refer to the dominant enterprise in each group. However, in order to simplify the large number of tables in this document, the farm types were further reduced to four farm systems; namely dairying, cattle, sheep and tillage.

2. *Data analysis:* The data from farms were analysed using the SAS statistical package. Two and three-way tables were produced relating N, P and K fertilizer use for different crops to geographic region, farm enterprise, farm size, stocking rate and soil suitability class. The mean values obtained for different crops were weighted according to the area of the crop on the farms in question. A total of 1232 farms were included in the survey in 2008. The survey was carried out following the definitions of terms appropriate to the national farm survey. Some of these, for example livestock units (LU), farm area, stocking rates and N usage are not calculated in the same way as those used in other contexts such as national area-aid schemes, and thus cannot be compared with them. A glossary of terms is included in Appendix 5 in order to avoid misunderstandings of the meanings of such farm parameters.

3. *Validation:* An overall validation procedure for the survey results was performed by comparing annual sales of N, P and K fertilizer for 2008 with the amount calculated from the survey results for N, P and K usage for different crops, taken together with the published national areas under these crops. The agreement between the calculated fertilizer consumption from the survey and the nationally published figures of 308,960 tonnes of N, 26,350 tonnes of P and 69,584 tonnes of K was remarkably good with errors of only -1.1%, -1.4% and -0.5% for the three elements. The agreement indicates that the results of this fertilizer use survey are valid.

4. *Nutrient Advice:* Results from 52,350 soil samples submitted to Teagasc for soil analysis in 2008 together with Teagasc nutrient advice allowed the mean Teagasc fertilizer recommendation to be calculated for different crops. The mean advice levels were compared with the mean usage rates of N, P and K from the survey on the assumption that the soils of the farms surveyed had the same distribution of soil analysis levels and soil Index levels as the laboratory samples.

5. *Grazing:* The average usage of fertilizer nutrients applied to grazed grassland was estimated at 65, 3 and 9 kg/ha for N, P and K respectively. The nutrient usage, particularly N, was greater in the southern regions of the country than that used in the other regions. The mean N usage for grazing was 38% lower than that estimated for 2003. There was a 63% decrease in P usage, and a 50% decrease in K usage since 2003. Although the fertilizer usage on dairy farms was higher than that of other systems, the usage of N, P and K was below the estimated Teagasc advice rates for all farms at all stocking rates.

6. *Silage:* The estimated mean N, P and K usage for silage was 101, 7 and 24 kg/ha respectively. This represents a decrease in fertilizer usage since 2003 of 16% for N, 46% for P, and 41% for K. These decreases are line with the national decreases in fertilizer sales during this period of 20%, 40% and 37% for N, P and K respectively. The N, P and K

application rates were higher for silage on dairy farms than on farms which were mainly cattle, sheep or tillage. Comparison between the calculated Teagasc advice and the nutrient usage for the farms in the survey showed that the P and K usage rate was between the rates advised with and without slurry. The usage rate of N was lower than the advice assuming slurry application.

7. *Hay:* The mean N application rate on the farms in the survey was 54 kg/ha, while the P and K usage rates were 6 and 17 kg/ha respectively. The usage of N has remained constant since 2003, however, the P and K usage have decreased by 46 and 32% respectively during this period.

8. *Types of fertilizers:* The types of fertilizers used for grassland shows a continuing trend towards relying on high N fertilizer compounds (e.g. 24-2.5-10 and 27-2.5-5) rather than high P K compounds (e.g. 0-10-20 and 0-7-30) to supply the P and K for both grazed and cut swards. The use of straight N fertilizers (CAN and urea) has also increased. This has resulted in the relatively larger decrease in the usage of P and K than that of N. This trend has also been noted in previous surveys.

9. *Trends in fertilizer usage:* Nitrogen usage for grassland increased from 1995 to 1999 but decreased steadily from 1999 to 2008, this is broadly in line with the changes in the national N fertilizer consumption. The decreasing P and K usage on grassland also closely mirrored the changes in national consumption of these elements. The reduced costs on farms arising from decreased fertilizer inputs is a major benefit to farmers, and may indicate that improvements are being made in how efficiently farmers are utilising nutrients on farms. However, ensuring that soil fertility levels are sustained and balanced into the future remains a key concern.

10. *Winter Wheat:* The mean N, P and K application rates were 179, 19 and 52 kg/ha respectively. The estimated usage of N was between the calculated Teagasc advice for 9 and 11 t/ha crop yields. The estimated P and K usage respectively were below the calculated Teagasc P and K advice. The usage of all three major nutrients has decreased since 2003. The largest decrease was with P usage (17%), while N and K usage also decreased by 12 and 5% respectively.

11. *Spring Wheat:* The mean N, P and K application rates were 139, 20 and 49 kg/ha respectively. The N usage on the Survey farms compares closely with calculated Teagasc advice. The use of fertilizer of P and K for spring wheat was lower than Teagasc advice. The N use decreased since 2003 by 13 kg/ha (9%). The P and K usage also decreased.

12. *Winter Barley:* The mean N, P and K application rates were 163, 25 and 64 kg/ha respectively. The mean N application rate on farms in the survey was higher than the calculated mean Teagasc advice of 143 kg/ha. Calculated Teagasc P advice levels matched almost exactly the rates used, while K usage was less than that advised. The mean N usage for winter barley showed a small decrease of 2% compared to 2003. The P and K usage showed larger decreases of 17 and 10% respectively compared to 2003.

13. *Spring Barley:* The mean N, P and K application rates were 118, 21 and 45 kg/ha respectively. The usage of N was close to that advised, while P and K usage was below the calculated advice rates. Since 2003, N usage decreased slightly by 4%, while P and K usage showed larger decreases of 19 and 18% respectively.

14. *Malting Barley:* The mean N usage was 117 kg/ha, which was 5 kg/ha higher than in 2003. The usage of P on malting barley was 16 kg/ha, and has decreased by 20% since 2003. The usage of K of 48 kg/ha has decreased by 13% since 2003.

15. *Winter Oats:* The mean N, P and K usage on winter oats was 141, 23 and 51 kg/ha respectively. Compared with 2003, N usage increased slightly by 3 kg/ha, while both P and K usage decreased by 3 kg/ha. The N usage was above the calculated Teagasc advice, while P usage was similar. The K usage was only 54% of the calculated advice rate.

16. *Spring Oats:* Spring oats had the lowest fertilizer use of any cereal crop, with mean N, P and K usage of 75, 11 and 23 kg/ha respectively. Compared with 2003, N usage decreased by 34%, while P and K usage both decreased by 56 and 53% respectively. The N usage was above the calculated Teagasc advice, while P usage was similar. The K usage was only 54% of the calculated advice rate.

17. *Cereal Crops:* The fertilizer usage over all cereal crops was 137, 20 and 48 kg/ha for N, P and K respectively, representing a decrease in the usage of all three nutrients by 10% for N, 20% for P, and 14% for K.

18. *Root crops:* The calculated mean N, P and K usage on all root crops was 106, 46, and 138 kg/ha for N, P and K respectively. The usage was below that of 2003 for all nutrients. However, direct comparisons between these years should only be made in the context of the difference in crop mix during this period with the disappearance of the sugar beet crop.

19. *Forage Maize:* The N, P and K usage for forage maize was 152, 41 and 96 kg/ha respectively. The usage of N, P and K has increased compared with 2003. Maize is the only crop in the survey that has shown an increase in the usage of all three fertilizer nutrients during this period. The N and P usage compared closely with calculated Teagasc advice, while K usage was below the rates advised, assuming no slurry is applied.

20. *REPS:* The fertilizer N, P and K application rates for grassland and tillage crops on REPS farms were lower than the rates used on non-REPS farms. For grazing, REPS farms used 51% of the N rate and 50% of the P rate of non-REPS farms. For silage the comparison was 78% and 88% for N and P and for hay it was 61% and 71% respectively. REPS farms also had lower N and P usage than non-REPS farms for all cereal and root crops, with the exception of barley and potatoes.

TABULAR SUMMARY OF RESULTS

Table 1. Fertilizer usage on grassland in 2008

Grassland	N	P	K	Mean Area (ha)	No. of Farms
	kg/ha				
Grazing	65	3	9	29.0	1093
Silage	101	7	24	12.7	1028
Hay	54	6	17	4.0	262
Total Grassland	86	5	14	28.7	1110

Table 2. Fertilizer usage on tillage crops in 2008

Crop	N	P	K	Mean Area (ha)	No. of Farms
	kg/ha				
Winter wheat	179	19	52	22	66
Spring wheat	139	20	49	8	40
Winter barley	163	25	64	15	22
Spring barley	118	21	45	16	184
Malting barley	117	16	48	17	30
Winter oats	141	23	51	12	30
Spring oats	75	11	23	6	16
Cereal crops Overall	137	20	48	25	242
Forage maize	152	41	96	7	64
Fodder beet	155	51	184	4	49
Potatoes	93	73	170	12	10
Root crops Overall	106	46	138	6	84

Table 3. Mean fertilizer nutrient use for grassland from 1995-2008

Year	N	P	K	Mean Area (ha)	No. of Farms
	kg/ha				
1995	123	16	39	33	1207
1999	145	13	34	37	1097
2000	136	13	33	39	1112
2001	133	11	30	41	1207
2002	126	11	28	39	1224
2003	123	11	27	40	1251
2004	113	11	27	27	1240
2005	112	10	26	27	1198
2006	107	9	23	28	1203
2007	98	7	20	28	1213
2008	86	5	14	29	1110

Table 4. Mean fertilizer nutrient use for tillage crops from 1995-2008

Year	N	P	K	Mean Area (ha)	No. of Farms
	kg/ha				
Cereals					
1995	137	26	69	18	262
1999	127	25	56	23	210
2000	160	25	60	28	214
2001	147	24	53	27	240
2002	157	25	56	28	255
2003	152	25	56	30	247
2004	148	26	60	28	244
2005	140	26	58	22	210
2006	146	25	57	23	201
2007	148	22	52	23	223
2008	137	20	48	25	242
Root Crops					
1995	161	76	199	5	211
1999	154	62	190	7	126
2000	146	70	187	8	112
2001	151	74	208	9	120
2002	142	57	169	9	123
2003	139	58	168	9	117
2004	146	63	191	9	120
2005	154	58	193	8	119
2006	113	51	187	7	91
2007	108	50	160	8	83
2008	106	46	138	6	84

Table 5. National sales of N P and K fertilizers from 1995 to 2008 (DAFF, 2009)

YEAR	N	P	K
	tonnes		
1995	428,826	62,410	150,543
1999	442,916	50,509	125,729
2000	407,598	49,267	122,695
2001	368,667	42,697	106,884
2002	363,513	41,869	105,597
2003	388,080	43,832	111,136
2004	362,525	42,661	110,645
2005	352,165	38,645	100,710
2006	345,154	37,209	92,880
2007	321,588	32,415	84,737
2008	308,960	26,350	69,584

INTRODUCTION

The National Farm Survey (NFS) is carried out each year by the Teagasc NFS Unit in order to determine the financial situation on Irish farms and to measure the current levels of farm performance. It provides a database for agricultural economics and rural development research projects.

The NFS is Ireland's contribution to the Farm Accountancy Data Network of the European Union (FADN). The objective of the FADN is to determine the income on farm holdings across the EU. A subset of the data from the NFS was made available to Johnstown Castle Research Centre in order to conduct a Fertilizer Use Survey (FUS).

This survey uses NFS data on the amount and types of chemical fertilizer used by the farmers for different crops together with data on areas under grassland and agricultural crops, livestock numbers, land use class and animal numbers. The aim was to determine the amounts of N, P and K nutrients and types of fertilizer used on grassland and arable crops and to measure the relationships between fertilizer use and such factors as geographic region, farm size, stocking rate and soil use class.

Comparisons were made between fertilizer use and Teagasc fertilizer advice for the different crops and the report points to possible explanations for the findings. Comparisons were also made with fertilizer use data since 1995, and many tables are presented in this report.

The report uses metric measurements throughout, and in the tables, usages of P and K are presented in elemental form. To facilitate comparisons with different surveys and reports in this and other countries, a range of conversion factors for metric, imperial and popular units and for conversion between elemental P and K and their oxide forms are listed in Appendix 7.

SURVEY METHODS

National Farm Surveys have as their basis, a stratified random selection of farms to represent the major farm systems and sizes. The farms included in the 2008 survey were selected using information from the 2007 Farm Structures Survey (Connolly *et al.*, 2009). Farms are classified into major farming systems according to the standardised EU typology used by FADN. This is then further simplified so that 8 EU farm types are reduced to the following 6 main farm types namely: dairying, dairying with other enterprises, cattle rearing, cattle with other, mainly sheep and mainly tillage systems. These systems refer to the dominant enterprise in each group. However, in order to simplify the large number of tables in this document, the farm types were further reduced to four; namely dairying, cattle, sheep and tillage.

The estimated farm distribution used in the NFS 2008 is shown in Table 6 in this simplified classification. Thus 23% of farms are classified as mainly in dairying while 55% are mainly involved in cattle enterprises. Almost 34% of Irish farms have an area of 20 ha or less.

Table 6. Percentage distribution of Irish farms in 2008 according to farm system and size

Farm Size (ha)	< 10	10 - 20	20 - 30	30 - 50	50 - 100	> 100	Total
System	% of Farms						
Dairy	1.1	2.4	3.9	7.1	6.9	1.3	22.8
Cattle	6.0	15.3	13.3	12.6	6.3	1.2	54.7
Sheep	2.4	5.2	3.3	2.6	1.9	0.7	16.2
Tillage	0.4	0.9	1.0	1.5	1.7	0.9	6.4
All systems	9.9	23.9	21.5	23.8	16.7	4.2	100.0

Survey Method

The raw data used in this fertilizer survey consisted of a database record of farm management information and fertilizer use for each of 1102 farms. There were 170 items of information which consisted of a numeric farm reference; fertilizer usage data; and codes for the farm system, soil suitability class and county in which the farm is situated. The utilized agricultural area (UAA); the area of forage; the area of total feed; and the number of livestock units on the farm are also given. Definitions for these terms are given in Appendix 5.

The fertilizer usage information supplied by the NFS Unit for this survey consisted of a number of farm records, each containing the area under each of 16 tillage crops, together with the area under hay, silage and grazing and total grassland. For each crop, the types and quantities of up to six fertilizer applications (up to 11 applications for grazing) was also given. The fertilizer type was coded into one of 90 different compounds of known composition. These compounds cover most of the fertilizer types used by Irish farmers. Any fertilizer types not included in this list were coded as a group. The weighted mean composition of these products, based on total usage of each product, was used to calculate the N, P and K application rates from these compounds.

The data were tabulated using the statistical package from the SAS Institute into two- and three-way tables. These related N, P and K fertilizer use to geographic regions, farm enterprise, stocking rate, and soil use class. The procedures used were based on those of Coulter *et al.* (2002; 2005) in the fertilizer use surveys for 2000 and 2003. The mean values quoted for different crops were weighted according to the area of the crop on the farm in question.

Land Use Classes

The categorisation of farms into different classes follows the classification of Gardiner and Radford (1980). Land use class is a qualitative method by which the range of potential uses of a soil can be expressed. There are six classes varying from wide, moderately wide, somewhat limited, limited, very limited and extremely limited. In this report they are amalgamated into four by combining the bottom three classes into a single range called limited. The extent of each class varies throughout the country. Overall, 35% of land is in class 1 or 2 (wide and moderately wide). The percentage of soils in class 1 or 2 is 54% in Leinster, 39% in Munster, 12% in Ulster and 17% in Connacht.

Validation Procedure

The survey results were validated by comparing the published national annual sales of N, P and K (DAFF, 2009) with the estimated total usage as calculated from the survey results. The total

usage was estimated from the survey data by collating the fertilizer N, P and K usage on different crops with the published national areas under these crops (CSO, 2009) using the appropriate weightings from the NFS to calculate weighted means.

The National Farm Survey (Connolly *et al.*, 2009) gives information on sample numbers and representation for the NFS (Table 7). The table shows the number of farms of different sizes and the survey representation, i.e. the number of farms in the national population represented by one NFS-participating farm. Note that Table 7 gives details of 1102 survey farms but the fertilizer use survey was applied to 1232 farms. The difference is due to the inclusion of a number of farms to the NFS sample after Table 7 was compiled and to the exclusion of a number of small farms from the NFS 2008 report. This discrepancy does not affect the calculation of N, P and K usage, as means are weighted by area of the crop.

Table 7. Farm sample numbers for 2008 survey[1] (and representation[2]) (Connolly *et al.*, 2009)

Farm Size (ha)	< 10	10 - 20	20 - 30	30 - 50	50 - 100	> 100	Total
Dairy	2 (136)	8 (164)	35 (85)	82 (70)	119 (41)	25 (28)	271 (58)
Dairy / Other	1 (909)	10 (124)	2 (577)	21 (82)	38 (61)	20 (36)	92 (88)
Cattle Rearing	5 (326)	43 (138)	48 (108)	87 (55)	45 (43)	10 (31)	238 (83)
Cattle / Other	13 (361)	40 (253)	47 (186)	79 (106)	72 (65)	19 (51)	270 (139)
Sheep	4 (634)	22 (249)	19 (182)	34 (80)	27 (73)	22 (34)	128 (132)
Tillage	2 (196)	5 (194)	9 (112)	23 (69)	46 (38)	18 (52)	103 (65)
Total Sample	27 (386)	128 (195)	160 (141)	326 (76)	347 (51)	114 (38)	1102 (95)

[1]The 1102 farms in the NFS sample represent a farming population of 104,781.
[2]Representation is the number of farms in the population represented by one participating farm and is rounded to the nearest digit.

In this fertilizer use survey, the grassland and tillage areas represented by each farm in each category were calculated from Table 7, together with information on the national areas under grassland and each tillage crop, and on farm numbers within each farm size category (CSO, 2009). For each crop, a table was prepared giving the total area of all farms of each given size and farm system. These areas were multiplied by the fertilizer use per hectare of crop, obtained in the survey, to give an estimate of total consumption for each crop, farm size and farm system. Summing all these values weighted by crop area gave a survey estimate of total annual consumption. The results were 305,419; 25,968 and 69,218 tonnes/year of N, P and K respectively.

The agreement between the calculated consumption from the survey and the nationally published fertilizer sales figures of N, P and K of 308,960; 26,350 and 69,584 tonnes respectively for 2008 (DAFF, 2009) was very strong, with deviations of only -1.1 %, -1.4 % and -0.5 % for the three elements. Some minor errors could have been expected because (i) rough grazing is not included, (ii) the national statistics do not distinguish between malting barley and spring feeding barley and (iii) certain minor crops are omitted. Also, national fertilizer statistics are compiled on the basis of an October 1st to September 30th year but the NFS was compiled on a Jan 1st to December 31st year. Possible errors from this time difference would be expected to be low because farmers are advised not to apply fertilizers during this winter period. However, some discrepancies may arise due to carry-over of fertilizer on farms from previous years or into or subsequent years. The agreement between fertilizer use and official national statistics of fertilizer consumption indicates that the results of this fertilizer use survey are valid.

Comparison with Teagasc Advice

An analysis of the soil analysis results for agricultural samples submitted in 2008 to the Teagasc soil laboratories at Johnstown Castle was undertaken to find out the percentage of soil samples that were at Index 1, Index 2, Index 3 and Index 4 for P and K. The P and K Indices depend on the available levels of these nutrients determined by soil analysis (Coulter and Lalor, 2008).

Teagasc gives fertilizer advice depending on the crop, the nutrient Index of the soil and other factors relevant to the crop. For example, N advice for grazed grassland depends on the stocking rate. The P and K advice depends on the soil Index, stocking rate and whether the livestock are dairy or beef cattle. For silage, advice depends on the nutrient indices, the number of cuts and the amount of organic nutrients to be recycled. Advice for hay is similar to that for silage. Advice for tillage crops depends mainly on the soil index, but the fertilizer advice is also modified for some crops according to crop yields, soil texture or expected summer rainfall amount (Coulter and Lalor, 2008).

Taking the appropriate factors into account, the mean fertilizer recommendations were calculated from the percentages of soils in each Index point for P and K. It was assumed that the Survey farms had the same distribution of soil analysis levels as the laboratory samples. Since there were a large number of samples, this is a reasonable assumption and furthermore, they represent the only available estimates of national soil fertility. In the following sections of this report, the calculated Teagasc mean advice levels are compared with the P and K use for each crop, as determined by the fertilizer use survey.

FERTILIZER USE ON GRASSLAND

Grazing

In the farm management survey the application of nutrients to grassland is recorded according to the use made of the area at different periods throughout the year. Thus when an area is to be used for silage, the nutrients applied are recorded under the silage crop, and when the same area is used later in the year for grazing, the nutrient use is recorded under the grazing heading. Thus, in the field records, the area used for grazing only is recorded as the grazing area, and the areas under hay or silage are recorded as hay or silage areas even when they are grazed for part of the year. There is thus an underestimation of the grazing area and therefore an overestimation of the rates of N, P & K per ha used for the grazing land if the area of aftermath grazing was not taken into account. However the estimates of the total amounts of N, P & K used on the total area of grassland are unbiased.

The amounts of N, P & K applied for silage and hay are recorded correctly and therefore require no further correction. An attempt has been made in this survey to estimate more accurately the use of nutrients on grazing land using the following procedure. The use of nutrients for grazing the silage and hay aftermaths are assumed to be at the same rates as those used for the grazing only areas but in proportion to the yields. The yields of grazed grass from areas harvested once, twice, or three times per annum for silage or hay are assumed to be approximately 50, 25 and 10 percent, respectively, of the total annual yield.

In calculating the N, P & K per grazed hectare, the amount recorded by the NFS for grazing was divided by the grazing area, plus 50% of the area cut once for silage or hay, plus 25% of the area cut twice for silage or hay, plus 10 % of any area cut three times.

The average amount of fertilizer nutrients applied to grazed grassland was estimated from the fertilizer used on 1093 survey farms which had grazed grassland. The mean overall values were 65, 3 and 9 kg/ha for N, P and K respectively. This represents a decrease in the usage of N, P and K of 38%, 63% and 50% respectively compared with 2003. Table 8 shows the distribution of nutrient use classified by region. It is clear that the amount of nutrients, particularly N, used in the southern regions of the country was greater than that used in the other regions. The lowest N usage was in the west region.

Table 8. Regional distribution of N, P and K application rates for grazing in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	85	5.0	4	0.4	12	1.4	30.3	170
Mid-East	66	5.5	3	0.3	7	1.0	34.1	150
Midlands	52	4.9	3	0.3	7	0.8	34.5	135
Border	57	4.1	3	0.3	6	0.7	25.7	202
South-West	76	5.0	4	0.3	10	0.9	31.3	193
South	76	7.8	5	0.7	11	1.4	22.8	91
West	34	3.5	2	0.3	7	0.8	23.0	152
Overall	65	1.9	3	0.1	9	0.4	29.0	1093

The geographic distribution of N and P application rates is shown in Figure 1. The higher usage of N in the south, south-west and south-east reflects the type of farming and stocking rates in these regions.

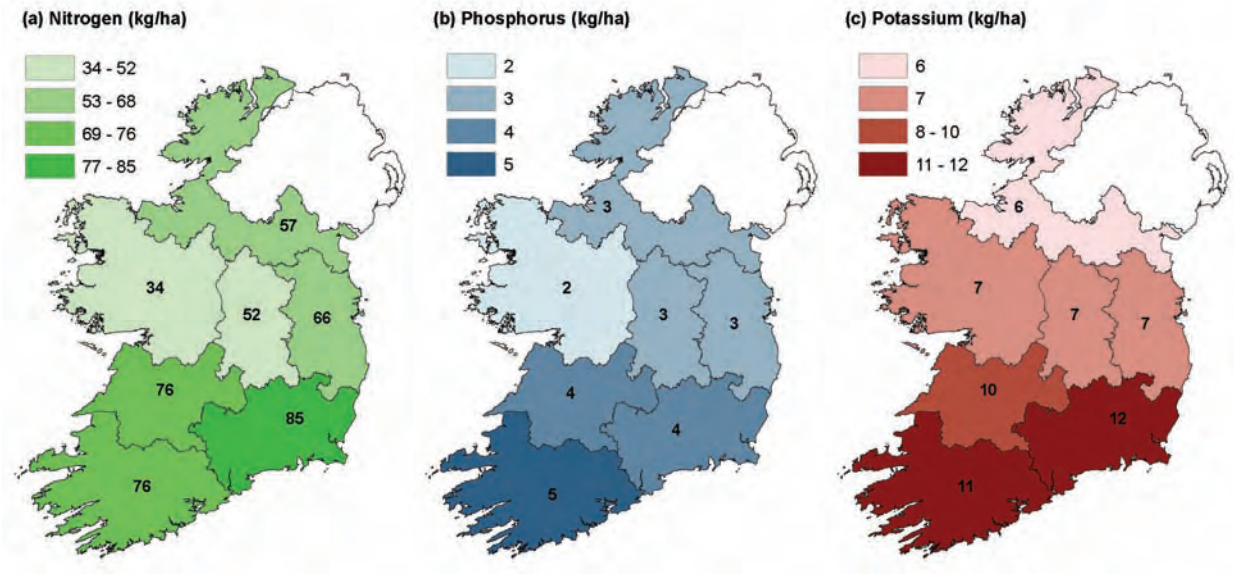

Figure 1. Regional variation in fertilizer N (a), P (b) and K (c) usage for grazing in 2008

The estimated amount of N, P and K applied to grazing land within each of the different farm systems is shown in Table 9. The N application rates were higher for grazing on dairy farms than on other farms. The P and K rates were higher on dairy and also on tillage farms.

Table 9. Estimated N, P and K fertilizer applied to grazed grassland in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Dairy	112	3.4	4	0.3	12	0.8	34.2	391
Cattle	28	1.2	2	0.1	6	0.3	25.8	561
Sheep	30	2.9	1	0.2	4	1.1	32.9	71
Tillage	56	5.0	4	0.7	14	2.5	22.2	70
Overall	65	1.9	3	0.1	9	0.4	29.0	1093

The effect of soil use class on nutrient applications to grazed grass is shown in Table 10. The highest rates of N were applied to the best soils. Application rates of P and K were not affected by soil use class.

Table 10. Effect of soil use class on nutrients for grazing in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	84	3.9	3	0.2	10	0.7	31.2	372
Moderately Wide	57	4.0	3	0.3	8	0.9	30.3	209
Somewhat Limited	50	3.9	3	0.3	8	1.0	27.8	192
Limited	54	3.0	4	0.2	9	0.6	26.5	320
Overall	65	1.9	3	0.1	9	0.4	29.0	1093

The fertilizer application rates for different stocking rates are shown in Tables 11, 12 and 13 for farms in which the main enterprise is dairying, cattle and sheep respectively. In these tables, stocking rate refers to total grassland stocking rate, rather the stocking rate on the grazing platform in isolation. The highest nutrient usage was found in dairy systems, with much lower usage levels on cattle and sheep farms.

Table 11. Fertilizer application rates for grazing on dairy farms at different stocking rates in 2008. (Stocking rates in this case refers to stocking rate over the total grassland area)

Stocking Rate (kg/ha Org N)	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
< 100	35	4.9	3	0.5	6	1.0	28.6	35
100 - 130	76	5.3	4	0.5	12	1.4	35.4	71
130 - 170	106	3.9	5	0.4	11	1.1	37.8	174
170 - 210	168	7.3	5	0.7	15	2.1	31.2	75
210 - 250	199	13.9	6	1.2	16	3.4	26.5	32
> 250	145	70.6	4	2.0	12	6.2	24.9	4

Table 12. Fertilizer application rates for grazing on cattle farms at different stocking rates in 2008. (Stocking rates in this case refers to stocking rate over the total grassland area)

Stocking Rate (kg/ha Org N)	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
< 100	19	1.1	2	0.2	5	0.4	25.3	350
100 - 130	33	2.2	3	0.3	6	0.7	28.0	128
130 - 170	49	4.9	3	0.4	7	0.9	25.3	70
170 - 210	87	14.1	6	1.6	14	4.0	21.3	11

Table 13. Fertilizer application rates for grazing on sheep farms at different stocking rates in 2008. (Stocking rates in this case refers to stocking rate over the total grassland area)

Stocking Rate (kg/ha Org N)	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
< 100	17	3.1	1	0.3	2	0.6	26.6	36
100 - 130	38	5.2	1	0.4	4	2.9	48.5	20
130 - 170	42	6.9	2	0.7	7	2.3	27.2	15

Table 14 shows the fertilizer application rates for all farms at different grassland stocking rates.

Table 14. Fertilizer application rates for grazing on all farms of different stocking rates in 2008. (Stocking rates in this case refers to stocking rate over the total grassland area)

Stocking Rate (kg/ha Org N)	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
< 100	21	1.1	2	0.2	5	0.4	25.0	451
100 - 130	49	2.5	3	0.2	9	0.8	32.3	241
130 - 170	92	3.3	4	0.3	11	0.8	33.1	272
170 - 210	158	6.9	5	0.7	15	1.8	29.4	91
210 - 250	199	13.6	6	1.1	15	3.4	25.9	33
> 250	140	54.7	5	1.7	13	4.8	25.1	5

The N rates for cattle and sheep (Tables 12 and 13) are well below Teagasc advice rates, thus reflecting the much lower margins for cattle and sheep enterprises and consequently the lower economic optimum N rate. However, while the application rates are low, they are difficult to interpret as the quantity of clover in the sward on the farms surveyed is unknown.

The N, P and K usage and corresponding Teagasc N, P and K advice for grazed grassland on dairy farms are compared in Table 15. Comparison between the P and K usage and the corresponding Teagasc advice for grazing cannot be done precisely because of the unavailability of soil analysis data for the Survey farms. However examination of the Johnstown Castle soil analysis results for the year 2008 shows that of 34,874 soil samples received from grazing land, the percentage with soil P levels in Index 1, Index 2, Index 3 and Index 4 were 14%, 24%, 30% and 32% respectively. For potassium, the corresponding percentages for soil K in grazed grassland were 8%, 29%, 27% and 36%.

Teagasc fertilizer advice for grazed grassland depends on the stocking rate and on the livestock system (Coulter and Lalor, 2008). Thus, if one assumes that the Survey farms had the same distribution of soil indices as the laboratory samples, one can calculate the likely P and K advice for the farms surveyed. This is discussed in the section on survey methods. Table 15 gives the results of the calculation for dairy farms at a range of stocking rates. At all stocking rates, usage of P and K was lower than the rates advised by Teagasc for optimal grassland and animal production. However, the P and K advice rates in this case does include P and K from organic fertilizers, and P from concentrate feeds. Therefore, the true deficit of usage compared to advice may be less than initially inferred by Table 15.

Table 15. Fertilizer N, P and K usage in 2008 and Teagasc N, P and K advice for grazed grassland on dairy farms. (Stocking rates in this case refers to stocking rate over the total grassland area)

Stocking Rate (kg/ha Org N)	N		P		K	
	Usage	Advice	Usage	Advice	Usage	Advice
	kg/ha					
< 100	35	40	3	9	6	26
100 - 130	76	93	4	12	12	30
130 - 170	106	158	5	15	11	33
170 - 210	168	259	5	18	15	36
210 - 250	199	279	6	21	16	39
> 250	145	279	4	21	12	42

The usage of different fertilizer compounds for grazing over all farms is summarised in Table 16. It shows the percentage of the N, P and K applications supplied by the different compounds. CAN, 27-2.5-5 and urea supplied 87% of the N. The combined usage of both CAN and urea of 65% has increased from 53% in 2003. This is most likely due to the decreased usage of P and K during this period. Over 65% of the P was supplied with 27-2.5-5 and 18-6-12, with 10-10-20 and 24-2.5-10 combined supplying 13%. The K distribution mirrored the P distribution with over 65% of the K coming from the same four compounds.

Table 16. Percentage of the total N, P and K applied for grazing in 2008 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	46.1	-	-
UREA	19.1	-	-
Potash 50% K	-	-	5.4
0 - 7 - 30	-	2.1	3.5
0 - 10 - 20	-	1.5	1.2
10 - 10 - 20	0.4	7.1	5.5
18 - 6 - 12	3.8	25.4	19.5
20 - 0 - 15	1.1	-	6.5
24 - 2.5 - 10	3.0	6.2	9.5
27 - 2.5 - 5	21.8	40.2	30.9
25 - 4 - 0	0.4	1.3	-
22 - 2.5 - 10	0.6	1.4	2.1
18 - 2.5 - 14	0.2	0.7	1.4
6 - 4.3 - 3.8	0.1	1.6	0.5
19 - 0 - 4	0.9	-	1.4
Other	2.4	12.4	12.5

Silage

The nutrients used for silage in each region are illustrated in Figure 2 and shown in Table 17. The estimated mean usage of N, P and K for silage was 101, 7 and 24 kg/ha respectively. This represents a decreased fertilizer usage since 2003 of 16% for N, 46% for P, and 41% for K. In general, the highest rates of N were found in the south-east, mid-east, midlands and south-west. The highest P and K usage was found in the midlands.

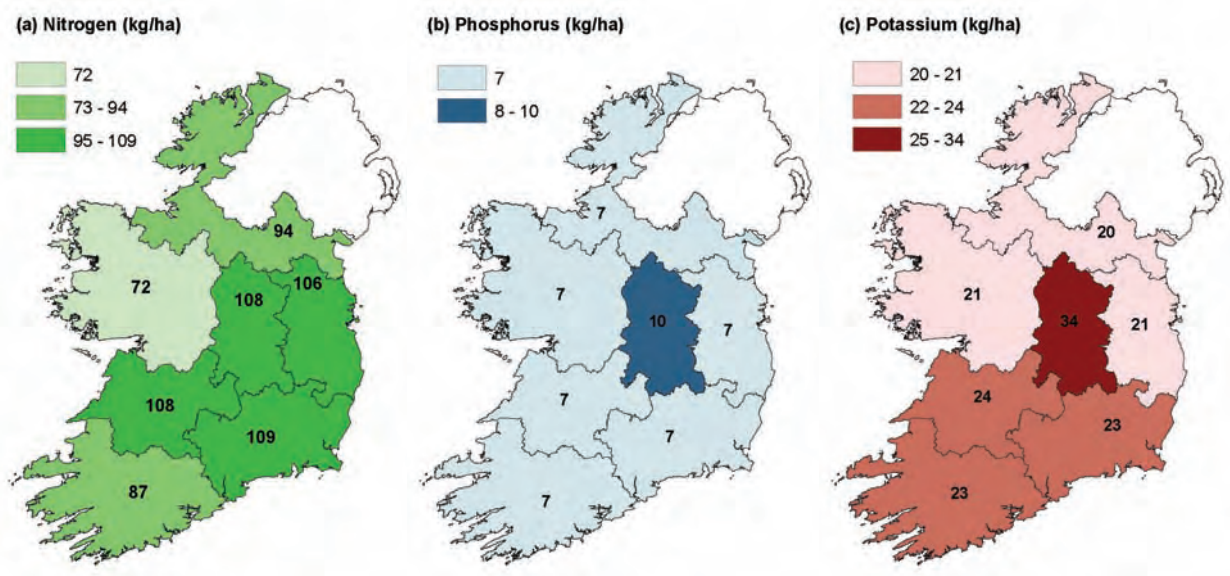

Figure 2. Regional variation in fertilizer N (a), and K (b) usage for silage in 2008

Table 17. Regional distribution of N, P and K application rates for silage in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	109	3.4	7	0.6	23	1.7	15.2	159
Mid-East	106	4.4	7	0.6	21	1.9	16.4	142
Midlands	108	4.7	10	0.7	34	2.3	14.4	129
Border	94	3.6	7	0.5	20	1.4	10.5	190
South-West	108	4.2	7	0.5	24	1.7	13.6	180
South	87	5.1	7	0.7	23	2.4	10.1	81
West	72	2.9	7	0.6	21	1.6	7.8	147
Overall	101	1.6	7	0.2	24	0.7	12.7	1028

The effect of soil quality on nutrient applications to silage is shown in Table 18. As with grazing, the highest rates of N were applied to the best soils.

Table 18. Effect of soil use class on nutrients for silage in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	108	3.0	8	0.4	24	1.3	14.5	348
Moderately Wide	103	3.2	7	0.5	22	1.6	13.3	201
Somewhat Limited	89	3.3	6	0.5	21	1.6	11.0	180
Limited	95	2.8	8	0.4	27	1.2	11.1	299
Overall	101	1.6	7	0.2	24	0.7	12.7	1028

The estimated amount of N, P and K applied to silage land in the different farm systems is shown in Table 19.

Table 19. Estimated N, P and K fertilizer applied for silage within each farming system in 2008

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	121	2.5	8	0.4	26	1.2	18.9	384
Cattle	75	1.9	7	0.3	21	0.9	8.9	522
Sheep	68	4.2	7	1.0	19	2.6	8.3	57
Tillage	90	5.1	7	0.9	25	2.9	9.6	65
Overall	101	1.6	7	0.2	24	0.7	12.7	1028

As with grazing, the N application rates are higher for silage on dairy farms than on cattle, sheep or tillage farms. However this difference was smaller than with grazing (see Table 9). The Teagasc N advice for silage cut once is 125 kg/ha before accounting for N applied in slurry which is often recycled onto silage land. For multiple cuts, 125 kg/ha is advised for the first cut and a further 100 kg/ha for each subsequent cut, again without taking account of N in the slurry.

The survey data does not contain information on the amount of slurry spread so it is difficult to determine if the average of 101 kg/ha N is in line with Teagasc advice. However, the data showed that 83.4% of the silage area had one cut of silage and 16.4% had two silage cuts, and 0.3% was cut three times. Thus it can be assumed that these percentages of farms would follow the advice for one two and three cuts respectively. Assuming most of the silage was more than 4 years since reseeding, Teagasc N advice for a composite of 83.4% of one cut and 16.4% of two cuts, and 0.3% for three cuts of silage would be 142 kg/ha assuming no slurry. Assuming a total

N content of 3.6 kg/m^3, and an N fertilizer replacement value with application in April of 25% (Coulter, 2004), a typical application rate of cattle slurry for silage of 33 m^3/ha (3000 gallons/acre) would provide approximately 30 kg/ha of N. Therefore, the current fertilizer N usage for silage appears to be lower than the Teagasc advice, even assuming that slurry N fertilizer value was being maximised fully.

Teagasc P and K advice for silage also depends on slurry or manure application rates. Assuming total P and K contents in cattle slurry of 0.6 and 4.3 kg/m^3 respectively (Coulter, 2004), a typical application rate of cattle slurry for silage of 33 m^3/ha would provide approximately 20 and 142 kg/ha of P and K respectively. Chemical fertilizer advice for silage cut once, twice and three times, both with and without this application of slurry, are shown in Table 20. The Teagasc advice rates shown are calculated based on the assumed percentages of silage area cut once, twice and three times as used above for N advice, and on the percentage of soil analysis samples for silage crops in soil P and K Index ranges of 1, 2, 3 and 4. The percentages of soil analysis samples for silage and hay crops combined in Index 1, 2, 3 and 4 were 14%, 24%, 28% and 34% respectively for P and 14%, 39%, 26% and 22% respectively for K (n=10,239).

Table 20. Teagasc P and K fertilizer advice for silage both with and without a typical application rate of 33 m^3/ha of cattle slurry (20 and 142 kg/ha of P and K respectively)

No. of Cuts	P or K Index	P		K	
		No Slurry	Slurry	No Slurry	Slurry
		kg/ha			
1 Cut	1	40	20	175	33
	2	30	10	150	8
	3	20	0	120	0
	4	0	0	0	0
2 Cut	1	50	30	245	103
	2	40	20	200	58
	3	30	10	155	13
	4	0	0	0	0
3 Cut	1	60	40	315	173
	2	50	30	250	108
	3	40	20	190	48
	4	0	0	0	0
Teagasc Advice		20	6	121	13
Fertilizer Usage in 2008		7		24	

The corresponding usage of fertilizer N, P and K for silage in 2003 was 120, 13 and 41 kg/ha respectively. The mean N, P and K usage for 2008 showed declines of 16, 46 and 41%, respectively, from the means for 2003.

The usage of different fertilizer compounds for silage over all farms is summarised in Table 21. The pattern is similar to that for grazing land. CAN, 24-2.5-10, 27-2.5-5 and urea supplied almost 88% of the N. The compounds 24-2.5-10, 18-6-12 and 27-2.5-5 supplied 80% of the P and 74% of the K.

Table 21. Percentage of the total N, P and K applied for silage in 2008 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	32.1	-	-
UREA	12.7	-	-
Potash 50% K	-	-	1.5
0 - 7 - 30	-	3.9	5.2
10 - 10 - 20	0.1	2.0	1.2
18 - 6 - 12	4.5	20.6	12.8
20 - 0 - 15	2.0	-	6.3
24 - 2.5 - 10	27.8	39.6	49.1
27 - 2.5 - 5	15.3	19.3	12.0
20 - 4 - 10	0.4	1.0	0.8
25 - 4 - 0	0.6	1.3	-
22 - 2.5 - 10	0.7	1.1	1.4
18 - 2.5 - 14	0.3	0.6	1.1
Other	3.4	10.6	8.7

The most notable change since the 2003 survey was the decline in the use of high P K compounds such as 0-7-30 and 0-10-20. In 2003, 0-7-30 supplied 15.0% of the P and 20.8% of the K for silage. In 2008 it supplied only 3.9% of P and 5.2% of K. Similarly, 0-10-20, which supplied 3.6% of the P and 2.3% of the K for silage in 2003, supplied less than 1% of P and K in 2008, and is hence included in the other category in Table 21 since its usage was not large enough to merit inclusion as an individual entry in the table. The decline in the usage of these products reflects the overall reduction in P and K fertilizer application for silage.

Hay

The N, P and K fertilizer rates for hay are summarised in Table 22 classified by region. The overall mean N, P and K usage was 54, 6 and 17 kg/ha respectively. The highest usage of N was in the south-west and south-east and the lowest in the west. The highest usage of P and K was in the midlands and south. The usage of fertilizer N has remained constant over time, having been 53 kg/ha in 2003. However, as with silage and grazing, the usage of P and K for hay has declined, from 11 and 25 kg/ha respectively in 2003.

Table 22. Regional distribution of N, P and K application rates for hay in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	67	17.2	7	1.2	18	2.5	4.1	43
Mid-East	52	5.5	6	1.2	15	3.1	4.7	45
Midlands	43	4.5	8	1.2	24	3.3	4.7	42
Border	39	6.4	4	0.8	9	2.0	3.3	31
South-West	78	8.3	7	1.2	16	2.8	4.5	47
South	51	15.8	8	2.0	26	8.0	2.8	18
West	24	4.1	3	0.8	8	1.9	2.9	36
Overall	54	3.8	6	0.5	17	1.2	4.0	262

The differences in fertilizer rates between regions are illustrated in Figure 3.

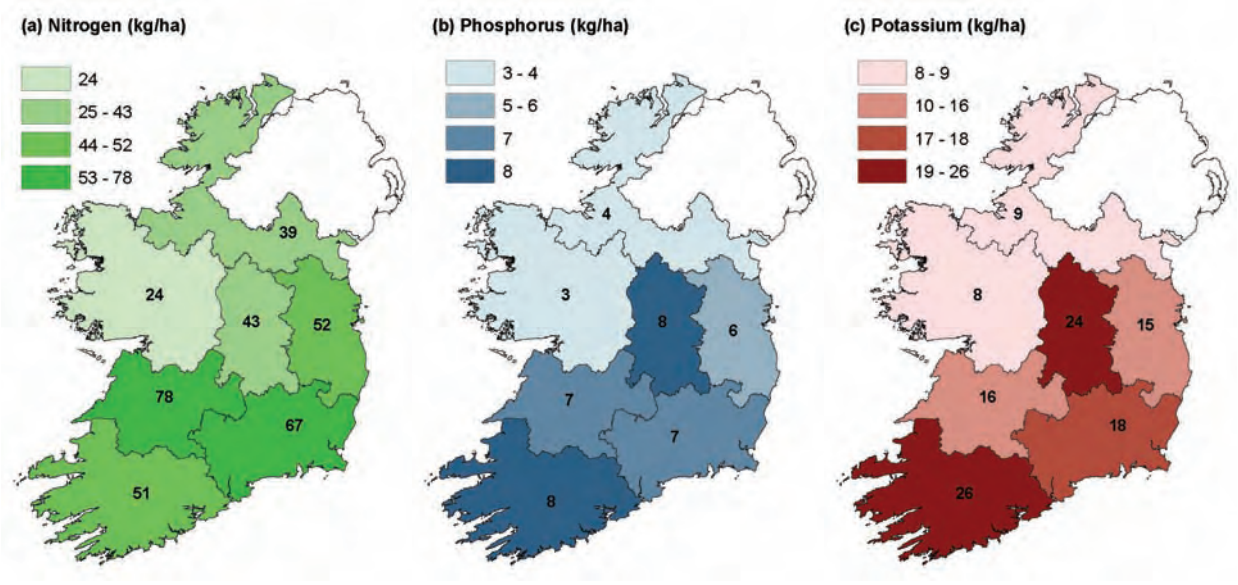

Figure 3. Regional variation in fertilizer N (a), P (b) and K (c) usage for hay in 2008

The effect of soil quality on nutrient applications for hay is shown in Table 23. The highest rates of N were applied to soil classes 1, 2 and 4.

Table 23. Effect of soil use class on nutrients for hay in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	58	4.5	7	0.8	19	2.0	4.7	107
Moderately Wide	51	6.6	6	1.1	16	3.0	4.3	55
Somewhat Limited	38	4.5	4	0.8	11	2.5	3.7	43
Limited	63	15.6	6	0.8	14	1.9	2.8	57
Overall	54	3.8	6	0.5	17	1.2	4.0	262

The estimated amount of N, P and K applied to hay in the different farming systems is shown in Table 24. The N application rates for hay are higher on dairy farms than with the other farm systems. The highest P and K usage was on tillage farms

The Teagasc N advice for each cut of hay is 65-80 kg/ha if no organic manure is applied. The mean application rate for the Survey farms was 54 kg/ha which is consistent with advice assuming good use of N from slurry and other organic fertilizers on the farms.

Table 24. Estimated N, P and K fertilizer applied to hay in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Dairy	83	11.1	7	0.8	17	2.3	3.2	82
Cattle	41	3.6	5	0.5	12	1.4	3.9	124
Sheep	45	6.3	6	1.6	18	4.0	4.2	27
Tillage	52	6.8	10	1.8	25	4.4	6.9	29
Overall	54	3.8	6	0.5	17	1.2	4.0	262

The usage of different fertilizer compounds for hay over all farms is summarised in Table 25. CAN, 27-2.5-5, 18-6-12 and 24-2.5-10 supplied over 82% of the N. Almost 80% of the P was

supplied by 18-6-12 (over 50%), 27-2.5-5 and 24-2.5-10. These three compounds also supplied over 70% of the K. As with silage, the contribution of high P K compounds such as 0-7-30 and 10-10-20 to overall P and K supply has declined by over 50% since 2003, reflecting the decreased overall usage of P and K during this period.

Table 25. Percentage of the total N, P and K applied for hay in 2008 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	29.2	-	-
UREA	9.8	-	-
0 - 7 - 30	-	2.8	4.6
10 - 10 - 20	1.0	8.9	6.9
18 - 6 - 12	17.7	50.4	38.9
20 - 0 - 15	1.3	-	3.2
24 - 2.5 - 10	13.1	11.7	18.1
27 - 2.5 - 5	22.2	17.6	13.6
Other	5.8	8.8	14.8

Grassland Overall

The overall N, P and K fertilizer rates for grassland are summarised in Table 26 and illustrated in Figure 4. The highest N rate was in the south-east and the lowest in the west. The overall mean N usage in 2008 was 86 kg/ha, which has declined by 30% from 123 kg/ha in 2003. The overall mean P and K usage was 5 and 14 kg/ha respectively in 2008. These rates are 55% and 48% lower than those of 11 kg/ha for P and 27 kg/ha for K in 2003.

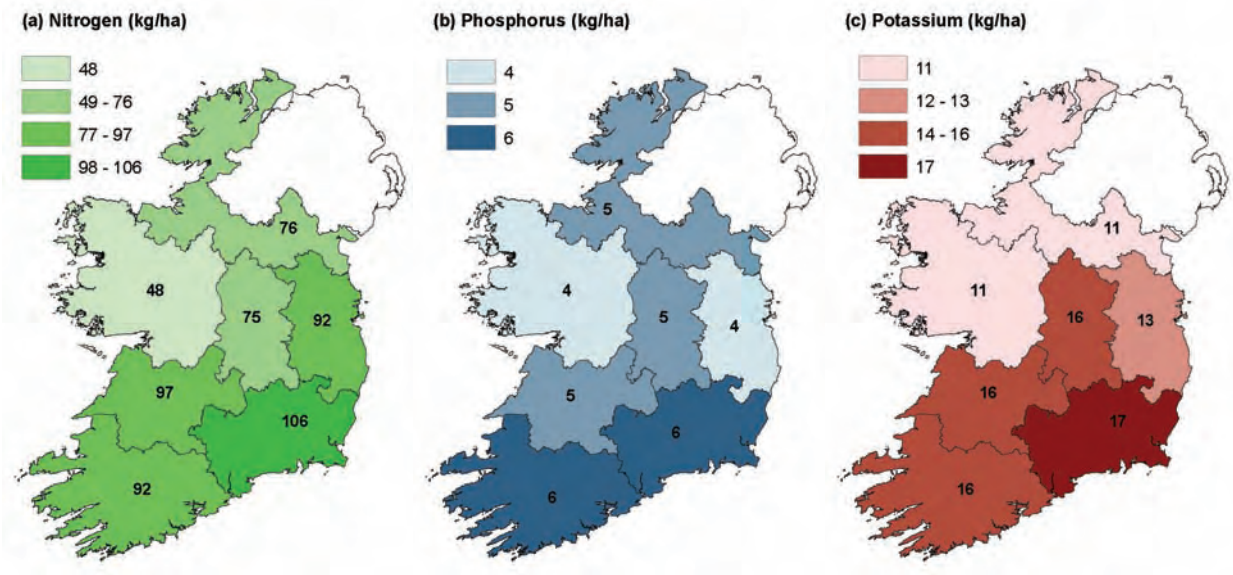

Figure 4. Regional variation in fertilizer N (a), P (b) and K (c) usage for grassland in 2008

Table 26. Regional distribution of N, P and K application rates for grassland in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	106	4.8	6	0.4	17	1.4	29.5	176
Mid-East	92	5.9	4	0.4	13	1.1	33.7	153
Midlands	75	5.2	5	0.4	16	1.2	34.0	137
Border	76	4.2	5	0.3	11	0.8	25.3	205
South-West	97	4.9	5	0.4	16	1.0	31.0	196
South	92	7.7	6	0.7	16	1.5	22.8	91
West	48	3.5	4	0.3	11	0.9	23.0	152
Overall	86	2.0	5	0.2	14	0.4	28.7	1110

The effect of soil quality on overall nutrient applications to grassland is shown in Table 27. The highest rates of N, P and K were applied to soil class 1, while soil class 2 had the next highest N rate. Standard errors for each nutrient are quite small showing that there is a consistent pattern of use across the farms. The P and K usage was more consistent across soil use classes.

Table 27. Effect of soil use class on nutrients for grassland in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	104	3.7	5	0.3	16	0.8	30.3	384
Moderately Wide	81	4.4	5	0.3	13	1.0	30.0	211
Somewhat Limited	69	4.1	4	0.3	12	1.1	27.5	195
Limited	74	3.2	5	0.3	15	0.7	26.5	320
Overall	86	2.0	5	0.2	14	0.4	28.7	1110

The overall amount of N, P and K applied to grassland in the different farming systems is shown in Table 28. As with grazing and silage, the highest rates of N, P and K were used on dairy farms followed by tillage, cattle and sheep farms.

Table 28. Estimated N, P and K fertilizer applied to grassland in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	134	3.2	6	0.3	19	0.8	34.2	391
Cattle	43	1.4	4	0.2	10	0.4	25.8	561
Sheep	40	3.0	3	0.3	7	1.3	32.9	71
Tillage	72	4.7	6	0.7	20	2.4	18.9	87
Overall	86	2.0	5	0.2	14	0.4	28.7	1110

The overall amount of N, P and K applied to grassland on all farms with different grassland stocking rates is shown in Table 29.

Table 29. Estimated N, P and K fertilizer applied to grassland at different stocking rates in 2008. (Stocking rates in this case refers to stocking rate over the total grassland area)

Stocking Rate (kg/ha Org N)	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
< 100	34	1.3	3	0.2	9	0.5	24.3	468
100 - 130	67	2.6	5	0.3	13	0.8	32.3	241
130 - 170	112	3.2	6	0.3	18	0.9	33.1	272
170 - 210	174	5.9	7	0.6	22	2.0	29.4	91
210 - 250	206	10.0	8	1.3	22	3.6	25.9	33
> 250	185	40.6	8	1.6	24	5.1	25.1	5

The usage of different fertilizer compounds for grassland over all farms is summarised in Table 30. CAN, 27-2.5-5, urea and 24-2.5-10 supplied 89% of the N. Over 75% of the P was supplied by 27-2.5-5, 18-6-12 and 24-2.5-10. These three compounds also supplied almost 67% of the K. The usage of high P K compounds such as 0-7-30 and also 10-10-20 has declined since 2003, reflecting the decreased overall usage of P and K.

Table 30. Percentage of the total N, P and K applied to grassland in 2008 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	41.2	-	-
UREA	16.8	-	-
Potash 50% K	-	-	3.4
0 - 7 - 30	-	2.9	4.3
0 - 10 - 20	-	1.3	0.9
10 - 10 - 20	0.3	5.1	3.5
18 - 6 - 12	4.3	24.2	16.9
20 - 0 - 15	1.4	-	6.3
24 - 2.5 - 10	11.4	20.2	28.3
27 - 2.5 - 5	19.6	30.9	21.6
25 - 4 - 0	0.5	1.3	-
22 - 2.5 - 10	0.7	1.3	1.8
18 - 2.5 - 14	0.3	0.7	1.3
6 - 4.3 - 3.8	0.1	1.0	0.3
Other	3.4	11.2	11.5

FERTILIZER USE ON TILLAGE CROPS

The nutrient usage for the most commonly grown tillage crops are shown and discussed in this section. Because most tillage is grown in the south, east, south-east and midlands, the coverage of some of the crops is incomplete in the regional tables. Results for crops where the mean fertilizer usage in each region, soil use class, or farm system was based on less than three farms in the survey have been omitted from the tables shown. Maps indicating regional variation in nutrient use are included for spring barley and cereal crops overall. Maps are not included for other crops due to the relatively low sample numbers.

Winter Wheat

Winter wheat was grown on 66 of the farms included in the survey. The regional distribution of fertilizer rates for winter wheat is shown in Table 31. The overall mean usage of N, P and K was 179, 19 and 52 kg/ha respectively. The usage of N has reduced by 24 kg/ha from 203 kg/ha in 2003. The usage of P and K have reduced by 4 and 3 kg/ha respectively in the same period.

Table 31. Regional distribution of N, P and K application rates for winter wheat in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	158	15.5	18	5.2	54	7.2	11	11
Mid-East	198	6.7	17	2.1	52	7.2	29	23
Midlands	138	19.3	28	3.8	72	6.8	13	6
Border	184	14.6	20	3.2	47	7.1	24	18
South-West	128	25.9	21	3.5	55	5.9	22	8
Overall	179	6.8	19	1.5	52	3.7	22	66

The effect of soil quality on nutrient applications to winter wheat is shown in Table 32.

Table 32. Effect of soil use class on nutrients for winter wheat in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	168	11.6	20	2.3	55	5.4	22	32
Moderately Wide	201	5.8	15	1.8	49	6.3	26	21
Somewhat Limited	172	15.1	19	4.2	45	9.4	17	11
Overall	179	6.8	19	1.5	52	3.7	22	66

The rates of N, P and K applied to winter wheat on farms with different farming systems are shown in Table 33.

Table 33. Estimated N, P and K fertilizer applied to winter wheat in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	173	14.5	26	4.1	58	7.6	9	15
Cattle & Sheep	202	10.0	25	5.4	65	11.7	5	5
Tillage	179	8.2	18	1.7	51	4.4	29	46
Overall	179	6.8	19	1.5	52	3.7	22	66

Teagasc N advice for winter wheat depends on both the soil N index and the yield. Taking the soil analysis data for the range of N Index values as applicable, the calculated Teagasc N advice for winter wheat yielding 9 t/ha of grain was 163 kg/ha and the advice for a higher yield of 11 t/ha was 203 kg/ha. Crop yields are not available from the survey data. However, N usage compares closely with Teagasc advice assuming a normal mixture of low and high yielding crops. The calculated mean P and K advice for winter wheat on the Survey farms was 24 and 81 kg/ha respectively, assuming a grain yield of 9 t/ha, and the removal of straw. The usage of P and K from the surveyed farms was below these advised rates, especially in the case of K, where usage rates were only 64% of the advised rates.

Spring Wheat

Spring wheat was grown on 40 of the farms included in the survey. The nutrient application rates used for spring wheat are shown in Table 34. Results from regions with less than three farms growing the crop were omitted from the table. The standard errors were high due to the small number of samples, making comparisons between the different regions difficult. However, even taking this into account, the N, P and K rates used in the midlands region were very low compared to elsewhere. The overall mean usage rates of N, P and K were 139, 20 and 49 kg/ha respectively. Since 2003, the rate of N usage has decreased by 13%, while the usage of P and K has decreased by 17% and 8% respectively.

Table 34. Regional distribution of N, P and K application rates for spring wheat in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
South-East	157	14.5	26	2.5	56	5.2	9	18
Mid-East	152	17.0	16	3.5	47	11.6	8	8
Midlands	44	24.9	11	5.3	21	10.7	5	6
South-West	127	17.5	18	5.3	49	10.5	6	6
Overall	139	10.1	20	1.9	49	4.2	8	40

The effect of soil quality on nutrient applications to spring wheat is shown in Table 35. The results from farms with somewhat limited (n=1) and limited (n=2) soil use classes were omitted from the table.

Table 35. Effect of soil use class on nutrients for spring wheat in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	122	11.2	20	2.4	47	4.8	8	25
Moderately Wide	183	18.0	20	4.2	55	9.5	8	12
Overall	139	10.1	20	1.9	49	4.2	8	40

The rates of N, P and K applied to spring wheat in the different farming systems are shown in Table 36.

Table 36. Estimated N, P and K fertilizer applied to spring wheat in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	122	12.9	20	2.2	45	5.3	8	19
Cattle & Sheep	55	48.7	9	8.0	18	16.1	4	3
Tillage	169	13.6	22	3.4	57	6.5	7	18
Overall	139	10.1	20	1.9	49	4.2	8	40

The calculated mean Teagasc N advice for spring wheat was 141 kg/ha, assuming grain yields of 8.5 t/ha. Thus the N usage on the Survey farms of 139 kg/ha compared closely with Teagasc advice. The calculated advice rates for P and K were 24 and 89 kg/ha, assuming straw removal. As with winter wheat, the fertilizer usage of P and K for spring wheat was below the rates advised.

Winter Barley

This crop was grown on 22 farms in the survey. The nutrients used for winter barley are shown in Table 37. Results from regions with less than three farms growing the crop were omitted from the table. The overall mean usage of N, P and K was 163, 25 and 64 kg/ha. Since 2003, there has been a slight decrease in the usage of N (2%) and a larger decrease in P (17%) and K (10%).

Table 37. Regional distribution of N, P and K application rates for winter barley in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Mid-East	183	15.4	14	4.9	53	14.4	10	6
Border	158	13.4	29	3.2	65	9.4	19	11
Overall	163	10.0	25	2.5	64	6.2	15	22

Winter barley was grown on only three of the soil classes (Table 38). The results from farms with somewhat limited use class were omitted from the table (n=1).

Table 38. Effect of soil use class on nutrients for winter barley in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	158	14.8	29	2.8	70	8.2	17	12
Moderately Wide	165	13.9	16	3.4	50	10.0	11	9
Overall	163	10.0	25	2.5	64	6.2	15	22

The rates of N, P and K applied to spring wheat in the different farming systems are shown in Table 39. The N, P and K rates on tillage farms were higher than those for mainly dairy farms. One cattle or sheep farm also had a winter barley crop (omitted from table).

Table 39. Estimated N, P and K fertilizer applied to winter barley in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Dairy	136	3.5	4	5.0	11	11.0	7	3
Tillage	164	11.5	27	2.4	68	6.3	17	18
Overall	163	10.0	25	2.5	64	6.2	15	22

The calculated mean Teagasc N advice for winter barley was 143 kg/ha, assuming grain yields of 8.5 t/ha. Thus, the N usage on the survey farms of 163 kg/ha was higher than Teagasc advice. The calculated advice rates for P and K were 24 and 77 kg/ha, assuming straw removal. The advised rate of P compared closely with the fertilizer usage in this survey, while K usage was only 83% of the rate advised.

Spring Barley

Spring barley was grown on 184 of the farms included in the survey. The survey separated spring barley crops grown for feed from those grown for malting (discussed in next section). The nutrients used for spring barley are shown in Table 40. The regional variation in fertilizer use on spring barley is illustrated in Figure 5. There was a much wider occurrence of this crop than winter barley although the number of occurrences in the survey for the western counties was small (omitted from Table 40). The overall mean usage of N, P and K was 118, 21 and 45 kg/ha respectively. This represents a decrease in nutrient usage of 4% for N, 19% for P and 18% for K since 2003.

Table 40. Regional distribution of N, P and K application rates for spring barley in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
South-East	120	3.6	19	1.2	41	2.9	17	52
Mid-East	129	4.9	18	1.7	44	5.0	16	40
Midlands	110	5.2	21	1.9	48	3.2	18	30
Border	117	7.0	22	3.2	39	3.4	13	33
South-West	118	5.9	27	1.8	56	3.4	22	22
South	88	10.9	24	3.6	49	7.3	14	4
Overall	118	2.3	21	0.9	45	1.7	16	184

The effect of soil quality on nutrient applications to spring barley is shown in Table 41.

Table 41. Effect of soil use class on nutrients for spring barley in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	115	3.3	24	1.3	48	2.1	17	96
Moderately Wide	126	3.3	16	1.3	42	2.7	14	61
Somewhat Limited	116	9.0	20	2.9	42	9.7	17	17
Limited	116	5.6	22	2.2	48	3.7	16	10
Overall	118	2.3	21	0.9	45	1.7	16	184

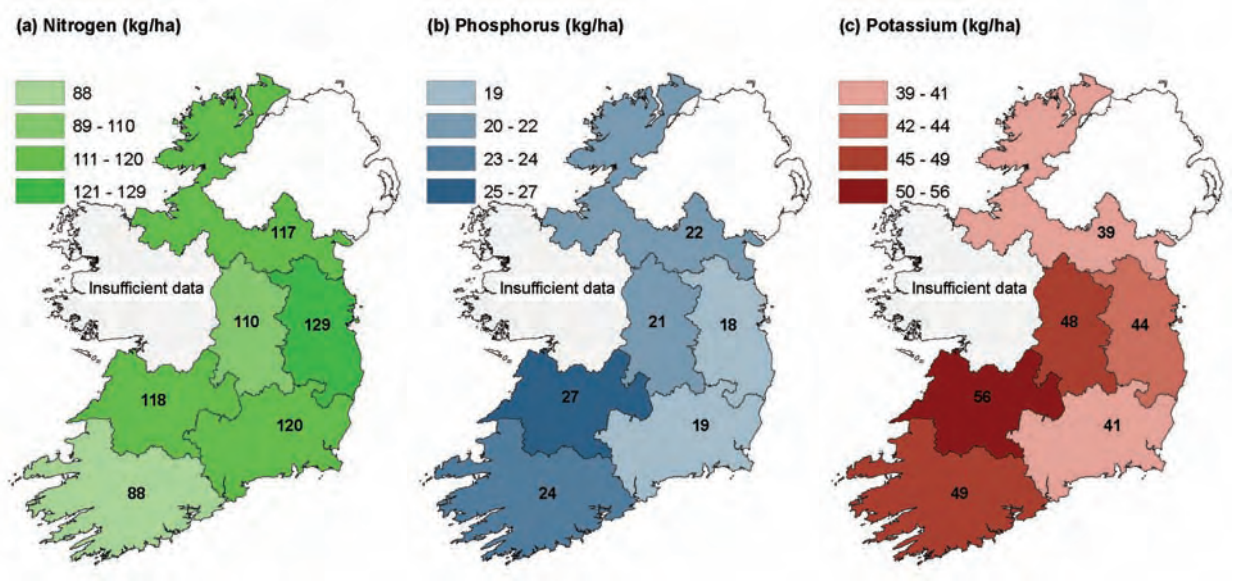

Figure 5. Regional variation in fertilizer N (a), P (b) and K (c) usage for spring barley in 2008

The rates of N, P and K applied to spring barley in the different farming systems are shown in Table 42.

Table 42. Estimated N, P and K fertilizer applied to spring barley in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	111	5.0	21	1.6	42	3.2	11	57
Cattle & Sheep	114	4.4	22	2.0	53	3.6	7	43
Tillage	122	3.0	21	1.3	46	2.5	24	84
Overall	118	2.3	21	0.9	45	1.7	16	184

The calculated mean Teagasc N advice for spring barley was 116 kg/ha, assuming grain yields of 7.5 t/ha. The N usage on the survey farms of 118 kg/ha compared closely with Teagasc advice. The calculated advice rates for P and K were 24 and 77 kg/ha, assuming straw removal. The usage rate of P was 88% of the advice rate, while K usage was low, at 58% of the rate advised.

Malting Barley

In addition to the spring barley included in the previous section, 30 farms in the survey had spring barley crops for malting. The nutrients used for malting barley are shown in Table 43. The overall mean usage of N, P and K was 117, 16 and 48 kg/ha respectively. The N and K rates applied were similar to those for spring barley crops. However, the mean usage of P was 5 kg/ha lower on malting barley than on other spring barley Compared with 2003, the usage of N on malting barley has increased slightly by 4%, while P and K usage have declined by 20% and 13% respectively.

Table 43. Regional distribution of N, P and K application rates for malting barley in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
South-East	121	6.6	15	2.7	45	8.0	17	16
Midlands	110	6.8	19	3.3	62	3.7	23	7
Mid-East	123	6.3	8	7.3	16	14.5	11	3
South-West	110	9.1	14	7.4	28	14.8	7	4
Overall	117	4.2	16	1.9	48	5.2	17	30

The effect of soil quality on nutrient applications to malting barley is shown in Table 44.

Table 44. Effect of soil use class on nutrients for malting barley in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	113	4.0	17	2.0	43	4.6	17	26
Moderately Wide	141	13.6	7	4.4	79	21.3	16	4
Overall	117	4.2	16	1.9	48	5.2	17	30

The rates of N, P and K applied to malting barley in the different farming systems are shown in Table 45.

Table 45. Estimated N, P and K fertilizer applied to malting barley in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Dairy	123	5.8	20	3.0	44	6.4	11	12
Tillage	114	6.2	14	2.6	49	8.1	20	16
Overall	117	4.2	16	1.9	48	5.2	17	30

Teagasc N, P and K advice for malting barley is the same as that for spring barley. Fertilizer N usage on malting barley was almost equal to the calculated N advice, while the usage of P and K were only 67% and 62% of the rates advised.

Winter Oats

Winter oats was grown on 30 of the farms included in the survey. The nutrients used for winter oats are shown in Table 46. Results from regions with less than three farms growing the crop were omitted from the table. The overall mean usage of N, P and K was 141, 23 and 51 kg/ha respectively. The usage of all elements was similar to that of 2003, with small increases in the usage of N and K of 2% and 6%, and a decrease in the usage P of 12% since 2003.

Table 46. Regional distribution of N, P and K application rates for winter oats in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
South-East	133	14.3	26	4.1	51	11.1	9	8
Mid-East	138	15.7	15	3.9	44	9.8	12	13
Border	158	9.9	28	5.8	59	11.2	15	7
Overall	141	8.3	23	2.9	51	5.8	12	30

The effect of soil quality on nutrient applications to winter oats is shown in Table 47. The rate of N, P and K applied to spring barley in the different farming systems is shown in Table 48.

Table 47. Effect of soil use class on nutrients for winter oats in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	148	12.9	35	3.6	68	7.9	12	12
Moderately Wide	147	8.2	14	3.0	43	8.5	12	12
Somewhat Limited	117	28.8	18	7.3	36	14.6	12	6
Overall	141	8.3	23	2.9	51	5.8	12	30

Table 48. Estimated N, P and K fertilizer applied to winter oats in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Dairy	143	63.8	22	15.3	44	30.6	4	3
Cattle & Sheep	107	38.9	35	13.6	71	27.1	5	3
Tillage	143	8.6	23	3.1	51	6.3	14	24
Overall	141	8.3	23	2.9	51	5.8	12	30

The calculated mean Teagasc N advice for winter oats was 126 kg/ha, assuming grain yields of 7.5 t/ha. The N usage on the survey farms of 141 kg/ha was higher than Teagasc advice. The calculated advice rates for P and K were 24 and 95 kg/ha, assuming straw removal. The usage rate of P was 96% of the advice rate, while K usage was low, being 54% of the rate advised.

Spring Oats

Spring oats was grown on 16 of the farms included in the survey. The nutrients used for spring oats, including the effect of farm system, are shown in Table 49. Results from soil use classes with less than three farms growing the crop were omitted from the table. The overall mean usage of N, P and K was 75, 11 and 23 kg/ha respectively. Compared with 2003, fertilizer usage has declined by 34, 56 and 53% in the case of N, P and K respectively.

Table 49. Estimated N, P and K fertilizer applied to spring oats in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Dairy	85	19.0	23	2.8	46	5.5	6	4
Cattle & Sheep	14	17.2	6	7.5	12	15.1	3	5
Tillage	85	32.1	8	3.7	15	7.6	8	7
Overall	75	17.9	11	3.0	23	6.0	6	16

The calculated mean Teagasc N advice for spring oats was 96 kg/ha, assuming grain yields of 6.5 t/ha. The N usage on the survey farms of 75 kg/ha was lower than Teagasc advice. The calculated advice rates for P and K were 24 and 85 kg/ha, assuming straw removal. The usage rate of P was low, being 46% of the advice rate, while K usage was even lower, at only 27% of the rate advised.

Cereals Overall

A total of 242 farms in the survey had a cereal crop. The mean application rates of the nutrients used on all cereals crops are shown in Table 50. The overall mean usage of N, P and K was 137, 20 and 48 kg/ha respectively. The usage of all elements was lower than in 2003. Overall, N usage has decreased by 15 kg/ha (10%), P usage has decreased by 5 kg/ha (20%), and K usage has decreased by 8 kg/ha (14%). The differences in fertilizer rates between regions are illustrated in Figure 6.

Table 50. Regional distribution of N, P and K application rates for all cereal crops in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
South-East	128	3.5	20	1.1	45	2.7	22	68
Mid-East	159	6.3	17	1.3	46	4.4	30	55
Midlands	112	5.2	21	1.6	53	3.0	21	42
Border	151	8.3	22	2.1	48	3.5	31	40
South-West	121	7.7	24	1.8	55	3.2	26	28
South	84	13.4	23	4.1	46	8.2	12	5
Overall	137	2.9	20	0.7	48	1.6	25	242

The effect of soil quality on nutrient applications to cereal crops is shown in Table 51.

Table 51. Effect of soil use class on nutrients for all cereal crops in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Wide	130	3.9	23	1.0	51	1.9	24	139
Moderately Wide	155	4.3	16	1.1	47	3.1	26	71
Somewhat Limited	135	11.9	19	2.3	41	7.3	29	21
Limited	110	6.4	24	2.2	52	4.3	19	11
Overall	137	2.9	20	0.7	48	1.6	25	242

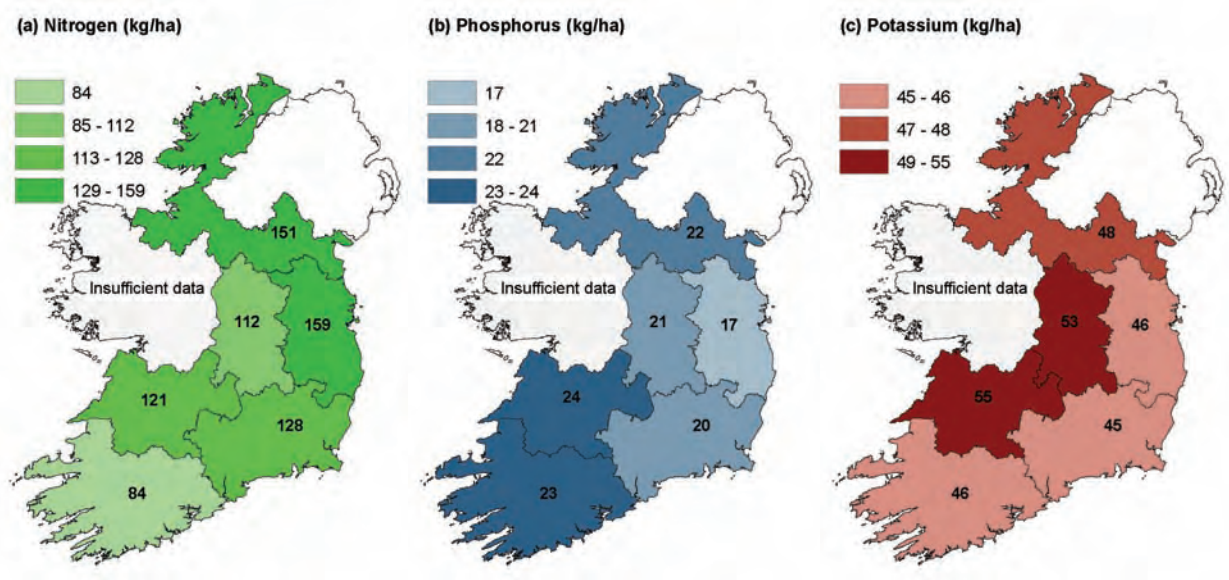

Figure 6. Regional variation in fertilizer N (a), P (b) and K (c) usage for all cereals crops in 2008

The N, P and K rates applied to cereals in the different farming systems are shown in Table 52.

Table 52. Estimated N, P and K fertilizer applied to all cereal crops in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	121	4.7	21	1.3	44	2.6	14	83
Cattle & Sheep	117	6.1	21	1.8	52	3.4	8	51
Tillage	143	4.3	20	1.0	49	2.4	42	108
Overall	137	2.9	20	0.7	48	1.6	25	242

Fertilizer Compounds for Cereals

The fertilizer compounds used for supply of N, P and K to cereals are listed in Tables 53-55. Fertilizer types that did not supply more than 1% of the N, P or K to any crop are combined within the 'other' fertilizer type category. These compounds combined to make up a substantial proportion of the nutrients applied, particularly in the case of P and K. This may be indicative of a move away from traditional fertilizer compounds to using more specialised fertilizer blends.

Table 53. Percentage of the total N applied to cereal crops in 2008 that was supplied with each fertilizer type

Fertilizer Type	Crop							
	W. Wheat	S. Wheat	W. Barley	S. Barley	M. Barley	W. Oats	S. Oats	All cereals
CAN	72.7	53.3	55.6	54.8	56.8	66.9	32.9	61.2
UREA	5.5	7.4	7.3	-	-	2.5	-	3.2
Potash 50%K	-	-	-	-	-	-	-	-
0 - 7 - 30	-	-	-	-	-	-	-	-
0 - 10 - 20	-	-	-	-	-	-	-	-
10 - 5 - 25	-	-	-	-	-	-	-	0.3
10 - 10 - 20	2.4	3.0	2.4	4.4	1.1	6.9	-	3.5
14 - 7 - 14	-	-	-	1.3	2.8	-	-	0.8
15 - 3 - 20	-	2.9	-	-	9.3	-	-	0.9
15 - 10 - 10	-	-	-	0.3	-	-	-	-
18 - 6 - 12	5.2	24.1	22.9	27.1	21.5	9.2	32.2	18.3
20 - 0 - 15	1.2	2.1	-	2.6	-	-	-	1.8
24 - 2.5 - 10	-	-	-	2.3	-	-	-	1.3
27 - 2.5 - 5	-	-	-	1.5	-	-	32.9	1.1
25 - 4 - 0	-	-	-	-	-	-	-	0.9
16 - 4 - 20	-	-	-	0.6	-	-	-	0.3
Other	12.9	7.2	11.8	5.0	8.4	14.5	2.0	6.4

Table 54. Percentage of the total P applied to cereal crops in 2008 that was supplied with each fertilizer type

Fertilizer Type	Crop							
	W. Wheat	S. Wheat	W. Barley	S. Barley	M. Barley	W. Oats	S. Oats	All cereals
CAN	-	-	-	-	-	-	-	-
UREA	-	-	-	-	-	-	-	-
Potash 50%K	-	-	-	-	-	-	-	-
0 - 7 - 30	9.2	-	14.0	-	-	-	-	3.4
0 - 10 - 20	6.1	-	-	1.0	-	-	-	3.2
10 - 5 - 25	-	-	-	-	-	-	-	1.0
10 - 10 - 20	23.6	22.7	15.6	26.9	8.2	41.9	-	24.8
14 - 7 - 14	-	-	-	4.0	10.6	-	-	3.0
15 - 3 - 20	-	4.4	-	-	14.0	-	-	1.3
15 - 10 - 10	-	-	-	1.3	-	-	-	-
18 - 6 - 12	16.9	60.2	49.8	55.3	53.9	18.7	71.5	43.5
20 - 0 - 15	-	-	-	-	-	-	-	-
24 - 2.5 - 10	-	-	-	1.5	-	-	-	0.9
27 - 2.5 - 5	-	-	-	0.9	-	-	20.3	0.7
25 - 4 - 0	-	-	-	-	-	-	-	1.0
16 - 4 - 20	-	-	-	0.9	-	-	-	0.6
Other	44.2	12.7	20.7	8.1	13.3	39.5	8.2	16.5

Table 55. Percentage of the total K applied to cereal crops in 2008 that was supplied with each fertilizer type

Fertilizer Type	Crop							
	W. Wheat	S. Wheat	W. Barley	S. Barley	M. Barley	W. Oats	S. Oats	All cereals
CAN	-	-	-	-	-	-	-	-
UREA	-	-	-	-	-	-	-	-
Potash 50%K	3.1	5.7	-	3.8	8.4	5.3	-	4.2
0 - 7 - 30	14.0	-	23.4	-	-	-	-	5.7
0 - 10 - 20	4.3	-	-	0.9	-	-	-	2.5
10 - 5 - 25	-	-	-	-	-	-	-	2.0
10 - 10 - 20	16.8	17.1	12.1	22.9	5.3	37.6	-	19.6
14 - 7 - 14	-	-	-	3.4	6.9	-	-	2.4
15 - 3 - 20	-	11.0	-	-	30.4	-	-	3.5
15 - 10 - 10	-	-	-	0.6	-	-	-	-
18 - 6 - 12	12.0	45.5	38.9	47.0	35.1	16.8	71.0	34.5
20 - 0 - 15	3.2	4.6	-	5.0	-	-	-	3.9
24 - 2.5 - 10	-	-	-	2.5	-	-	-	1.5
27 - 2.5 - 5	-	-	-	0.7	-	-	20.1	0.6
25 - 4 - 0	-	-	-	-	-	-	-	-
16 - 4 - 20	-	-	-	2.0	-	-	-	1.1
Other	46.5	16.0	25.5	11.3	13.8	40.2	8.9	18.5

As in 2003, CAN and 18-6-12 are the dominant sources of N, while 18-6-12 and 10-10-20 are the most common P and K sources.

Fodder Beet

Fodder beet was grown on 49 of the farms included in the survey. The nutrients used for fodder beet are shown in Table 56. Results from regions with less than three farms growing the crop were omitted from the table. The overall mean usage of N, P and K was 155, 51 and 184 kg/ha respectively. The usage of all elements has increased since 2003. Overall, N usage has increased by 20%, P usage has increased by 6%, and K usage has increased by 22%.

Table 56. Regional distribution of N, P and K application rates for fodder beet in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	131	15.8	53	5.4	190	11.2	3	20
Mid-East	178	14.8	46	9.4	184	39.4	13	6
Midlands	136	18.2	54	7.2	192	26.9	3	12
South-West	226	31.8	59	13.7	190	46.9	2	8
Overall	155	9.3	51	3.5	184	11.7	4	49

The effect of soil quality on nutrient applications to fodder beet is shown in Table 57. Results from soil use classes with only two or less farms growing fodder beet are omitted from the table.

Table 57. Effect of soil use class on nutrients for fodder beet in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	152	14.6	46	6.7	144	21.4	3	26
Moderately Wide	165	12.6	52	3.4	209	10.5	8	13
Limited	121	25.7	59	9.0	202	27.1	3	8
Overall	155	9.3	51	3.5	184	11.7	4	49

The rates of N, P and K applied to fodder beet in the different farming systems are shown in Table 58.

Table 58. Estimated N, P and K fertilizer applied to fodder beet in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	141	17.3	52	5.9	188	18.6	3	22
Cattle & Sheep	171	25.8	69	5.4	232	11.1	2	9
Tillage	161	12.1	47	5.4	173	19.7	6	18
Overall	155	9.3	51	3.5	184	11.7	4	49

The mean Teagasc recommendations for N, P and K (assuming 200 mm of rainfall between April and June) were 155, 44 and 202 kg/ha respectively. The K advice for fodder beet is total advice for K and sodium (Na). The N usage is equal to the advice, while P usage was 16% higher than the calculated advised rate, and K usage was 9% less than the calculated advice. The deficit in K usage compared to advice may be compensated to some extent through the inclusion of Na in some compound fertilizers used on beet crops.

Potatoes

Potatoes were grown on 10 of the farms included in the survey. The nutrients used for potatoes are shown in Table 59. Results from regions with less than three farms growing potatoes were omitted from the table. The overall mean usage of N, P and K was 93, 73 and 170 kg/ha respectively. The usage of all elements has decreased since 2003. Overall, N usage has decreased by 19%, P usage has decreased by 29%, and K usage has decreased by 24%.

Table 59. N, P and K application rates for potatoes in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Border	121	7.3	107	11.8	228	11.6	10	5
Mid-East	69	19.6	42	28.7	99	55.7	20	3
Overall	93	11.4	73	15.2	170	31.9	12	10

The effect of soil quality and farm system on nutrient application rates are not shown due to small sample numbers.

The mean Teagasc recommendations for N, P and K depends on whether the crop is grown as a main crop, a seed crop, or an early crop. The calculated N P and K advice rates for main crop potatoes were 155, 85 and 215 kg/ha respectively. The fertilizer usage for all elements was less than the calculated advice rates. However, the small sample number, combined with the absence of information on crop type (main, seed or early) limits the scope to make comparisons.

Root Crops Overall

The mean fertilizer usage on all root crops (Potatoes (n=10), fodder beet (n=49), sugar beet (n=1), turnips (n=5), and kale and rape (n=29)) is shown in Table 60. Results from regions with less than three farms growing the crop were omitted from the table. The mean overall usage rates of N, P and K were 106, 46 and 138 kg/ha respectively.

Table 60. Regional distribution of N, P and K application rates for all root crops in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
South-East	93	11.2	39	5.5	136	17.2	4	33
Mid-East	103	21.0	38	8.9	130	25.3	14	13
Midlands	114	18.4	45	7.0	153	26.2	3	14
Border	118	6.8	96	15.5	210	21.2	10	6
South-West	128	25.2	32	6.7	85	20.0	4	14
Overall	106	7.5	46	3.9	138	9.9	6	84

The effect of soil quality on nutrient applications to root crops is shown in Table 61.

Table 61. Effect of soil use class on nutrients for all root crops in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	115	11.3	37	4.9	108	15.8	4	40
Moderately Wide	125	12.9	64	7.8	188	15.1	8	24
Somewhat Limited	56	15.8	24	6.2	82	14.6	10	9
Limited	85	22.7	40	9.0	134	28.8	3	11
Overall	106	7.5	46	3.9	138	9.9	6	84

The rate of N, P and K applied to root crops in the different farming systems is shown in Table 62.

Table 62. Estimated N, P and K fertilizer applied to all root crops in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	93	11.8	32	4.2	105	13.5	4	35
Cattle & Sheep	58	17.4	28	6.3	103	18.7	3	23
Tillage	128	10.5	60	7.3	167	17.4	10	26
Overall	106	7.5	46	3.9	138	9.9	6	84

Fertilizer Compounds for Root Crops

The fertilizer compounds used for supply of N, P and K to root crops are shown in Table 63. Fertilizer types that did not supply more than 1% of the N, P or K are combined within the 'other' fertilizer type category.

Table 63. Percentage of the total N, P and K applied for all root crops in 2008 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	22.6	-	-
UREA	17.2	-	-
0 - 7 - 30	-	11.5	16.4
8 - 5 - 18	16.8	24.3	29.0
13 - 4 - 14	5.6	3.9	4.6
7 - 6 - 17	5.5	11.0	10.3
10 - 10 - 20	15.1	35.0	23.2
18 - 6 - 12	9.3	7.2	4.8
10 - 3 - 18	2.7	1.8	3.7
Other	5.1	5.3	8.1

Forage Maize

Forage maize was grown on 64 of the farms included in the survey. The total and regional distribution of fertilizer rates for forage maize is shown in Table 64. Results from regions with less than three farms growing the crop were omitted from the table. The overall mean usage of N, P and K was 152, 41 and 96 kg/ha respectively. The usage of N, P and K were all higher than in 2003.

Table 64. Regional distribution of N, P and K application rates for forage maize in 2008

Region	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
South-East	134	11.3	33	4.6	66	10.1	6	18
Mid-East	183	30.1	24	4.9	66	10.5	9	15
Midlands	152	27.9	32	4.0	99	20.2	8	7
Border	127	9.3	81	14.1	164	27.2	8	9
South-West	158	20.3	51	10.9	124	22.7	7	13
Overall	152	10.0	41	4.1	96	8.4	7	64

The effect of soil quality on nutrient applications to forage maize is shown in Table 65.

Table 65. Effect of soil use class on nutrients for forage maize in 2008

Soil Use Class	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Wide	160	14.8	46	5.7	103	11.7	8	39
Moderately Wide	146	14.7	21	3.8	70	16.3	8	11
Somewhat Limited	137	20.6	48	9.7	107	16.0	6	9
Limited	118	27.3	43	16.3	85	32.5	6	5
Overall	152	10.0	41	4.1	96	8.4	7	64

The amount of N, P and K applied to forage maize on farms with different farming systems is shown in Table 66.

Table 66. Estimated N, P and K fertilizer applied to forage maize in 2008 within each farming system

Farm System	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Dairy	159	14.5	33	3.5	78	7.7	7	42
Cattle & Sheep	164	15.9	31	5.5	81	17.8	6	11
Tillage	123	10.2	74	13.7	160	24.7	9	11
Overall	152	10.0	41	4.1	96	8.4	7	64

The mean Teagasc recommendations for N, P and K were 158, 37 and 199 kg/ha respectively. The N and P usage are comparable with the N and P advice. However, the K usage is only 48% of the calculated advice. However, this may be explained in part by the common practice to apply cattle slurry, which has high K contents, before sowing forage maize. The N, P and K advice was calculated for crops receiving no slurry.

The usage of different fertilizer compounds for forage maize over all farms is summarised in Table 67.

Table 67. Percentage of the total N, P and K applied for forage maize in 2008 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	30.6	-	-
UREA	5.2	-	-
SUPER16% P	-	4.0	-
Potash 50% K	-	-	3.8
0 - 7 - 30	-	3.5	6.4
0 - 10 - 20	-	1.3	1.1
7 - 6 - 17	0.3	1.0	1.2
10 - 10 - 20	12.2	44.7	38.4
18 - 6 - 12	26.2	32.0	27.5
24 - 2.5 - 10	15.0	5.7	9.8
27 - 2.5 - 5	3.6	1.2	1.0
Other	7.0	6.6	10.7

CHANGES IN FERTILIZER USE FROM 1995-2008

The N, P and K usage for grassland and crops are detailed in Appendices 1-4 for the years 2004 to 2007 respectively. Data for years previous to 2004 were sourced from previous fertilizer use surveys (Coulter *et al.*, 2002; Coulter *et al.*, 2005).

Grassland

A summary of nutrient usage for grassland for the years 1995-2008 is shown in Table 68.

Table 68. Mean fertilizer nutrient use for grassland from 1995-2008

Year	N	P	K	Mean Area (ha)	No. of Farms
	kg/ha				
1995	123	16	39	33	1207
1999	145	13	34	37	1097
2000	136	13	33	39	1112
2001	133	11	30	41	1207
2002	126	11	28	39	1224
2003	123	11	27	40	1251
2004	113	11	27	27	1240
2005	112	10	26	27	1198
2006	107	9	23	28	1203
2007	98	7	20	28	1213
2008	86	5	14	29	1110

Because grassland is the major crop grown in Ireland, one would expect a strong relationship between usage of N, P and K and national sales of the elements as chemical fertilizers (Appendix 6). The changes in N usage from 1995 to 2008 (Figure 7) appear to be similar to those for national N sales. The correlation coefficient of 0.87 was statistically significant. The relationship between P and K usage and national sales of the elements (Figures 6 and 7) are even stronger, with correlation coefficients of 0.99 and 0.98 respectively.

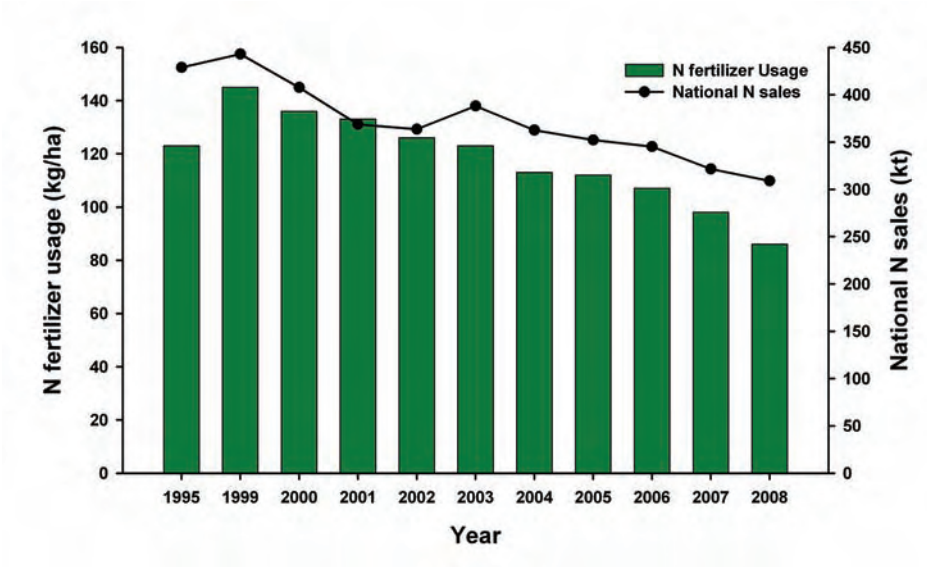

Figure 7. N fertilizer usage on grassland and national sales of N from 1995 to 2008

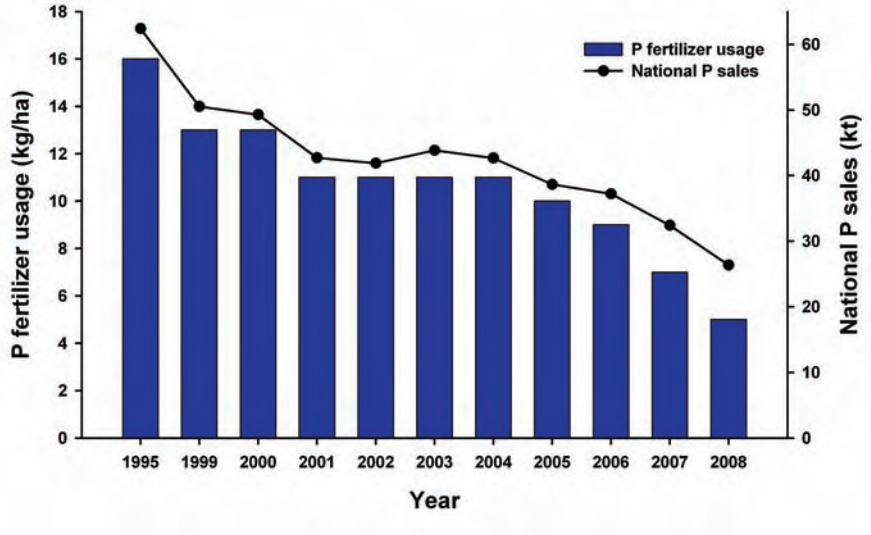

Figure 8. P fertilizer usage on grassland and national sales of P from 1995 to 2008

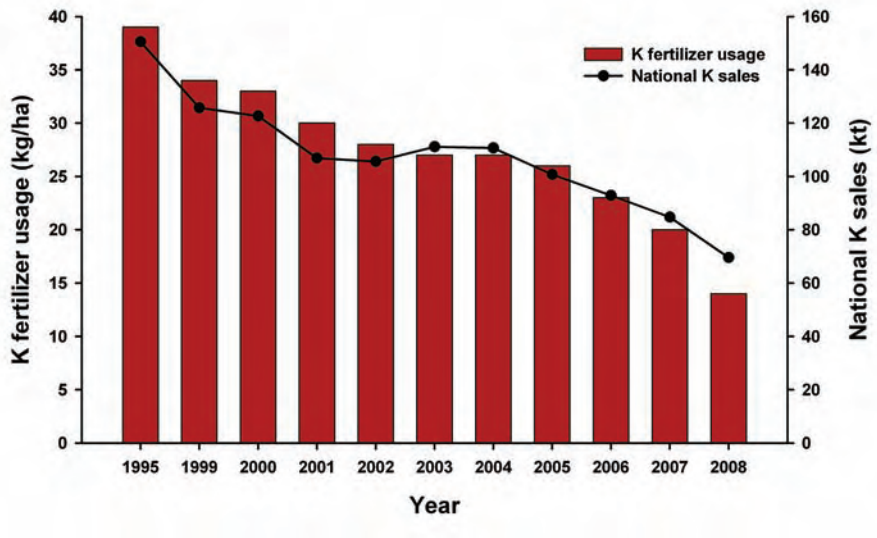

Figure 9. K fertilizer usage on grassland and national sales of K from 1995 to 2008

Tillage Crops

A summary of nutrient usage for cereals and root crops for the years 1995-2008 is shown in Table 69. The N usage for cereal crops was 10% lower in 2008 compared with 2003. However, N usage in 2008 was equal to that of 1995. P and K usage have decreased by 23 and 30% respectively between 1995 and 2008, with a large proportion of this decrease occurring since 2006. For root crops, the usage of all three nutrients decreased markedly in 2008 compared with 1995; the changes were 34, 39 and 31% for N, P and K respectively.

Table 69. Mean fertilizer nutrient use for tillage crops from 1995-2008

Year	N	P	K	Mean Farm Area (ha)	No. of Farms
	kg/ha				
Cereals					
1995	137	26	69	18	262
1999	127	25	56	23	210
2000	160	25	60	28	214
2001	147	24	53	27	240
2002	157	25	56	28	255
2003	152	25	56	30	247
2004	148	26	60	28	244
2005	140	26	58	22	210
2006	146	25	57	23	201
2007	148	22	52	23	223
2008	137	20	48	25	242
Root Crops					
1995	161	76	199	5	211
1999	154	62	190	7	126
2000	146	70	187	8	112
2001	151	74	208	9	120
2002	142	57	169	9	123
2003	139	58	168	9	117
2004	146	63	191	9	120
2005	154	58	193	8	119
2006	113	51	187	7	91
2007	108	50	160	8	83
2008	106	46	138	6	84

FERTILIZER USE ON FARMS IN THE REPS SCHEME

There were a total of 574 farms in the survey participating in the national Rural Environmental Protection Scheme (REPS). The objectives of REPS are to establish procedures and production methods which help environmental protection by good farming practice and improved management of farm nutrients. Thus, REPS participants must abide by regulations which limit the amount of chemical fertilizers and organic nutrients that can be applied to their crops. There are whole farm stocking rate limits, organic nutrient limits, fertilizer application limits and other obligations. The REPS scheme is voluntary, and individual farmers could choose to avail of it or operate outside of it.

Of the farms 1110 in the survey that had grassland, 509 were participants in REPS. The range of crops was not as variable on the REPS farms as on non-REPS farms; 89% of the REPS farms had grassland (Table 70) but a relatively small number grew tillage crops (Table 71). The area under the different crops also tended to be smaller on REPS farms.

Table 70. Number of grassland farms and mean area of grassland crops on REPS and non-REPS farms in 2008

Crop	REPS Farms		Non-REPS Farms	
	No.	Mean Area (ha)	No.	Mean Area (ha)
Grazing	500	28.2	593	29.8
Silage	467	10.8	561	14.2
Hay	134	3.7	128	4.3
Overall	509	27.8	601	29.4

Table 71. Number of farms with tillage crops, and mean crop area on REPS and non-REPS farms in 2008

Crop	REPS Farms		Non-REPS Farms	
	No.	Mean Area (ha)	No.	Mean Area (ha)
Winter Wheat	22	15	44	26
Spring Wheat	14	7	26	8
Winter Barley	5	12	17	16
Spring Barley	82	17	102	16
Malting Barley	12	16	18	17
Winter Oats	12	8	18	15
Spring Oats	10	7	6	5
All cereals	107	21	135	28
Fodder Beet	16	3	33	5
Potatoes	5	5	5	20
All root crops	31	4	53	7

The level of fertilizer N, P and K applications to grassland and tillage crops on REPS farms is shown in Table 72. For grassland and most crops, the N, P and K rates on REPS farms were considerably lower than the average rates used on the non-REPS farms.

Table 72. Fertilizer N, P and K usage rates on various crops on REPS and non-REPS farms in 2008

Crop	REPS Farms (kg/ha)			Non-REPS Farms (kg/ha)		
	N	P	K	N	P	K
Grazing	42	2	6	83	4	11
Silage	86	7	22	110	8	25
Hay	40	5	13	66	7	20
Total Grassland	60	4	11	105	6	17
Winter Wheat	139	16	57	190	19	51
Spring Wheat	117	18	41	149	21	53
Winter Barley	191	28	82	157	25	60
Spring Barley	117	22	49	120	21	42
Malting Barley	107	12	28	123	18	60
Winter Oats	106	15	33	155	26	58
Spring Oats	66	5	10	94	24	48
All cereals	119	19	47	148	21	49
Fodder Beet	122	39	125	166	54	204
Potatoes	101	92	254	91	68	150
All root crops	81	42	121	114	47	144

To facilitate comparison, Table 73 expresses the rates of N, P and K applications on REPS farms as a percentage of the usage on non-REPS farms. The N, P and K usage on REPS farms was lower in most cases than on non-REPS farms, with the only exceptions being with all nutrients on winter barley and potatoes, P and K on spring barley, and K on winter wheat. However, these comparisons need to be taken in the context of the relatively small number of farms growing the crop. For example, winter barley and potatoes were each grown on only five REPS farms. In general, the difference between REPS and non-REPS farms was greater with grassland than with tillage crops.

Table 73. Usage of N, P and K on REPS farms relative to non-REPS farms in 2008

Crop	Relative Usage Ratio		
	N	P	K
Grazing	0.51	0.50	0.55
Silage	0.78	0.88	0.88
Hay	0.61	0.71	0.65
Total Grassland	0.57	0.67	0.65
Winter Wheat	0.73	0.84	1.12
Spring Wheat	0.79	0.86	0.77
Winter Barley	1.22	1.12	1.37
Spring Barley	0.98	1.05	1.17
Malting Barley	0.87	0.67	0.47
Winter Oats	0.68	0.58	0.57
Spring Oats	0.70	0.21	0.21
All cereals	0.80	0.90	0.96
Fodder Beet	0.73	0.72	0.61
Potatoes	1.11	1.35	1.69
All root crops	0.71	0.89	0.84

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APPENDIX 1: FERTILIZER USAGE IN 2007

Table 1-1. N, P and K usage for all grassland in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	98	2.0	7	0.2	20	0.5	28.3	1213
Region								
South-East	123	5.0	9	0.6	22	1.3	30.4	162
Mid-East	101	6.2	6	0.5	16	1.2	36.9	148
Midlands	96	6.1	8	0.6	26	2.4	33.2	132
Border	86	4.4	7	0.4	17	0.9	23.9	219
South-West	113	4.5	8	0.4	21	1.1	29.2	265
South	82	6.7	6	0.5	15	1.2	23.9	119
West	62	3.8	6	0.4	17	1.2	22.6	168
Soil Use Class								
Wide	123	3.9	8	0.4	22	1.1	30.5	390
Moderately Wide	98	4.7	7	0.4	19	1.1	29.0	208
Somewhat Limited	83	4.3	7	0.4	18	1.0	27.7	210
Limited	78	2.9	7	0.3	18	0.8	26.2	405
Farm System								
Dairy	148	3.3	9	0.4	24	0.9	33.7	416
Cattle	56	1.7	6	0.2	17	0.8	24.8	575
Sheep	55	2.8	6	0.4	13	0.9	32.3	135
Tillage	92	5.9	10	0.9	26	2.0	19.2	84
Stocking Rate (All Farm Types)								
< 100	44	1.5	6	0.2	13	0.5	24.8	511
100 - 130	83	2.7	7	0.3	19	0.8	30.2	249
130 - 170	122	3.4	8	0.4	24	1.4	33.5	285
170 - 210	176	5.7	9	0.6	26	1.5	29.1	126
210 - 250	232	11.4	10	2.2	24	3.9	24.9	30
> 250	234	20.8	12	3.2	31	7.0	19.4	12
Dairy System by Stocking Rate								
< 100	70	6.9	5	0.6	13	1.5	27.9	43
100 - 130	113	6.2	8	0.7	21	1.7	34.3	63
130 - 170	136	4.1	9	0.5	24	1.5	37.7	177
170 - 210	188	5.8	9	0.7	26	1.7	31.6	98
210 - 250	237	12.0	10	2.4	25	4.3	26.8	26
> 250	250	23.9	11	3.8	28	8.1	21.1	9
Cattle System by Stocking Rate								
< 100	39	1.5	5	0.3	13	0.6	24.4	349
100 - 130	68	3.0	7	0.4	17	1.1	26.4	132
130 - 170	89	6.0	7	0.6	27	4.3	25.1	72
170 - 210	92	9.0	9	2.0	26	3.5	24.0	17
210 - 250	173	8.1	6	5.1	17	13.2	13.8	3

Table 1-2. N, P and K usage for grazing in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	78	2.0	5	0.2	13	0.5	28.6	1199
Region								
South-East	102	5.4	6	0.5	15	1.2	30.9	159
Mid-East	77	5.9	4	0.4	9	0.9	37.0	147
Midlands	75	6.3	5	0.5	18	2.6	33.4	131
Border	68	4.4	5	0.3	11	0.8	24.3	214
South-West	92	4.6	6	0.4	14	0.9	29.5	262
South	63	6.3	4	0.4	9	0.9	23.9	119
West	46	3.7	5	0.4	11	0.9	22.6	167
Soil Use Class								
Wide	103	4.1	6	0.3	15	1.0	31.2	380
Moderately Wide	75	4.7	5	0.4	12	0.9	29.2	207
Somewhat Limited	65	4.3	5	0.4	11	1.0	27.8	208
Limited	58	2.8	5	0.2	12	0.6	26.2	404
Farm System								
Dairy	128	3.7	6	0.3	16	0.8	33.7	416
Cattle	39	1.5	4	0.2	10	0.7	24.9	573
Sheep	43	2.7	4	0.3	9	0.7	32.3	135
Tillage	76	6.6	8	0.9	21	2.1	21.4	72
Stocking Rate (All Farm Types)								
< 100	29	1.3	4	0.2	8	0.4	25.3	498
100 - 130	67	2.7	5	0.3	12	0.6	30.2	249
130 - 170	104	3.7	6	0.4	16	1.4	33.5	284
170 - 210	158	6.7	7	0.6	19	1.5	29.1	126
210 - 250	219	12.7	8	1.2	22	3.5	24.9	30
> 250	237	31.1	9	2.9	18	5.6	19.4	12
Dairy System by Stocking Rate								
< 100	52	6.5	3	0.5	8	1.1	27.9	43
100 - 130	93	6.4	5	0.6	13	1.4	34.3	63
130 - 170	118	4.6	6	0.5	15	1.4	37.7	177
170 - 210	174	7.0	7	0.7	20	1.7	31.6	98
210 - 250	223	13.5	8	1.3	23	3.8	26.8	26
> 250	260	35.5	8	2.8	16	5.6	21.1	9
Cattle System by Stocking Rate								
< 100	25	1.3	4	0.2	8	0.4	24.4	348
100 - 130	52	2.8	4	0.3	10	0.8	26.4	132
130 - 170	71	6.4	5	0.5	19	4.5	25.1	71
170 - 210	66	9.8	5	2.0	16	4.2	24.0	17
210 - 250	167	14.0	6	5.2	16	12.7	13.8	3

Table 1-3. N, P and K usage for silage in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	108	1.6	10	0.3	30	0.7	12.5	1119
Region								
South-East	123	3.6	13	1.5	32	2.0	15.1	148
Mid-East	117	4.8	10	0.7	28	2.1	15.7	139
Midlands	111	4.3	11	0.7	38	1.9	14.6	128
Border	97	3.3	10	0.7	28	1.6	10.0	202
South-West	120	3.9	10	0.6	30	1.8	13.3	242
South	84	5.2	7	0.7	24	2.3	10.3	106
West	77	2.7	9	0.7	27	1.9	9.0	154
Soil Use Class								
Wide	121	2.9	11	0.7	31	1.3	14.4	359
Moderately Wide	112	3.2	10	0.6	30	1.9	13.1	199
Somewhat Limited	91	3.5	9	0.6	27	1.5	12.1	195
Limited	99	2.8	11	0.5	30	1.3	10.6	366
Farm System								
Dairy	129	2.6	10	0.6	31	1.3	18.3	407
Cattle	82	1.8	10	0.4	29	1.0	9.2	541
Sheep	82	3.0	11	0.8	27	1.9	9.4	98
Tillage	104	6.7	11	1.6	30	2.7	9.0	70

Table 1-4. N, P and K usage for hay in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	56	3.9	8	0.5	20	1.0	4.4	305
Region								
South-East	62	3.6	8	1.3	22	2.8	4.7	50
Mid-East	52	5.5	7	1.2	21	2.6	6.2	49
Midlands	49	3.1	10	0.9	25	1.8	5.9	44
Border	34	5.9	6	1.2	14	2.7	3.4	36
South-West	70	5.9	7	1.3	17	2.2	4.1	70
South	105	52.7	7	1.5	17	3.2	2.2	27
West	31	4.4	8	1.4	19	2.8	2.6	29
Soil Use Class								
Wide	61	3.6	9	0.8	22	1.7	5.2	116
Moderately Wide	54	3.9	8	0.9	22	2.1	5.5	59
Somewhat Limited	41	5.3	4	1.0	11	2.0	3.6	49
Limited	61	15.7	9	1.2	19	1.9	3.0	81
Farm System								
Dairy	79	11.4	8	0.8	20	2.0	4.1	97
Cattle	44	2.6	8	0.8	20	1.3	4.3	146
Sheep	48	5.3	8	1.5	23	3.2	3.9	31
Tillage	54	7.0	7	1.3	17	2.9	6.4	31

Table 1-5. Percentage of the total N, P and K applied for grassland in 2007 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	37.7	-	-
UREA	11.6	-	-
Potash 50% K	-	-	2.0
0 - 7 - 30	-	2.6	4.1
0 - 10 - 20	-	2.4	1.8
10 - 10 - 20	0.5	6.2	4.5
18 - 6 - 12	5.8	26.1	19.1
20 - 0 - 15	1.6	-	6.0
24 - 2.5 - 10	12.9	18.2	26.6
27 - 2.5 - 5	23.9	30.1	22.0
20 - 4 - 10	0.4	1.2	1.1
25 - 4 - 0	0.5	1.0	-
22 - 2.5 - 10	1.1	1.6	2.4
25 - 2.2 - 4.5	0.8	1.0	0.8
18 - 2.5 - 14	0.3	0.6	1.2
Other	2.9	8.8	8.7

Table 1-6. N, P and K usage for winter wheat in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	203	5.8	21	1.9	52	4.0	27	43
Region								
South-East	193	11.4	31	4.2	57	5.1	13	6
Mid-East	210	7.8	17	2.6	47	6.7	33	18
Border	216	10.5	27	4.3	59	8.6	27	11
South-West	162	15.5	23	2.4	57	7.7	26	6
Soil Use Class								
Wide	196	10.5	27	2.4	61	4.3	27	20
Moderately Wide	213	6.6	16	2.7	45	7.1	31	16
Somewhat Limited	194	12.3	15	5.8	39	14.8	19	6
Farm System								
Dairy	206	13.4	28	4.2	66	10.5	15	6
Tillage	203	6.4	20	2.0	50	4.4	30	36

Table 1-7. N, P and K usage for spring wheat in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	122	10.1	18	2.1	47	4.6	9	39
Region								
South-East	156	9.0	27	3.4	59	4.8	7	14
Mid-East	131	14.0	19	2.6	57	10.8	13	8
Midlands	88	25.5	9	6.0	39	12.0	9	4
South-West	120	23.8	17	4.1	37	8.4	6	12
Soil Use Class								
Wide	114	14.3	19	2.8	42	5.5	9	26
Moderately Wide	148	9.3	17	3.7	59	10.3	9	10
Farm System								
Dairy	124	9.5	23	2.6	53	5.4	6	14
Cattle & Sheep	83	58.6	11	7.9	31	22.8	5	3
Tillage	124	14.6	17	2.9	46	6.6	11	22

Table 1-8. N, P and K usage for winter barley in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	166	7.8	21	3.6	62	8.1	16	20
Region								
Mid-East	198	14.8	20	4.0	87	8.1	13	6
Border	150	9.8	20	6.8	42	10.1	19	9
Soil Use Class								
Wide	159	9.9	21	3.7	64	12.0	18	10
Moderately Wide	189	12.6	25	8.2	73	10.2	13	8
Farm System								
Dairy	174	28.5	14	6.0	45	11.8	8	3
Tillage	168	9.1	21	4.5	65	10.1	18	15

Table 1-9. N, P and K usage for spring barley in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	128	2.6	24	1.3	51	2.0	13	174
Region								
South-East	127	4.5	26	2.6	46	3.4	13	52
Mid-East	138	3.8	26	4.5	60	6.3	15	30
Midlands	121	8.1	23	2.6	49	3.9	15	30
Border	134	5.7	23	2.1	49	4.9	13	34
South-West	125	6.8	22	2.5	52	2.9	12	21
West	84	13.3	44	11.4	88	22.8	4	5
Soil Use Class								
Wide	125	3.7	26	1.7	51	2.6	14	91
Moderately Wide	128	3.6	18	1.6	47	3.0	12	55
Somewhat Limited	145	5.2	39	8.1	65	11.5	10	18
Limited	132	19.8	24	2.5	54	4.6	12	10
Farm System								
Dairy	120	4.9	20	1.9	43	3.8	10	55
Cattle & Sheep	113	4.2	25	2.0	56	3.9	7	40
Tillage	134	3.8	26	2.2	53	2.9	19	79

Table 1-10. N, P and K usage for malting barley in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	130	5.1	19	1.4	56	4.6	18	34
Region								
South-East	131	6.5	23	1.1	62	9.3	16	15
Midlands	116	5.5	16	3.2	66	5.8	22	6
South-West	136	11.7	17	3.6	43	5.0	21	10
Soil Use Class								
Wide	127	5.3	18	1.6	50	3.1	19	28
Moderately Wide	150	12.3	23	2.3	94	21.2	16	5
Farm System								
Dairy	125	9.4	19	2.8	48	4.6	11	15
Cattle & Sheep	120	5.7	18	5.1	51	3.9	16	3
Tillage	132	7.1	19	1.8	60	7.7	25	16

Table 1-11. N, P and K usage for winter oats in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	160	10.2	14	3.2	46	7.7	10	20
Region								
South-East	128	22.0	6.0	5.8	43	12.2	9	6
Mid-East	176	18.6	16	4.4	59	12.6	9	8
Border	170	8.2	13	6.4	29	16.3	13	5
Soil Use Class								
Wide	158	6.4	25	5.6	64	7.8	10	6
Moderately Wide	184	14.1	10	3.6	58	12.0	9	8
Somewhat Limited	147	16.9	8	7.0	18	13.8	11	5
Farm System								
Tillage	171	8.1	14	3.5	49	8.5	11	16

Table 1-12. N, P and K usage for spring oats in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	102	14.5	19	2.5	45	5.5	7	21
Region								
South-East	122	14.1	25	3.7	55	8.1	6	6
Border	109	31.0	19	3.9	38	7.8	8	7
South-West	49	39.9	19	9.1	58	30.0	8	3
Soil Use Class								
Wide	95	22.3	17	3.9	44	8.8	9	11
Moderately Wide	126	14.5	24	0.7	51	3.5	7	7
Farm System								
Dairy	88	24.6	22	3.1	59	12.5	4	7
Tillage	106	20.0	18	3.5	40	5.9	9	12

Table 1-13. N, P and K usage for all cereals in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	148	3.0	22	0.9	52	1.6	23	223
Region								
South-East	135	4.0	25	1.8	51	3.1	19	64
Mid-East	176	6.1	20	2.0	55	4.5	33	40
Midlands	122	6.0	20	2.0	54	3.2	19	38
Border	157	7.8	22	1.9	48	4.0	25	42
South-West	133	7.6	21	1.8	50	2.9	24	30
West	77	13.4	41	9.7	82	19.5	3	7
Soil Use Class								
Wide	139	4.1	24	1.2	53	1.9	24	124
Moderately Wide	164	5.0	18	1.2	52	3.3	25	64
Somewhat Limited	156	6.7	25	4.1	46	8.3	17	23
Limited	122	16.9	21	2.6	50	5.3	13	12
Farm System								
Dairy	129	5.0	21	1.4	47	2.7	13	74
Cattle & Sheep	115	4.3	24	1.7	54	3.2	9	46
Tillage	156	4.3	22	1.3	53	2.5	36	103

Table 1-14. Percentage of the total N, P and K applied to all cereal crops in 2007 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	64.1	-	-
Potash 50% K	-	-	5.2
0 - 7 - 30	-	3.6	5.9
0 - 10 - 20	-	2.1	1.6
10 - 10 - 20	3.1	22.9	17.5
14 - 7 - 14	2.5	9.2	7.0
15 - 3 - 20	1.1	1.7	4.3
18 - 6 - 12	17.3	43.0	32.8
20 - 0 - 15	2.7	-	5.8
27 - 2.5 - 5	1.1	0.8	0.6
18 - 2.5 - 14	0.5	0.6	1.2
Other	7.5	16.3	18.3

Table 1-15. N, P and K usage for fodder beet in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	175	10.2	49	4.4	164	11.1	5	41
Region								
South-East	189	16.3	45	6.6	150	17.5	4	19
Mid-East	165	23.3	64	7.4	195	17.4	14	4
Midlands	159	38.5	52	14.5	184	51.0	3	6
South-West	189	19.3	35	10.8	150	24.4	4	9
Soil Use Class								
Wide	161	16.3	43	7.1	153	16.7	4	21
Moderately Wide	187	15.8	51	6.8	164	18.3	9	12
Limited	158	28.0	65	9.0	220	35.2	3	6
Farm System								
Dairy	181	21.8	38	5.5	127	19.1	4	16
Cattle & Sheep	165	32.3	62	11.4	205	26.2	2	7
Tillage	172	11.1	54	6.9	181	14.2	6	18

Table 1-16. N, P and K usage for potatoes in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	85	10.5	67	10.4	213	25.6	22	14
Region								
Mid-East	71	16.0	57	12.6	227	38.8	34	4
South-West	56	32.3	48	27.7	136	78.5	2	3
Border	95	26.4	72	31.4	175	55.9	46	3
Soil Use Class								
Wide	77	17.5	70	14.4	310	31.7	19	5
Moderately Wide	98	17.6	74	19.1	180	33.5	27	6
Farm System								
Dairy	65	13.9	56	11.9	157	33.7	4	3
Tillage	85	12.1	67	12.0	215	29.3	27	11

Table 1-17. N, P and K usage for all root crops in 2007

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	108	7.2	50	4.0	160	11.1	8	83
Region								
South-East	136	14.2	41	7.3	144	24.0	5	29
Mid-East	95	17.3	55	7.3	201	24.7	19	11
Midlands	106	23.1	33	8.2	113	29.6	5	10
Border	97	19.0	69	19.7	170	35.0	25	6
South-West	128	17.8	28	6.8	105	21.3	4	22
West	54	17.2	41	14.3	108	38.8	4	5
Soil Use Class								
Wide	104	9.3	46	5.1	181	18.9	6	43
Moderately Wide	127	13.3	59	8.5	159	16.8	13	23
Somewhat Limited	53	17.0	30	6.9	111	23.0	9	8
Limited	102	29.0	36	11.2	121	39.1	3	9
Farm System								
Dairy	133	14.2	30	3.8	96	12.4	4	33
Cattle & Sheep	70	17.7	20	6.7	61	20.3	4	17
Tillage	106	9.8	60	6.5	194	16.3	14	33

Table 1-18. Percentage of the total N, P and K applied to all root crops in 2007 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	19.5	-	-
Potash 42% K	-	-	8.8
8 - 5 - 18	11.0	15.2	16.6
13 - 4 - 14	5.2	3.6	3.8
7 - 6 - 17	19.1	36.4	31.2
10 - 5 - 25	3.7	4.1	6.2
10 - 10 - 20	10.1	22.5	13.7
18 - 6 - 12	3.7	2.8	1.7
20 - 0 - 15	3.4	-	1.7
24 - 2.5 - 10	5.7	1.3	1.6
27 - 2.5 - 5	2.6	0.5	0.3
Other	16.2	13.6	14.4

Table 1-19. N, P and K usage for forage maize in 2007

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	136	6.7	35	3.2	81	6.9	6	61
Region								
South-East	125	5.8	43	4.7	82	9.8	6	18
Mid-East	135	12.8	39	9.5	92	18.3	7	13
Midlands	157	19.3	23	4.0	72	10.5	7	7
Border	111	30.4	35	10.7	71	21.4	5	7
South-West	151	19.4	23	5.1	73	19.0	6	14
Soil Use Class								
Wide	142	9.7	38	4.0	85	9.2	7	33
Moderately Wide	123	14.1	35	9.5	85	18.6	8	13
Somewhat Limited	130	13.3	30	6.3	63	15.0	5	9
Limited	146	24.3	26	6.9	65	14.1	6	6
Farm System								
Dairy	140	6.7	39	4.1	84	9.3	6	39
Cattle & Sheep	132	11.0	24	4.6	68	10.3	6	12
Tillage	128	30.3	33	9.7	82	19.8	8	9

APPENDIX 2: FERTILIZER USAGE IN 2006

Table 2-1. N, P and K usage for all grassland in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	107	2.2	9	0.2	23	0.6	27.6	1203
Region								
South-East	118	4.8	10	0.6	26	1.7	30.9	180
Mid-East	107	7.5	8	0.7	21	1.9	36.0	118
Midlands	104	6.7	10	0.7	28	1.6	31.4	114
Border	91	5.2	9	0.7	20	1.3	24.0	207
South-West	78	5.1	7	0.5	18	1.2	27.2	146
South	151	5.3	11	0.6	28	1.5	26.8	267
West	59	3.4	7	0.5	18	1.2	21.9	171
Soil Use Class								
Wide	136	4.4	10	0.5	27	1.3	29.7	376
Moderately Wide	103	5.0	9	0.7	22	1.4	29.3	213
Somewhat Limited	93	4.7	8	0.4	21	1.2	26.5	211
Limited	85	3.3	9	0.4	22	0.9	25.4	403
Farm System								
Dairy	158	3.6	11	0.5	29	1.1	32.6	449
Cattle	59	1.8	7	0.3	18	0.7	23.6	547
Sheep	58	3.3	6	0.4	13	1.0	29.9	137
Tillage	90	6.9	10	1.2	27	3.2	21.3	67
Stocking Rate (All Farm Types)								
< 100	48	1.8	6	0.2	14	0.6	23.5	503
100 - 130	83	2.6	8	0.4	21	1.1	29.8	246
130 - 170	137	3.7	11	0.5	28	1.3	33.7	281
170 - 210	200	6.7	13	1.1	33	2.3	27.5	127
210 - 250	216	14.8	16	1.7	43	4.6	27.6	34
> 250	211	21.2	16	2.5	38	5.4	15.1	12
Dairy System by Stocking Rate								
< 100	81	8.5	7	1.0	18	2.2	25.5	48
100 - 130	105	5.4	9	0.8	22	2.1	35.3	73
130 - 170	152	4.5	11	0.6	29	1.6	37.3	185
170 - 210	206	7.2	13	1.3	33	2.5	28.8	106
210 - 250	238	14.1	18	1.8	48	4.7	26.1	29
> 250	235	19.8	17	3.2	41	6.9	16.3	8
Cattle System by Stocking Rate								
< 100	44	1.7	6	0.3	14	0.6	22.5	350
100 - 130	66	3.0	8	0.6	20	1.7	25.6	118
130 - 170	87	3.6	10	0.9	25	2.1	26.6	58
170 - 210	163	16.9	15	2.1	37	5.6	22.6	16
> 250	162	38.9	16	4.0	31	8.0	12.9	3

Table 2-2. N, P and K usage for grazing in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	86	2.3	7	0.2	15	0.6	27.7	1195
Region								
South-East	96	4.9	7	0.6	19	1.6	31.1	179
Mid-East	82	7.4	5	0.6	11	1.7	36.3	116
Midlands	85	7.1	7	0.6	17	1.5	31.7	113
Border	74	5.4	6	0.8	12	1.2	24.2	205
South-West	60	5.1	5	0.4	11	0.9	27.2	146
South	129	5.7	9	0.6	20	1.5	26.9	265
West	44	3.4	5	0.4	13	1.0	21.9	171
Soil Use Class								
Wide	117	4.6	8	0.5	19	1.2	30.1	370
Moderately Wide	79	5.1	6	0.8	15	1.3	29.3	213
Somewhat Limited	75	5.0	6	0.4	13	1.1	26.6	209
Limited	64	3.2	6	0.4	14	0.8	25.4	403
Farm System								
Dairy	138	4.0	9	0.5	20	1.1	32.6	449
Cattle	42	1.7	5	0.2	11	0.6	23.6	547
Sheep	46	3.3	4	0.4	9	0.9	29.9	137
Tillage	77	7.3	8	1.3	20	3.4	23.0	59
Stocking Rate (All Farm Types)								
< 100	34	1.6	4	0.2	9	0.5	23.8	495
100 - 130	65	2.7	6	0.4	14	1.1	29.8	246
130 - 170	116	4.0	8	0.5	19	1.1	33.7	281
170 - 210	188	8.0	11	1.3	25	2.5	27.5	127
210 - 250	213	18.3	14	2.2	34	5.3	27.6	34
> 250	206	27.8	12	2.5	28	6.6	15.1	12
Dairy System by Stocking Rate								
< 100	62	7.5	6	1.2	12	2.3	25.5	48
100 - 130	85	5.8	6	0.8	14	1.8	35.3	73
130 - 170	132	5.0	9	0.6	19	1.5	37.3	185
170 - 210	196	8.6	11	1.5	25	2.8	28.8	106
210 - 250	242	17.9	17	2.4	40	5.8	26.1	29
> 250	250	23.8	13	3.4	31	9.1	16.3	8
Cattle System by Stocking Rate								
< 100	29	1.5	4	0.2	8	0.5	22.5	350
100 - 130	49	3.0	6	0.7	14	1.8	25.6	118
130 - 170	66	4.1	8	0.8	18	1.9	26.6	58
170 - 210	142	20.4	11	2.2	25	4.6	22.6	16
> 250	110	35.4	11	3.9	22	7.9	12.9	3

Table 2-3. N, P and K usage for silage in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	117	1.7	12	0.3	35	0.8	12.0	1091
Region								
South-East	127	3.8	12	0.8	32	2.0	14.7	167
Mid-East	126	5.8	12	0.8	38	2.4	15.6	108
Midlands	116	4.7	15	0.9	48	2.5	13.6	104
Border	103	3.7	11	0.6	32	1.7	10.2	190
South-West	94	4.7	11	0.9	33	2.4	10.7	125
South	136	3.6	11	0.6	35	2.0	12.9	243
West	84	3.3	9	0.7	27	2.2	7.5	154
Soil Use Class								
Wide	130	3.2	12	0.5	37	1.8	14.0	338
Moderately Wide	119	3.6	11	0.7	30	1.7	12.5	206
Somewhat Limited	102	3.5	11	0.6	33	1.6	11.2	190
Limited	107	2.8	12	0.5	36	1.3	10.2	357
Farm System								
Dairy	136	2.6	12	0.4	38	1.4	17.4	439
Cattle	90	2.1	11	0.4	31	1.1	8.2	497
Sheep	88	3.3	9	0.8	26	2.1	8.6	99
Tillage	96	6.3	10	1.2	35	4.6	8.8	53

Table 2-4. N, P and K usage for hay in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	59	2.3	9	0.5	23	1.1	4.0	428
Region								
South-East	62	5.9	8	1.0	19	2.1	4.9	71
Mid-East	57	6.1	11	1.6	26	3.2	5.4	52
Midlands	49	3.0	11	1.0	27	2.3	4.8	53
Border	47	5.0	8	1.1	17	2.4	3.1	56
South-West	54	8.5	9	1.8	24	4.5	3.3	67
South	96	5.7	9	1.0	24	2.8	3.3	69
West	47	4.0	9	1.1	23	2.6	3.4	60
Soil Use Class								
Wide	62	3.6	9	0.7	24	1.9	4.8	143
Moderately Wide	66	3.5	8	0.8	22	1.8	4.1	89
Somewhat Limited	48	4.5	9	1.2	21	2.8	3.7	73
Limited	57	6.2	10	1.2	23	2.4	3.2	123
Farm System								
Dairy	69	4.6	10	0.8	23	2.1	3.6	144
Cattle	53	3.5	10	0.8	24	1.7	3.6	199
Sheep	51	4.1	7	1.1	19	2.3	5.4	55
Tillage	68	6.8	9	1.4	25	3.7	6.2	30

Table 2-5. Percentage of the total N, P and K applied for grassland in 2006 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	34.7	-	-
UREA	12.6	-	-
SUPER16%P	-	1.0	-
Potash 50% K	-	-	1.5
0 - 7 - 30	-	4.2	7.0
0 - 10 - 20	-	3.4	2.7
10 - 10 - 20	0.7	8.9	6.9
18 - 6 - 12	6.0	23.6	18.4
20 - 0 - 15	0.3	-	1.1
24 - 2.5 - 10	13.6	16.8	26.2
27 - 2.5 - 5	25.7	28.2	22.0
20 - 4 - 10	0.4	1.1	1.0
22 - 2.5 - 10	1.4	1.9	3.0
Other	4.3	10.6	9.9

Table 2-6. N, P and K usage for winter wheat in 2006

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	198	8.0	24	2.1	59	5.1	29	36
Region								
South-East	205	22.2	29	6.9	58	13.8	19	5
Mid-East	196	8.0	17	1.8	50	8.4	34	13
Border	192	15.6	30	3.3	70	7.4	30	15
Soil Use Class								
Wide	203	16.1	27	3.4	56	6.5	27	16
Moderately Wide	199	6.5	23	3.2	65	9.4	34	14
Somewhat Limited	178	21.4	21	4.8	52	11.9	21	6
Farm System								
Dairy	210	18.8	23	4.5	52	9.2	19	7
Tillage	197	9.3	24	2.4	60	5.9	33	27

Table 2-7. N, P and K usage for spring wheat in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	159	10.2	24	1.7	52	3.2	9	43
Region								
South-East	166	11.5	27	2.7	53	5.5	8	13
Mid-East	187	12.7	28	2.9	61	5.3	8	9
Midlands	157	43.9	17	4.6	42	9.2	12	7
South	131	16.3	25	3.4	52	6.1	9	12
Soil Use Class								
Wide	157	14.7	25	2.5	52	4.7	10	27
Moderately Wide	176	11.0	24	1.7	51	3.7	8	12
Farm System								
Dairy	144	13.6	27	2.8	56	5.3	9	18
Tillage	167	14.6	23	2.2	49	4.2	10	24

Table 2-8. N, P and K usage for winter barley in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	163	8.2	31	2.7	82	7.8	15	19
Region								
Mid-East	188	14.4	19	1.7	74	7.1	8	7
Border	158	13.1	33	3.0	76	11.9	19	9
Soil Use Class								
Wide	146	9.0	34	3.6	81	9.7	17	10
Moderately Wide	187	10.7	27	3.8	83	13.6	13	9
Farm System								
Dairy	180	17.4	23	1.8	73	18.6	12	4
Tillage	159	9.3	33	3.1	84	8.9	16	15

Table 2-9. N, P and K usage for spring barley in 2006

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	128	2.6	26	1.0	58	1.8	14	155
Region								
South-East	132	4.7	27	1.7	52	3.0	14	48
Mid-East	134	5.9	28	2.7	66	4.3	17	25
Midlands	123	7.0	23	2.6	55	4.3	16	23
Border	133	6.7	27	2.0	62	4.9	13	29
South	116	6.5	24	2.0	57	4.9	14	24
West	99	14.3	24	2.9	48	5.8	5	5
Soil Use Class								
Wide	129	3.7	26	1.1	57	2.4	15	87
Moderately Wide	126	4.0	24	2.1	54	3.3	15	44
Somewhat Limited	139	10.9	34	3.1	78	7.2	10	16
Limited	110	7.2	23	3.2	56	4.7	14	8
Farm System								
Dairy	130	5.0	25	1.6	53	3.2	11	54
Cattle & Sheep	111	6.0	27	2.9	57	4.4	8	36
Tillage	131	3.6	26	1.3	60	2.7	20	65

Table 2-10. N, P and K usage for malting barley in 2006

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	121	5.1	20	2.3	50	3.8	13	32
Region								
South-East	130	6.6	25	3.5	48	6.5	14	15
Midlands	115	7.8	18	4.1	60	5.7	18	6
South	104	10.5	14	4.5	42	6.5	10	10
Soil Use Class								
Wide	115	5.2	20	2.7	51	4.5	13	26
Moderately Wide	151	10.5	20	4.9	44	8.1	15	5
Farm System								
Dairy	121	8.4	24	4.5	48	7.9	11	15
Tillage	124	7.3	19	2.5	51	3.8	15	15

Table 2-11. N, P and K usage for winter oats in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	131	13.9	22	2.7	48	5.4	9	17
Region								
South-East	89	42.4	0	0.0	11	17.4	6	3
Mid-East	116	18.4	23	2.2	52	4.9	10	7
Border	177	11.9	27	3.9	55	7.7	10	5
Soil Use Class								
Wide	105	22.4	21	5.3	42	10.6	10	6
Somewhat Limited	159	14.4	25	2.9	58	4.2	9	9
Farm System								
Dairy	105	22.4	21	5.3	42	10.6	10	6
Tillage	149	16.5	19	5.1	41	9.9	9	9

Table 2-12. N, P and K usage for spring oats in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	101	9.9	18	2.2	44	6.8	7	31
Region								
South-East	104	10.1	22	2.2	47	5.0	6	13
Mid-East	108	29.3	15	6.1	51	21.4	6	4
Border	112	19.0	18	4.9	48	16.9	10	9
South	59	54.3	10	8.8	21	19.1	8	3
Soil Use Class								
Wide	79	17.3	14	3.0	30	6.8	8	13
Moderately Wide	133	9.1	23	2.7	55	7.5	6	11
Somewhat Limited	107	18.3	20	7.5	62	26.8	7	6
Farm System								
Dairy	118	12.7	19	2.2	43	5.9	5	10
Cattle & Sheep	106	19.6	27	5.7	55	11.6	3	6
Tillage	95	15.7	16	3.5	43	11.4	10	15

Table 2-13. N, P and K usage for all cereals in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	146	3.3	25	0.8	57	1.7	23	201
Region								
South-East	138	4.6	26	1.3	51	2.4	19	60
Mid-East	164	6.1	23	1.5	59	3.5	30	37
Midlands	131	9.0	22	2.2	57	3.9	21	30
Border	161	8.9	28	2.0	66	5.0	33	35
South	121	8.1	22	2.0	52	3.8	19	32
West	99	12.5	24	2.6	48	5.2	4	6
Soil Use Class								
Wide	141	4.8	25	1.0	56	2.0	24	114
Moderately Wide	159	4.8	23	1.4	59	3.3	26	58
Somewhat Limited	148	9.3	27	2.4	64	6.8	18	20
Limited	106	10.6	21	3.2	53	5.7	16	9
Farm System								
Dairy	139	5.0	25	1.3	52	2.5	17	71
Cattle & Sheep	113	6.0	25	2.3	57	4.0	8	43
Tillage	153	5.0	25	1.1	59	2.5	36	87

Table 2-14. Percentage of the total N, P and K applied to all cereal crops in 2006 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	60.4	-	-
UREA	2.6	-	-
Potash 50% K	-	-	2.0
0 - 7 - 30	-	2.6	4.8
0 - 10 - 20	-	8.4	7.2
10 - 10 - 20	4.7	28.2	24.1
14 - 7 - 14	1.8	5.4	4.6
15 - 3 - 20	0.7	0.9	2.4
18 - 6 - 12	20.5	40.9	34.9
20 - 0 - 15	1.6	-	3.1
27 - 2.5 - 5	1.5	0.8	0.7
Other	6.0	13.0	16.1

Table 2-15. N, P and K usage for sugar beet in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	197	21.7	85	9.9	225	17.6	3	12
Region								
South-East	190	11.2	114	17.1	261	28.9	3	5
South	200	40.7	66	5.9	196	15.4	4	6
Soil Use Class								
Wide	201	26.9	70	5.1	205	17.4	3	10
Farm System								
Dairy	173	17.5	106	18.2	257	30.4	3	6
Tillage	213	51.6	67	6.0	193	10.1	5	4

Table 2-16. N, P and K usage for fodder beet in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	153	9.7	55	3.3	169	9.6	4	44
Region								
South-East	163	15.9	62	6.9	177	17.8	3	18
Mid-East	167	16.0	58	3.9	187	15.9	8	6
Midlands	166	22.1	57	3.9	210	14.3	4	6
South	121	23.1	33	5.8	102	17.9	4	10
Soil Use Class								
Wide	139	17.1	49	5.7	145	15.7	4	21
Moderately Wide	164	11.3	60	4.2	185	12.2	5	17
Limited	147	24.9	62	5.0	222	18.1	3	4
Farm System								
Dairy	198	16.9	59	5.5	179	10.6	4	17
Cattle & Sheep	108	18.6	42	9.6	126	31.3	4	9
Tillage	139	10.5	56	4.0	177	13.8	5	18

Table 2-17. N, P and K usage for potatoes in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	111	45.9	70	11.2	317	50.3	18	11
Region								
Border	124	6.7	77	18.6	416	44.0	25	5
Soil Use Class								
Moderately Wide	124	5.2	80	14.8	405	36.9	20	7
Somewhat Limited	80	199.0	42	9.2	86	30.4	17	3
Farm System								
Dairy	275	301.0	107	4.6	294	12.1	3	4
Tillage	100	17.4	68	15.7	320	73.4	31	6

Table 2-18. N, P and K usage for all root crops in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	113	10.8	51	3.4	187	15.3	7	91
Region								
South-East	92	11.3	38	5.3	108	15.9	5	37
Mid-East	99	20.4	48	5.5	128	21.3	10	11
Midlands	120	10.7	44	5.6	146	23.0	4	10
Border	117	8.3	73	12.9	371	47.0	16	9
South	164	53.5	45	4.9	136	15.3	4	20
West	109	30.4	87	24.4	257	71.8	5	3
Soil Use Class								
Wide	108	11.2	41	4.0	123	13.3	5	47
Moderately Wide	114	9.3	58	7.9	256	33.7	10	27
Somewhat Limited	81	71.9	34	5.8	78	15.1	7	11
Limited	83	26.2	36	11.3	119	39.8	5	6
Farm System								
Dairy	140	26.3	49	4.8	137	13.0	4	41
Cattle & Sheep	67	10.5	28	5.4	75	16.6	5	21
Tillage	101	10.6	53	6.9	227	32.1	11	29

Table 2-19. Percentage of the total N, P and K applied to all root crops in 2006 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	24.1	-	-
Potash 42% K	-	-	25.1
8 - 5 - 18	13.0	18.3	17.8
9 - 4.5 - 18	1.6	1.8	1.9
9 - 6 - 15	5.5	8.2	5.5
13 - 4 - 14	4.8	3.3	3.2
7 - 6 - 17	13.0	25.0	19.1
10 - 10 - 20	11.5	25.7	13.9
18 - 6 - 12	8.3	6.2	3.4
24 - 2.5 - 10	1.7	0.4	0.4
27 - 2.5 - 5	2.0	0.4	0.2
Other	14.5	10.7	9.3

Table 2-20. N, P and K usage for forage maize in 2006

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	148	7.8	36	4.2	80	8.6	6	51
Region								
South-East	139	10.3	43	5.4	88	13.4	6	20
Mid-East	161	24.2	30	14.1	78	27.0	8	9
Midlands	148	24.0	31	10.8	75	21.7	8	6
Border	170	24.9	32	5.1	64	10.2	5	4
South	131	17.0	41	7.6	83	14.2	5	10
Soil Use Class								
Wide	148	8.9	42	4.5	91	10.6	5	27
Moderately Wide	171	20.8	29	9.9	73	19.3	7	11
Somewhat Limited	138	19.3	39	14.3	84	27.2	7	8
Limited	109	24.7	27	14.1	53	28.2	6	5
Farm System								
Dairy	141	7.2	39	5.2	86	10.8	6	37
Cattle & Sheep	135	20.4	40	7.8	85	14.9	6	10
Tillage	219	34.7	16	12.0	43	26.5	9	4

APPENDIX 3: FERTILIZER USAGE IN 2005

Table 3-1. N, P and K usage for all grassland in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	112	2.3	10	0.3	26	0.6	27.4	1198
Region								
South-East	126	5.3	11	0.7	29	1.7	29.6	185
Mid-East	108	7.8	10	0.9	25	1.7	37.4	119
Midlands	98	6.2	12	0.7	31	2.0	30.5	111
Border	98	4.9	10	0.8	22	1.3	23.7	208
South-West	82	5.3	9	0.6	23	1.5	26.1	132
South	161	5.6	11	0.4	29	1.1	27.2	268
West	60	3.4	8	0.5	21	1.2	21.9	175
Soil Use Class								
Wide	142	4.6	11	0.4	29	1.1	29.6	381
Moderately Wide	108	5.2	10	0.8	26	1.4	28.8	217
Somewhat Limited	93	4.4	11	0.6	24	1.1	27.3	208
Limited	90	3.5	9	0.4	24	0.9	24.5	392
Farm System								
Dairy	160	3.7	13	0.4	33	1.0	32.7	470
Cattle	62	1.9	8	0.3	20	0.7	22.5	518
Sheep	59	3.3	8	0.8	17	1.1	30.7	133
Tillage	97	6.7	9	1.0	24	2.4	21.2	74
Stocking Rate (All Farm Types)								
< 100	46	1.7	7	0.3	15	0.6	23.5	444
100 - 130	87	3.2	10	0.5	23	1.0	28.0	252
130 - 170	138	3.8	12	0.4	31	1.1	33.5	305
170 - 210	186	6.1	14	0.8	36	2.1	26.1	141
210 - 250	237	11.6	18	2.5	42	3.7	27.0	49
> 250	284	21.7	20	1.8	50	3.5	15.5	7
Dairy System by Stocking Rate								
< 100	71	7.8	6	0.9	14	1.7	32.8	46
100 - 130	114	7.6	11	0.7	27	1.7	32.6	70
130 - 170	153	4.8	12	0.5	33	1.3	37.2	195
170 - 210	196	6.7	15	0.9	38	2.4	27.5	112
210 - 250	256	10.8	19	2.8	45	4.0	27.8	41
> 250	292	16.0	20	2.0	50	3.3	17.5	6
Cattle System by Stocking Rate								
< 100	41	1.7	6	0.3	15	0.7	21.2	300
100 - 130	69	2.9	8	0.5	22	1.3	23.8	129
130 - 170	100	5.6	11	0.8	28	2.3	27.7	66
170 - 210	128	12.1	13	1.9	30	4.7	15.7	19
210 - 250	107	18.4	12	5.2	32	10.4	29.0	4
> 250	41	1.7	6	0.3	15	0.7	21.2	300

Table 3-2. N, P and K usage for grazing in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	93	2.4	8	0.3	17	0.5	27.5	1191
Region								
South-East	106	5.5	8	0.6	21	1.6	29.8	184
Mid-East	83	7.4	7	0.9	14	1.5	37.8	117
Midlands	78	6.3	8	0.7	20	1.9	30.8	110
Border	81	5.0	8	0.9	16	1.2	23.9	206
South-West	63	5.2	6	0.5	14	1.3	26.1	132
South	144	6.2	9	0.5	20	1.0	27.3	267
West	46	3.2	6	0.4	13	1.0	21.9	175
Soil Use Class								
Wide	125	4.9	8	0.4	20	1.1	29.9	377
Moderately Wide	87	5.1	7	0.8	17	1.2	28.8	217
Somewhat Limited	76	4.5	8	0.7	16	1.0	27.4	206
Limited	69	3.4	7	0.3	15	0.7	24.5	391
Farm System								
Dairy	143	4.1	10	0.4	23	0.9	32.7	470
Cattle	45	1.7	5	0.3	13	0.6	22.5	518
Sheep	46	3.2	6	0.9	12	1.0	30.7	133
Tillage	86	7.3	8	1.0	18	2.8	22.6	67
Stocking Rate (All Farm Types)								
< 100	32	1.5	5	0.2	10	0.5	23.7	437
100 - 130	71	3.3	7	0.5	16	1.0	28.0	252
130 - 170	122	4.2	9	0.4	22	1.0	33.5	305
170 - 210	174	6.8	11	0.8	25	2.1	26.1	141
210 - 250	230	14.3	15	3.0	30	3.7	27.0	49
> 250	297	27.8	19	2.6	42	5.4	15.5	7
Dairy System by Stocking Rate								
< 100	53	6.6	5	0.6	10	1.3	32.8	46
100 - 130	101	8.0	8	0.7	19	1.7	32.6	70
130 - 170	137	5.4	10	0.5	23	1.2	37.2	195
170 - 210	185	7.7	12	1.0	27	2.5	27.5	112
210 - 250	253	13.7	17	3.4	34	4.0	27.8	41
> 250	305	24.5	19	2.7	43	5.5	17.5	6
Cattle System by Stocking Rate								
< 100	27	1.4	4	0.3	9	0.6	21.2	300
100 - 130	51	2.7	6	0.5	15	1.2	23.8	129
130 - 170	83	6.0	8	0.8	21	2.2	27.7	66
170 - 210	114	11.9	10	1.7	21	3.5	15.7	19
210 - 250	87	23.5	4	2.0	8	4.0	29.0	4

Table 3-3. N, P and K usage for silage in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	118	1.7	13	0.3	39	0.8	11.8	1091
Region								
South-East	125	4.4	14	1.0	37	2.1	14.1	167
Dublin	85	19.9	6	4.0	16	8.5	12.7	8
Mid-East	127	6.0	14	0.9	43	2.6	16.1	108
Midlands	114	5.0	16	1.0	50	2.7	13.9	102
Border	108	4.0	11	0.6	31	1.7	9.8	189
South-West	100	3.8	14	1.2	40	2.5	10.5	118
South	136	3.4	12	0.5	39	1.8	12.4	250
West	82	3.3	12	0.7	36	1.9	7.5	157
Soil Use Class								
Wide	131	3.1	13	0.6	41	1.6	13.8	342
Moderately Wide	115	3.9	13	0.7	39	2.1	12.4	205
Somewhat Limited	108	4.0	15	0.8	36	1.5	10.6	188
Limited	108	2.6	13	0.5	38	1.4	10.2	356
Farm System								
Dairy	137	2.5	14	0.5	43	1.3	16.4	462
Cattle	90	2.1	12	0.4	34	1.1	7.9	473
Sheep	91	3.8	12	0.8	34	2.5	9.4	95
Tillage	91	6.4	9	1.0	27	3.0	10.4	58

Table 3-4. N, P and K usage for hay in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	51	1.9	10	0.5	24	1.1	4.1	408
Region								
South-East	56	4.4	9	1.3	22	2.8	4.2	86
Mid-East	51	6.2	12	1.5	29	3.2	5.8	49
Midlands	42	3.8	9	0.8	23	1.9	5.7	53
Border	42	4.3	10	1.7	22	3.5	2.8	60
South-West	41	4.2	9	1.1	21	2.2	3.6	56
South	84	5.2	8	0.9	24	2.4	3.7	54
West	35	2.9	9	1.0	25	3.1	3.4	50
Soil Use Class								
Wide	61	3.3	11	0.9	27	2.0	4.5	141
Moderately Wide	47	3.4	9	0.9	24	2.1	4.8	89
Somewhat Limited	41	4.7	9	1.1	23	2.6	4.2	65
Limited	45	3.5	8	0.8	19	1.7	3.1	113
Farm System								
Dairy	58	3.7	10	0.9	25	2.0	3.8	146
Cattle	41	2.3	9	0.6	22	1.4	3.9	175
Sheep	56	5.9	10	1.4	23	2.8	4.9	44
Tillage	59	4.7	10	1.8	28	3.7	5.5	43

Table 3-5. Percentage of the total N, P and K applied for grassland in 2005 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	30.2	-	-
UREA	13.3	-	-
Potash 50% K	-	-	1.0
0 - 7 - 30	-	4.3	7.3
0 - 10 - 20	-	3.0	2.3
10 - 10 - 20	0.9	9.4	7.4
18 - 6 - 12	5.9	21.5	16.9
24 - 2.5 - 10	14.8	16.9	26.6
27 - 2.5 - 5	27.3	27.7	21.8
20 - 4 - 10	0.5	1.1	1.1
25 - 4 - 0	0.5	1.0	-
22 - 2.5 - 10	1.3	1.6	2.6
Other	4.9	13.4	13.1

Table 3-6. N, P and K usage for winter wheat in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	189	11.4	22	2.1	55	5.4	26	37
Region								
South-East	148	4.0	23	11.6	46	23.3	18	3
Mid-East	181	17.3	21	3.0	57	8.0	34	14
Border	200	18.7	21	3.7	53	10.0	25	15
South	155	25.8	31	7.8	63	17.0	13	4
Soil Use Class								
Wide	195	15.9	26	2.6	58	6.2	21	20
Moderately Wide	188	20.7	17	3.4	50	9.1	40	11
Somewhat Limited	169	32.3	23	7.9	62	23.9	19	6
Farm System								
Dairy	167	18.4	22	5.9	51	13.7	15	11
Tillage	194	14.2	22	2.2	56	6.1	32	25

Table 3-7. N, P and K usage for spring wheat in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	149	10.5	31	3.7	59	4.6	9	37
Region								
South-East	149	13.8	37	7.2	60	7.2	10	16
Mid-East	158	30.3	27	5.7	74	12.0	9	4
Midlands	165	35.7	33	6.0	66	12.0	12	7
South	120	13.4	15	3.2	39	5.2	6	9
Soil Use Class								
Wide	154	15.0	26	3.1	54	5.6	8	22
Moderately Wide	164	15.0	43	10.9	68	7.3	11	9
Limited	99	30.9	27	8.4	54	16.9	11	4
Farm System								
Dairy	135	16.3	20	3.7	46	8.1	7	14
Tillage	155	13.5	36	5.0	65	5.3	10	23

Table 3-8. N, P and K usage for winter barley in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	163	10.6	27	2.5	83	9.1	16	21
Region								
Mid-East	212	29.3	28	7.5	88	22.2	9	5
Border	161	8.8	27	3.8	82	13.0	17	11
Soil Use Class								
Wide	160	13.6	30	2.6	89	10.6	19	11
Moderately Wide	170	21.7	21	5.3	66	18.4	13	8
Somewhat Limited	163	20.3	23	7.8	100	33.3	10	2
Farm System								
Dairy	153	38.1	33	6.1	99	28.9	22	4
Tillage	167	9.3	25	2.6	76	8.5	14	17

Table 3-9. N, P and K usage for spring barley in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	119	2.8	26	1.1	55	1.7	13	158
Region								
South-East	118	5.2	31	2.0	57	3.4	14	42
Mid-East	123	7.8	24	3.5	64	5.5	16	26
Midlands	124	8.5	30	2.8	61	2.8	14	22
Border	129	3.9	25	1.6	49	3.0	13	34
South	100	6.0	19	1.8	40	3.4	9	26
South-West	62	2.7	22	3.6	44	7.2	7	3
West	106	12.5	18	2.9	41	8.0	4	5
Soil Use Class								
Wide	121	3.9	28	1.5	55	2.2	13	83
Moderately Wide	112	5.0	21	1.6	48	2.9	13	51
Somewhat Limited	134	5.8	32	3.6	73	6.6	12	17
Limited	118	7.4	33	2.2	67	3.6	10	7
Farm System								
Dairy	118	3.6	27	1.9	49	2.8	11	63
Cattle & Sheep	91	7.0	23	2.3	51	4.0	6	28
Tillage	124	4.4	27	1.6	59	2.6	18	67

Table 3-10. N, P and K usage for malting barley in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	120	3.7	27	3.0	52	3.6	13	35
Region								
South-East	119	4.5	31	5.1	49	5.7	15	18
Mid-East	158	14.6	16	3.6	70	20.0	9	3
Midlands	117	10.0	21	4.4	61	4.2	15	5
South	113	7.0	21	2.0	51	3.0	9	9
Soil Use Class								
Wide	117	3.8	28	3.5	52	3.6	14	29
Moderately Wide	138	12.4	16	4.0	51	16.5	10	5
Farm System								
Dairy	114	7.4	30	4.6	58	7.0	11	14
Tillage	122	4.2	27	4.3	47	3.6	15	19

Table 3-11. N, P and K usage for winter oats in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	138	10.9	26	4.2	72	11.1	17	16
Region								
Mid-East	104	20.9	29	8.5	102	27.4	16	4
Border	149	16.5	20	5.2	57	13.9	19	8
Soil Use Class								
Wide	159	7.6	30	5.8	69	9.6	19	7
Moderately Wide	128	18.9	10	3.9	40	21.4	14	4
Somewhat Limited	109	27.5	30	8.7	98	26.8	16	5
Farm System								
Dairy	116	19.9	31	3.1	72	8.9	14	4
Tillage	145	14.1	22	5.5	61	13.3	17	11

Table 3-12. N, P and K usage for spring oats in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	90	9.2	22	2.5	45	5.0	6	29
Region								
South-East	89	20.1	29	6.8	58	13.8	6	6
Mid-East	100	38.0	27	11.8	55	23.5	6	3
Border	103	9.7	22	2.1	44	4.0	6	15
Soil Use Class								
Wide	87	22.0	18	5.6	37	11.1	5	11
Moderately Wide	97	7.2	26	2.2	51	4.5	7	15
Farm System								
Dairy	74	14.6	19	4.3	39	8.7	5	13
Tillage	99	12.9	24	3.4	48	6.7	7	14

Table 3-13. N, P and K usage for all cereals in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	140	3.4	26	0.9	58	1.7	22	210
Region								
South-East	123	3.9	31	2.0	56	3.0	20	58
Mid-East	152	8.9	23	2.0	65	4.1	28	38
Midlands	145	12.0	30	2.3	65	3.6	19	28
Border	155	7.0	23	1.7	56	4.0	29	43
South	109	6.0	21	1.5	45	2.8	15	33
South-West	62	2.7	22	3.6	44	7.2	7	3
West	100	13.8	17	2.8	41	7.8	3	7
Soil Use Class								
Wide	140	4.6	28	1.2	58	2.0	22	114
Moderately Wide	142	6.3	21	1.5	51	2.7	23	64
Somewhat Limited	140	9.9	29	2.9	77	7.5	20	22
Limited	106	14.2	28	4.0	60	7.8	14	10
Farm System								
Dairy	125	4.6	26	1.5	54	2.7	15	86
Cattle & Sheep	100	6.2	25	2.3	65	6.2	7	33
Tillage	149	5.2	25	1.3	59	2.3	33	91

Table 3-14. Percentage of the total N, P and K applied to all cereal crops in 2005 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	59.7	-	-
UREA	2.1	-	-
Potash 50% K	-	-	1.4
0 - 5 - 5	-	1.4	0.6
0 - 7 - 30	-	3.3	5.9
0 - 10 - 20	-	6.1	5.1
8 - 5 - 18	0.9	3.2	4.9
10 - 10 - 20	4.5	26.0	21.7
14 - 7 - 14	1.3	3.8	3.2
15 - 3 - 20	0.3	0.4	1.1
18 - 6 - 12	18.2	35.3	29.4
20 - 0 - 15	1.2	-	2.1
27 - 2.5 - 5	1.2	0.6	0.5
16 - 7 - 13.3	0.6	1.6	1.3
16 - 4 - 20	0.5	0.7	1.5
Other	9.3	17.4	21.4

Table 3-15. N, P and K usage for sugar beet in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	185	7.7	53	1.7	169	5.6	9	66
Region								
South-East	182	11.1	55	2.4	165	9.3	9	33
Mid-East	206	36.0	52	4.0	176	14.1	8	6
Midlands	149	9.8	57	2.7	206	9.0	7	11
South	191	14.2	44	2.6	152	7.4	10	15
Soil Use Class								
Wide	196	9.5	53	2.3	159	6.9	9	44
Moderately Wide	161	12.5	52	2.2	186	9.1	9	20
Farm System								
Dairy	183	13.4	51	3.3	138	11.5	7	24
Cattle & Sheep	107	11.5	57	6.1	243	22.2	5	5
Tillage	190	9.9	53	2.0	177	4.7	10	37

Table 3-16. N, P and K usage for fodder beet in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	142	12.2	55	4.1	174	11.8	3	36
Region								
South-East	174	20.8	72	7.4	201	16.2	2	13
Mid-East	159	8.1	60	2.9	198	15.8	3	5
Midlands	141	16.6	63	4.9	216	12.3	3	7
South	169	36.6	35	4.9	93	16.7	1	8
Soil Use Class								
Wide	141	19.7	47	6.8	151	19.1	2	20
Moderately Wide	174	14.3	66	3.7	201	15.5	3	9
Somewhat Limited	103	34.0	57	5.9	203	20.1	3	3
Limited	108	24.7	66	8.9	192	13.5	3	4
Farm System								
Dairy	163	17.4	57	6.2	180	16.6	2	17
Cattle & Sheep	136	25.9	68	6.8	213	21.3	3	5
Tillage	122	21.5	46	6.8	148	20.2	3	14

Table 3-17. N, P and K usage for potatoes in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	120	9.2	97	6.1	368	30.5	14	13
Region								
South-East	102	4.5	87	3.9	264	12.9	4	3
South	281	142.0	46	18.2	130	51.4	1	3
Border	116	5.8	90	8.7	419	47.5	32	4
Soil Use Class								
Wide	99	5.3	85	4.6	257	16.4	3	4
Moderately Wide	117	4.7	91	7.4	415	37.5	22	6
Somewhat Limited	135	44.6	121	15.0	243	26.3	13	3
Farm System								
Dairy	188	111.0	45	9.8	126	27.8	1	4
Tillage	118	3.7	98	7.5	373	37.9	22	8

Table 3-18. N, P and K usage for all root crops in 2005

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	154	6.1	58	2.4	193	10.1	8	119
Region								
South-East	158	10.4	51	2.8	150	9.4	8	49
Mid-East	157	21.1	77	11.1	194	17.9	9	13
Midlands	146	8.8	58	3.0	204	10.5	7	14
Border	121	15.3	79	9.3	351	50.7	16	10
South-West	134	33.8	56	8.4	202	30.2	4	3
South	180	12.7	42	1.9	140	7.0	6	29
Soil Use Class								
Wide	173	8.6	49	2.1	147	6.9	8	67
Moderately Wide	141	8.5	66	4.3	265	23.4	11	33
Somewhat Limited	113	22.2	90	15.2	194	29.0	6	10
Limited	75	20.8	44	10.3	132	32.3	4	9
Farm System								
Dairy	155	10.3	46	2.5	126	8.2	5	52
Cattle & Sheep	82	13.3	41	6.9	141	27.0	4	17
Tillage	162	8.4	65	3.7	229	15.9	12	50

Table 3-19. Percentage of the total N, P and K applied to all root crops in 2005 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	23.9	-	-
Potash 42% K	-	-	14.0
8 - 5 - 18	8.4	14.1	15.0
9 - 4.5 - 18	6.2	8.4	10.0
9 - 6 - 15	3.9	7.0	5.1
13 - 4 - 14	22.5	18.7	19.4
7 - 6 - 17	4.7	10.9	9.2
10 - 10 - 20	9.0	24.2	14.3
18 - 6 - 12	3.0	2.7	1.6
14 - 6.1 - 17.4	2.4	2.8	2.4
24 - 6 - 12	2.6	1.8	1.1
10 - 3 - 18	1.3	1.1	1.9
Other	12.1	8.3	6.1

Table 3-20. N, P and K usage for forage maize in 2005

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	157	11.1	36	3.6	80	7.8	6	49
Region								
South-East	144	10.3	39	5.3	77	11.3	6	18
Mid-East	159	21.6	38	10.5	78	20.5	7	10
Midlands	264	57.4	32	4.7	96	22.0	6	6
Border	145	25.5	52	21.3	108	42.8	5	4
South	120	18.1	29	7.2	75	16.5	7	9
Soil Use Class								
Wide	133	10.3	33	3.3	80	9.3	5	27
Moderately Wide	153	24.7	36	11.0	72	21.9	7	9
Somewhat Limited	174	13.1	50	12.9	102	24.9	7	8
Limited	239	70.8	22	3.6	55	8.0	7	5
Farm System								
Dairy	151	11.6	36	4.2	80	9.0	6	40
Cattle & Sheep	154	29.3	23	9.6	51	19.9	5	4
Tillage	208	51.6	47	5.0	100	18.2	6	5

APPENDIX 4: FERTILIZER USAGE IN 2004

Table 4-1. N, P and K usage for all grassland in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	113	2.2	11	0.3	27	0.6	26.7	1240
Region								
South-East	130	5.0	12	0.7	28	1.6	28.9	192
Mid-East	109	6.9	10	0.7	26	2.0	38.9	127
Midlands	97	6.4	10	0.8	29	2.2	29.7	120
Border	99	5.1	11	0.8	24	1.4	22.9	229
South-West	88	5.6	9	0.5	24	1.5	25.8	132
South	160	5.3	12	0.5	31	1.2	25.8	261
West	58	3.1	8	0.6	20	1.3	20.8	179
Soil Use Class								
Wide	140	4.5	11	0.5	29	1.1	29.4	383
Moderately Wide	111	5.0	10	0.7	26	1.6	28.1	226
Somewhat Limited	93	4.4	10	0.5	26	1.3	25.9	213
Limited	93	3.4	10	0.4	25	1.0	23.9	417
Farm System								
Dairy	159	3.4	13	0.4	34	1.0	32.1	495
Cattle	57	1.9	8	0.3	19	0.7	20.9	512
Sheep	63	3.9	7	0.6	17	1.4	29.8	137
Tillage	100	6.1	9	0.8	24	2.0	25.6	94
Stocking Rate (All Farm Types)								
< 100	48	2.0	7	0.3	16	0.7	23.3	453
100 - 130	84	2.8	10	0.4	24	0.9	27.9	261
130 - 170	141	3.6	12	0.5	31	1.2	31.4	310
170 - 210	183	5.4	14	0.7	35	1.8	27.0	164
210 - 250	237	11.9	20	1.8	49	3.0	22.0	44
> 250	225	36.8	26	12.8	54	19.8	20.9	8
Dairy System by Stocking Rate								
< 100	84	9.4	9	0.9	21	1.9	31.8	49
100 - 130	104	5.1	10	0.7	28	1.7	35.3	74
130 - 170	157	4.4	13	0.6	33	1.6	35.6	195
170 - 210	195	5.6	14	0.7	37	2.0	28.7	132
210 - 250	251	11.3	21	2.0	50	3.1	22.5	38
> 250	257	28.3	30	14.5	62	21.7	19.4	7
Cattle System by Stocking Rate								
< 100	41	1.8	6	0.3	16	0.8	20.4	312
100 - 130	69	3.6	9	0.6	22	1.3	22.9	126
130 - 170	97	5.7	10	1.0	25	2.4	20.7	57
170 - 210	101	14.6	13	3.2	33	7.7	15.7	16

Table 4-2. N, P and K usage for grazing in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	92	2.3	8	0.3	18	0.6	26.8	1232
Region								
South-East	107	5.3	9	0.7	21	1.6	29.1	191
Mid-East	83	6.2	7	0.6	17	1.9	38.9	125
Midlands	77	6.5	7	0.7	18	1.8	29.9	119
Border	81	5.3	8	0.8	17	1.5	23	228
South-West	71	5.8	6	0.5	15	1.3	25.8	132
South	140	5.7	10	0.5	23	1.1	26.1	258
West	43	2.9	6	0.5	13	1.0	20.8	179
Soil Use Class								
Wide	120	4.7	9	0.5	20	1.0	29.6	380
Moderately Wide	86	5.0	7	0.7	18	1.6	28	224
Somewhat Limited	77	4.3	8	0.5	18	1.2	25.9	212
Limited	71	3.4	7	0.4	17	0.8	24	415
Farm System								
Dairy	139	3.7	10	0.5	24	1.0	32	494
Cattle	41	1.7	5	0.3	12	0.6	20.9	511
Sheep	50	3.8	5	0.6	12	1.4	29.8	137
Tillage	81	6.1	7	0.8	17	2.1	26.9	88
Stocking Rate (All Farm Types)								
< 100	35	1.9	4	0.3	10	0.6	23.6	446
100 - 130	68	2.8	7	0.4	17	0.9	27.9	261
130 - 170	121	3.8	9	0.5	23	1.1	31.4	310
170 - 210	168	6.4	11	0.7	25	1.7	27	164
210 - 250	237	14.5	19	2.5	38	4.7	21.1	43
> 250	231	50.5	31	16.8	54	25.9	20.9	8
Dairy System by Stocking Rate								
< 100	67	9.2	6	1.0	14	2.0	31.8	49
100 - 130	87	5.2	8	0.7	19	1.8	35.3	74
130 - 170	136	4.8	10	0.6	25	1.5	35.6	195
170 - 210	182	6.8	11	0.8	27	1.9	28.7	132
210 - 250	256	13.9	19	2.8	37	4.9	21.4	37
> 250	279	40.3	38	19.1	65	29.1	19.4	7
Cattle System by Stocking Rate								
< 100	27	1.6	4	0.3	9	0.6	20.4	311
100 - 130	54	3.7	6	0.5	15	1.2	22.9	126
130 - 170	78	6.3	8	1.0	17	2.2	20.7	57
170 - 210	70	12.3	9	2.0	21	4.6	15.7	16

Table 4-3. N, P and K usage for silage in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	120	1.8	13	0.3	38	0.9	12.0	1141
Region								
South-East	136	4.5	14	0.7	35	2.2	14.6	175
Mid-East	137	7.4	14	1.0	42	2.6	16.5	114
Midlands	115	5.4	15	1.1	48	3.2	12.9	110
Border	104	3.5	13	0.6	34	1.6	10.0	209
South-West	100	4.4	13	0.9	40	2.9	10.9	124
South	137	3.6	12	0.5	38	2.0	12.8	244
West	77	3.0	12	0.7	31	1.8	7.6	165
Soil Use Class								
Wide	135	3.5	13	0.5	40	1.8	14.2	352
Moderately Wide	128	4.5	14	0.7	39	1.9	12.8	210
Somewhat Limited	98	3.4	12	0.6	36	1.7	10.5	197
Limited	107	2.7	13	0.5	37	1.4	10.2	381
Farm System								
Dairy	141	2.7	14	0.4	42	1.4	16.8	492
Cattle	82	2.0	12	0.4	31	1.2	7.9	470
Sheep	96	4.6	13	0.7	33	2.0	8.5	100
Tillage	114	7.0	13	1.3	32	2.6	11.0	77

Table 4-4. N, P and K usage for hay in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	51	2.0	10	0.5	24	1.2	4.1	353
Region								
South-East	55	3.4	10	1.2	21	2.5	4.8	66
Mid-East	65	6.4	12	1.7	30	3.6	5.4	52
Midlands	38	4.3	9	1.4	23	3.8	6.3	47
Border	44	5.6	8	1.3	17	2.7	2.8	45
South-West	37	4.1	9	1.0	24	2.7	3.4	48
South	74	5.9	10	1.2	25	2.9	2.8	55
West	40	3.8	8	1.5	25	3.5	3.1	40
Soil Use Class								
Wide	50	3.1	10	0.9	25	2.2	4.4	138
Moderately Wide	57	4.4	8	0.7	21	1.7	4.8	75
Somewhat Limited	52	5.2	11	1.4	29	3.1	3.5	64
Limited	45	3.7	9	1.1	22	2.6	3.6	76
Farm System								
Dairy	55	3.6	10	0.8	24	1.8	3.5	124
Cattle	38	2.5	9	0.8	23	1.8	3.6	147
Sheep	46	3.9	8	1.6	19	3.4	5.1	36
Tillage	70	6.2	11	1.6	30	4.1	6.8	46

Table 4-5. Percentage of the total N, P and K applied for grassland in 2004 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	29.2	-	-
UREA	13.4	-	-
Potash 50% K	-	-	1.0
0 - 7 - 30	-	5.5	9.3
0 - 10 - 20	-	3.2	2.6
10 - 10 - 20	0.8	8.3	6.6
18 - 6 - 12	6.4	22.7	18.0
20 - 0 - 15	0.5	-	1.7
24 - 2.5 - 10	11.1	12.4	19.7
27 - 2.5 - 5	28.4	28.1	22.3
20 - 4 - 10	0.6	1.2	1.2
24 - 2.5 - 5	2.9	3.2	2.5
27 - 2.5 - 10	0.8	0.8	1.3
22 - 2.5 - 10	1.4	1.7	2.7
Other	4.3	13.2	11.4

Table 4-6. N, P and K usage for winter wheat in 2004

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	199	4.2	27	1.7	65	3.4	35	54
Region								
South-East	209	23.6	22	12.3	85	15.0	22	4
Mid-East	207	6.0	23	2.1	61	5.6	38	23
Border	196	4.7	31	3.0	67	5.1	41	20
South	142	17.6	29	4.2	59	8.1	17	5
Soil Use Class								
Wide	189	5.7	31	2.9	70	4.2	26	27
Moderately Wide	208	6.9	25	2.3	60	5.5	58	17
Somewhat Limited	187	11.1	20	4.7	65	13.8	19	10
Farm System								
Dairy	168	10.7	30	4.7	66	9.3	15	15
Tillage	203	4.3	26	1.9	64	3.8	44	38

Table 4-7. N, P and K usage for spring wheat in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	154	8.4	24	2.2	54	4.6	12	41
Region								
South-East	143	8.9	28	3.1	58	7.1	11	18
Mid-East	149	11.2	30	5.6	64	12.4	15	7
Midlands	204	34.3	12	3.3	44	10.9	13	6
Border	172	19.1	15	8.7	40	13.8	21	3
South	105	24.8	18	5.4	42	10.4	7	7
Soil Use Class								
Wide	156	16.1	25	3.5	52	6.9	10	20
Moderately Wide	160	6.1	22	3.2	54	6.8	15	16
Limited	104	32.6	23	4.0	47	14.7	10	4
Farm System								
Dairy	130	9.4	25	4.3	60	10.5	7	14
Tillage	161	10.9	24	2.7	53	5.1	15	26

Table 4-8. N, P and K usage for winter barley in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	173	7.5	33	3.9	75	6.2	24	25
Region								
Mid-East	171	21.3	19	3.0	72	13.1	14	10
Border	174	6.9	40	6.1	76	6.7	33	12
Soil Use Class								
Wide	168	6.6	35	4.3	80	11.4	17	11
Moderately Wide	180	11.7	34	6.5	72	7.2	32	12
Farm System								
Tillage	176	7.7	33	4.2	76	6.6	24	23

Table 4-9. N, P and K usage for spring barley in 2004

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	120	2.3	25	1.0	55	1.9	15	186
Region								
South-East	118	3.4	27	1.8	53	3.2	14	59
Mid-East	130	4.3	28	2.7	62	4.5	19	36
Midlands	111	7.9	22	2.2	60	5.7	18	20
Border	124	6.5	24	2.0	47	3.6	17	36
South	113	5.6	23	2.1	51	4.1	9	26
South-West	91	14.5	28	5.6	84	20.1	9	5
West	65	8.8	12	5.6	23	11.3	3	4
Soil Use Class								
Wide	120	3.1	27	1.3	58	2.4	15	105
Moderately Wide	118	4.2	22	1.8	47	3.1	15	57
Somewhat Limited	132	7.4	27	3.1	65	7.7	17	16
Limited	101	6.6	29	2.3	60	5.1	11	8
Farm System								
Dairy	113	4.2	26	1.4	61	2.8	11	77
Cattle & Sheep	103	6.0	27	2.7	56	5.0	6	26
Tillage	125	3.0	25	1.5	52	2.8	21	83

Table 4-10. N, P and K usage for malting barley in 2004

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	120	5.0	23	3.0	59	4.8	16	40
Region								
South-East	115	7.3	27	5.9	48	6.1	20	16
Mid-East	104	8.5	13	7.4	50	20.7	9	4
Midlands	139	13.7	21	3.7	94	8.4	16	9
South	115	6.8	17	3.6	48	5.2	12	11
Soil Use Class								
Wide	121	5.8	24	3.5	58	5.4	17	32
Moderately Wide	117	7.9	20	6.4	59	12.6	12	6
Farm System								
Dairy	116	5.3	32	10.4	51	7.1	11	12
Tillage	122	6.6	20	2.1	60	6.1	18	27

Table 4-11. N, P and K usage for winter oats in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	122	7.3	29	3.5	73	7.8	13	15
Region								
South-East	133	11.8	19	6.1	79	16.8	12	3
Mid-East	105	19.1	31	7.0	94	14.7	12	4
Border	127	8.7	31	5.0	61	10.1	13	8
Soil Use Class								
Wide	122	10.7	29	4.5	72	7.5	10	9
Somewhat Limited	111	19.0	21	9.7	76	35.3	15	3
Farm System								
Dairy	118	24.2	31	6.3	69	8.0	9	4
Tillage	123	7.2	28	4.2	74	10.0	14	11

Table 4-12. N, P and K usage for spring oats in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	103	8.4	23	2.2	47	4.5	9	31
Region								
South-East	84	17.6	17	4.9	36	10.8	5	10
Mid-East	139	3.9	23	2.1	46	4.2	16	4
Border	97	9.5	26	3.0	53	6.0	10	13
Soil Use Class								
Wide	102	19.5	18	5.4	41	10.8	6	10
Moderately Wide	104	9.0	23	1.9	46	3.7	10	17
Farm System								
Dairy	85	11.6	20	4.2	44	8.2	7	12
Tillage	112	11.7	25	2.7	48	5.9	10	17

Table 4-13. N, P and K usage for all cereals in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	148	2.7	26	0.8	60	1.5	28	244
Region								
South-East	126	3.7	26	1.6	55	2.5	20	77
Mid-East	168	5.1	25	1.6	62	3.7	40	49
Midlands	133	9.0	21	1.8	69	4.8	21	29
Border	161	5.7	30	1.7	61	2.9	46	46
South	115	6.3	22	2.0	50	3.6	15	33
South-West	91	14.5	28	5.6	84	20.1	9	5
West	56	13.1	10	5.0	20	9.9	3	5
Soil Use Class								
Wide	140	3.5	27	1.2	62	2.0	25	136
Moderately Wide	162	4.9	25	1.2	56	2.3	39	71
Somewhat Limited	149	7.4	24	2.7	68	7.6	24	23
Limited	96	9.9	26	1.9	57	6.5	11	14
Farm System								
Dairy	122	3.9	27	1.5	60	2.6	15	97
Cattle & Sheep	102	5.4	26	2.5	57	5.0	6	30
Tillage	158	3.6	26	1.0	60	2.1	44	117

Table 4-14. Percentage of the total N, P and K applied to all cereal crops in 2004 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	64.6	-	-
UREA	4.9	-	-
Potash 50% K	-	-	2.0
0 - 7 - 30	-	6.5	11.7
0 - 10 - 20	-	17.6	14.9
10 - 10 - 20	4.7	27.4	23.1
14 - 7 - 14	1.4	4.1	3.4
15 - 3 - 20	1.1	1.2	3.5
15 - 10 - 10	0.6	2.4	1.0
18 - 6 - 12	14.1	27.6	23.2
20 - 0 - 15	0.6	-	1.1
27 - 2.5 - 5	1.9	1.0	0.9
Other	6.3	12.0	15.2

Table 4-15. N, P and K usage for sugar beet in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	171	6.7	54	1.7	190	5.9	9	68
Region								
South-East	165	10.3	58	2.1	190	6.3	10	35
Mid-East	144	11.4	54	3.7	209	12.4	10	8
Midlands	187	13.7	53	6.3	234	24.9	6	11
South	201	13.0	43	3.0	150	8.7	11	13
Soil Use Class								
Wide	183	9.5	53	2.2	184	8.1	9	44
Moderately Wide	151	6.8	56	2.6	198	8.1	11	21
Farm System								
Dairy	174	11.8	46	2.8	160	9.2	7	18
Cattle & Sheep	190	36.9	42	14.1	164	55.5	4	4
Tillage	170	8.4	56	1.9	198	6.7	11	46

Table 4-16. N, P and K usage for fodder beet in 2004

	N	s.e	P	s.e	K	s.e	Mean Area	No. of Farms
	kg/ha						(ha)	
Overall	124	9.5	51	4.7	170	12.8	2	39
Region								
South-East	152	11.4	58	7.5	205	17.8	2	16
Mid-East	82	13.9	48	8.4	168	25.4	2	5
Midlands	133	19.3	55	6.0	181	21.4	3	7
South	143	27.5	45	8.2	128	20.6	1	8
Soil Use Class								
Wide	123	13.3	51	7.6	160	19.2	3	22
Moderately Wide	120	21.3	40	5.4	157	20.3	2	10
Somewhat Limited	109	37.1	58	5.8	165	35.7	3	3
Limited	140	19.7	64	6.3	231	22.8	3	4
Farm System								
Dairy	129	14.9	59	6.9	183	16.8	3	15
Cattle & Sheep	142	21.2	57	8.6	210	32.1	2	7
Tillage	112	15.2	42	7.8	143	20.8	2	17

Table 4-17. N, P and K usage for potatoes in 2004

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	130	9.3	103	8.9	251	14.0	15	19
Region								
South-East	86	6.2	73	5.3	275	33.7	4	3
Mid-East	141	9.6	134	13.4	314	6.9	17	5
Border	129	16.8	91	13.0	221	17.9	23	8
South	65	6.4	56	5.5	158	15.5	1	3
Soil Use Class								
Wide	172	19.9	108	11.6	248	21.8	7	8
Moderately Wide	114	8.2	94	12.1	242	20.1	22	9
Farm System								
Dairy	86	13.5	78	14.5	194	28.6	1	3
Tillage	131	10.5	103	10.1	252	15.8	19	15

Table 4-18. N, P and K usage for all root crops in 2004

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	146	5.6	63	3.2	191	6.8	9	120
Region								
South-East	154	9.4	56	2.6	185	7.9	9	46
Mid-East	121	12.5	79	12.5	222	24.7	12	18
Midlands	167	14.2	53	4.6	214	19.7	6	16
Border	119	14.1	81	12.0	201	21.7	19	12
South	185	12.0	42	2.8	141	8.5	6	26
Soil Use Class								
Wide	167	8.2	56	3.3	179	8.3	8	69
Moderately Wide	126	7.3	68	5.7	204	11.5	13	36
Somewhat Limited	130	17.5	109	21.8	234	40.5	7	8
Limited	108	25.9	40	11.8	154	42.5	5	7
Farm System								
Dairy	133	12.1	41	3.7	136	11.5	6	38
Cattle & Sheep	108	18.7	34	6.8	118	24.4	4	16
Tillage	152	6.8	71	4.2	211	7.6	13	66

Table 4-19. Percentage of the total N, P and K applied to all root crops in 2004 that was supplied with each fertilizer type

Fertilizer Type	N	P	K
	%		
CAN	21.3	-	-
Sulph. Amm. (21% N)	5.0	-	-
0 - 7 - 30	-	2.6	3.7
8 - 5 - 18	11.7	17.0	20.1
9 - 4.5 - 18	8.2	9.5	12.5
9 - 6 - 15	4.3	6.7	5.5
13 - 4 - 14	17.7	12.6	14.5
7 - 6 - 17	3.7	7.4	6.9
10 - 10 - 20	12.5	28.9	19.0
18 - 6 - 12	1.3	1.0	0.7
20 - 0 - 15	1.0	-	0.6
10 - 3 - 18	2.6	1.8	3.5
Other	10.5	12.3	12.9

Table 4-20. N, P and K usage for forage maize in 2004

	N	s.e	P	s.e	K	s.e	Mean Area (ha)	No. of Farms
	kg/ha							
Overall	133	9.2	39	4.3	90	10.0	6	42
Region								
South-East	124	8.8	47	6.4	93	12.6	6	15
Mid-East	137	28.2	21	7.9	58	20.4	5	8
Midlands	117	26.5	24	2.8	69	16.9	7	6
Border	215	36.7	51	13.0	102	26.1	5	5
South	137	13.4	59	19.4	179	49.2	4	6
Soil Use Class								
Wide	130	7.1	50	6.2	106	15.8	5	22
Moderately Wide	149	28.5	37	8.4	91	18.3	5	11
Somewhat Limited	128	27.7	13	3.6	43	13.9	5	5
Limited	121	33.0	28	6.5	72	21.4	9	4
Farm System								
Dairy	123	7.9	37	4.7	86	11.4	6	34
Tillage	168	37.7	51	11.6	107	24.7	5	7

APPENDIX 5: GLOSSARY OF TERMS

Crop Area: The total adjusted area under crops, plus adjusted commonage area.

European Size Unit (ESU): An alternative measurement of farm size to that measured by surface area. A farm business with a size of one ESU has a standard gross margin of €1200.

Forage and Crop Area: The total adjusted area under grass (including rough grazing), plus adjusted commonage area.

Frequencies of Farms (%): Frequency distribution tables are given for farm systems, management variables, soil groups etc. These tables show the estimated per cent of farms in the population having various levels of the variables.

Grassland: The sum of areas under silage, hay and pasture, of which:

> **Silage:** Basic area of ground cut at least once for silage (no adjustments are made for land cut more than once or for grazing).
>
> **Hay:** Basic area of ground cut at least once for hay (no adjustments are made for land cut more than once or for grazing).
>
> **Grazing Livestock Unit (LU):** A dairy cow is taken as the basic grazing livestock unit. All other grazing stock are given equivalents, as shown in the following table.
>
> The rate of organic N excretion per animal per year is also shown:

Table 5-1. Livestock unit (LU) and annual organic N excretion rates for different animal types

Animal Type	LU	Organic N excretion per year (kg/ha)
Cattle		
Dairy cow	1.0	85
Suckler cow	0.9	65
Calves < 6 months	0.2	24
Calves 6-12 months	0.4	24
Cattle 1-2 years	0.7	57
Cattle > 2 years	1.0	65
Stock Bulls	1.0	65
Sheep		
Ewes and rams (Lowland)	0.20	13
Ewes and rams (Mountain)	0.14	7
Lambs to weaning	0.00	0
Lambs after weaning (Lowland)	0.12	0
Lambs after weaning (Mountain)	0.10	0
Hoggets and wethers (Lowland)	0.15	6
Hoggets and wethers (Mountain)	0.10	4

Per Cent of Population: These figures are estimates of the percentage of the population (of farms) that fall into individual categories. For example in Table 6 of the main text, 1.1% of the population (of farms) are estimated to be dairy farm systems of less than 10 UAA (Ha).

Region: Areas defined by the CSO containing the following counties:

Region	Counties
Border	Louth, Leitrim, Sligo, Cavan, Donegal, Monaghan
Mid-East	Dublin, Kildare, Meath, Wicklow
Midlands	Laois, Longford, Offaly, Westmeath
South	Cork**,** Kerry
South-East	Carlow, Kilkenny, Wexford, Tipperary SR, Waterford
South-West	Clare, Limerick, Tipperary NR
West	Galway, Mayo, Roscommon

Remainder of Farm: Land covered by woods, areas not in agricultural use for economic, social or other reasons but which could be so used. It also includes ground covered by paths, roads, buildings or land which cannot be farmed, e.g., quarries, barren land, swamps, areas under water, etc.

Rough Grazing: Grazed unreclaimable bogland, grazed mountain of known area and grazed lowland partially covered by scrub, bushes or rock. It does not include land with impeded drainage unless subject to flooding.

Soil Use Class: Farms are classified according to Gardiner and Radford (1982) into four major groups depending on the range of uses to which it may be put. Soil use class 1 can grow the widest range of crops without limitation and soil use class 4 contains farms with limited to extremely limited use range.

Total Area: The map area of land owned, plus land rented in, minus land rented out. It is equal to UAA plus 'remainder of farm'.

Utilised Agricultural Area (UAA): The area under crops and pasture, plus the area (unadjusted) of rough grazing. It is the total area owned, plus area rented in, minus area rented out, minus area under remainder of farm.

APPENDIX 6: NATIONAL FERTILIZER SALES 1995-2008

Table 6-1. National sales of N, P and K fertilizers from 1995 to 2008 (DAFF, 2009)

YEAR	N	P	K
	tonnes		
1995	428,826	62,410	150,543
1999	442,916	50,509	125,729
2000	407,598	49,267	122,695
2001	368,667	42,697	106,884
2002	363,513	41,869	105,597
2003	388,080	43,832	111,136
2004	362,525	42,661	110,645
2005	352,165	38,645	100,710
2006	345,154	37,209	92,880
2007	321,588	32,415	84,737
2008	308,960	26,350	69,584

APPENDIX 7: UNITS OF MEASUREMENT

Metric	Imperial
1 kg	2 units
1 kg/ha	0.81 units/acre
1 kg/ha	0.91 lb/acre
1 tonne/ha	0.4 tons/acre
1 m^3/ha	89.0 gallons/acre
1 kg/m^3	9.09 units/1000 gallons
Imperial	**Metric**
1 ton/acre	2.51 tonnes/ha
1 unit/acre	1.24 kg/ha
1 lb/acre	1.1 kg/ha
1 unit/ton	0.492 kg/tonne
1000 gallons/acre	11.2 m^3/ha
1 unit/1000 gallons	0.110 kg/m^3
Element to Oxide	
P to P_2O_5	Multiply by 2.291
K to K_2O	Multiply by 1.205
Oxide to Element	
P_2O_5 to P	Multiply by 0.436
K_2O to K	Multiply by 0.830