Department for Environment Food & Rural Affairs

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Fertiliser usage on farms: Results from the Farm Business Survey, England 2018/19

This release presents estimates of the use of precision farming techniques, soil nutrient software, clover and other legumes in grass swards, green manures, sources of nutrient planning advice and fertiliser application rates at the farm level in England. Key results summarising general questions on fertiliser practices and fertiliser application rates can be found below. All year on year changes are unlikely to be significant.

General Questions on Fertiliser Practices

- Almost a quarter (24%) of farm businesses carried out **precision farming techniques** to guide fertiliser application. Usage was more likely on cereal and general cropping farms and on farms with at least some of their land within a Nitrate Vulnerable Zone.
- Just over a quarter (27%) of farms used **soil nutrient software packages** to help determine fertiliser applications. Usage was most common on cereal and general cropping farms and on farms with at least some of their land within a Nitrate Vulnerable Zone.
- Just under half (49%) of farms with grass included **clover or other legumes in their grass swards**. This practice was most common on mixed and dairy farms, and on farms in the South West.
- Very few farmers (17%) use **green manures** in their arable rotations. Use was most common on cereal, general cropping and mixed farms. Farms designated as organic were also more likely to use green manures than others.
- For those farms using either clover/legumes or green manures, 71% made **adjustments to their fertiliser application** rates. This practice was most common on general cropping, dairy and mixed farms and on farms in the South West.
- Nearly half of farm businesses (46%) relied on their own non-FACTS[1] qualified **advice for nutrient planning**, 26% relied on independently supplied FACTS advice, and 23% received advice from their FACTS-qualified fertiliser supplier.

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[1] FACTS = Fertiliser Advisory Certification and Training Scheme

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Fertiliser Application Rates

- There has been little change in **overall application rates** recorded by the Farm Business Survey since 2012/13.
- The average amount of **nitrogen applied per hectare** of farmed area[2] from manufactured and organic fertilisers was 110 kg/ha and 9 kg/ha respectively. Cereal farms had the highest application rates of manufactured nitrogen whilst grazing livestock had the lowest. Dairy and pigs & poultry farms had the highest application rates of organic nitrogen, while horticulture had the lowest.
- The average amount of **phosphate applied per hectare** of farmed area[2] from manufactured and organic fertilisers was 22 kg/ha and 10 kg/ha respectively. General cropping farms had the highest application rates of manufactured phosphate whilst grazing livestock had the lowest. Dairy and pigs & poultry farms had the highest application rates of organic phosphate, while horticulture had the lowest.
- The average amount of **potash applied per hectare** of farmed area[2] from manufactured and organic fertilisers was 27 kg/ha and 28 kg/ha respectively. Horticulture farms had the highest application rates of manufactured phosphate whilst grazing livestock had the lowest. Dairy and pigs & poultry farms had the highest application rates of organic phosphate, while horticulture had the lowest.

[2] Excludes rough grazing

1 Introduction

The data used for this analysis is from a sample of 1768 farms that completed the fertiliser module in the 2018/19 Farm Business Survey (FBS). Completion of the module was compulsory from 2017/18 following a planned, phased introduction of the module since 2012/13. The FBS covers those farms with at least 25,000 euros of standard output in England.

Nutrients, particularly nitrogen, are the biggest determinant of yield and also have a major impact on crop structure and the quality of the end product. Over recent years there has been an increasing focus on agriculture's environmental footprint, and how nutrient losses to the ground and water can negatively affect biodiversity and the quality of drinking water. Data collected on the quantity of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) applied as fertiliser in their manufactured form can help estimate the environmental footprint. The British Survey of Fertiliser Practice[3] (BSFP) is the primary source of data on fertiliser use in Great Britain, and collects a more detailed breakdown of the crops that fertilisers are applied too. Comparisons are made throughout this publication.

This release marks the first year in which the organic fertiliser section of the module has been included in the publication. This section has not been published previously due to methodological changes in data collection on poultry farms and a small sample size for pig farms. The methodology has remained the same since 2016/17 and there has been an increase in sample size. Results for both 2017/18 and 2018/19 have been included for comparability.

The results for 2018/19 are shown with confidence intervals and comparisons to the previous year. The full breakdown of results by farm type, farm size, region, farm tenure, farmer age, farm economic performance, Nitrate Vulnerable Zone (NVZs) status and organic status, can be found at: https://www.gov.uk/government/statistics/fertiliser-usage-on-farm-england.

From 2018/19, the classification of farms is based on 2013 standard output coefficients. 2017/18 results have been recalculated and presented in this release to allow comparability. The results published here are therefore not directly comparable with those published in earlier years which are based on previous standard output coefficients.

Regression models were fitted to the key results to help determine the main factors associated with each response. In each case seven factors were considered - farm type, farm size, farm tenure, farmer's age, region, farm economic performance and Nitrate Vulnerable Zones[4] (NVZs). In the case of using green manures and when analysing organic fertiliser application rates, organic status was also considered, whilst the farmer's age was not considered for fertiliser application rates.

The land area in England which is designated a Nitrate Vulnerable Zone is regularly reviewed, with the latest review occurring in 2017 and the previous reviews occurring in 2013 and 2009. Results which were published in 2019 reflecting 2017/18 FBS data has since been reviewed

[3] For more information on the BSFP please see: https://www.gov.uk/government/collections/fertiliser-usage

[4] A NVZ is designated where land drains and contributes to the nitrate found in "polluted" waters. Farms with land in NVZs must comply with certain rules regarding nutrient planning, storage and application.

and NVZ designations updated to reflect the 2013 boundaries. Data published in previous years are therefore not directly comparable with results in this release and should be treated with caution. The results for 2018/19 data in this release are based on the 2017 NVZ designations.

This release provides the main results from the 2018/19 FBS which covered the 2018 harvest. Weather conditions can influence which crops are grown and the application rates of manufactured fertilisers. For a summary of the 2018/19 weather conditions and the 2018 crop areas on agricultural holdings see Appendix A.

2 General Questions

The Farm Business Survey includes six general questions covering the use of precision farming techniques, soil nutrient software, clover and legumes in grass swards, green manures and nutrient planning advice. The small year on year changes observed are unlikely to be significant.

2.1 Precision farming techniques

Precision farming techniques can make processes such as fertiliser application more efficient. Growers must balance the cost of inputs with a demand for higher yields and the pressure of increased environmental awareness and compliance. Precision technology can help to improve the efficiency of farm operations, including cultivation and better targeted fertiliser and agrochemical applications. This can reduce input use (and cost) and improve soil structure.

Farmers were asked if they carried out precision farming techniques (i.e. soil mapping and the use of satellite technology to guide fertiliser applications). In 2018/19, 24% of farms used these techniques (Table 1), little change from the previous year.

Table 1: Percentage of farm businesses using precision farming techniques, England 2017/18 to 2018/19

	Percent of farm businesses (%)	
	2017/18	2018/19
Precision farming techniques used	22 (±2)	24 (±2)
No precision farming techniques used	75 (±2)	73 (±2)
Not applicable[(a)]	3 (±1)	3 (±1)

95% confidence intervals shown in brackets.

[(a)] This includes farms who do not use any fertilisers and those that do not grow arable crops.

The use of precision farming techniques in 2018/19 was related[5] to farm type, farm size, region and to having land in a Nitrate Vulnerable Zone (NVZ). Cereal and general cropping farms were more likely to use these techniques than other farm types (46% in both cases, Figure 1). Usage was more common on large and very large farms (33% and 34% respectively).

Farms within a NVZ were more likely to use precision farming techniques, especially if their land was only partially within a NVZ (48% in 2018/19, up from 36% in the previous year, Figure 2). Farms in the East Midlands were more likely to use precision farming techniques than farms in other regions.

[5] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farmer age, farm performance and NVZ status) were related to this practice. Farm type, farm size, region and NVZ status were found to be significant predictors ($p < 0.05$).

Figure 1: Percentage of farm businesses using precision farming techniques by farm type, England 2017/18 to 2018/19

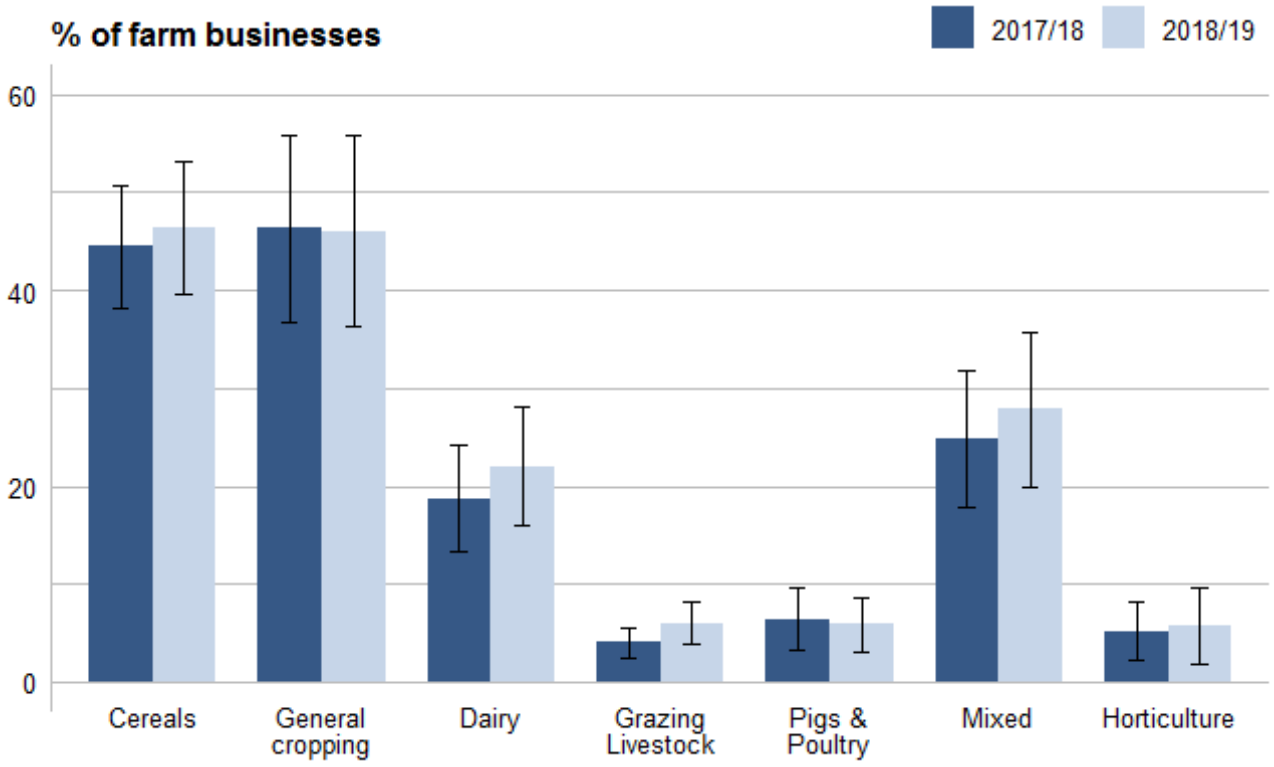
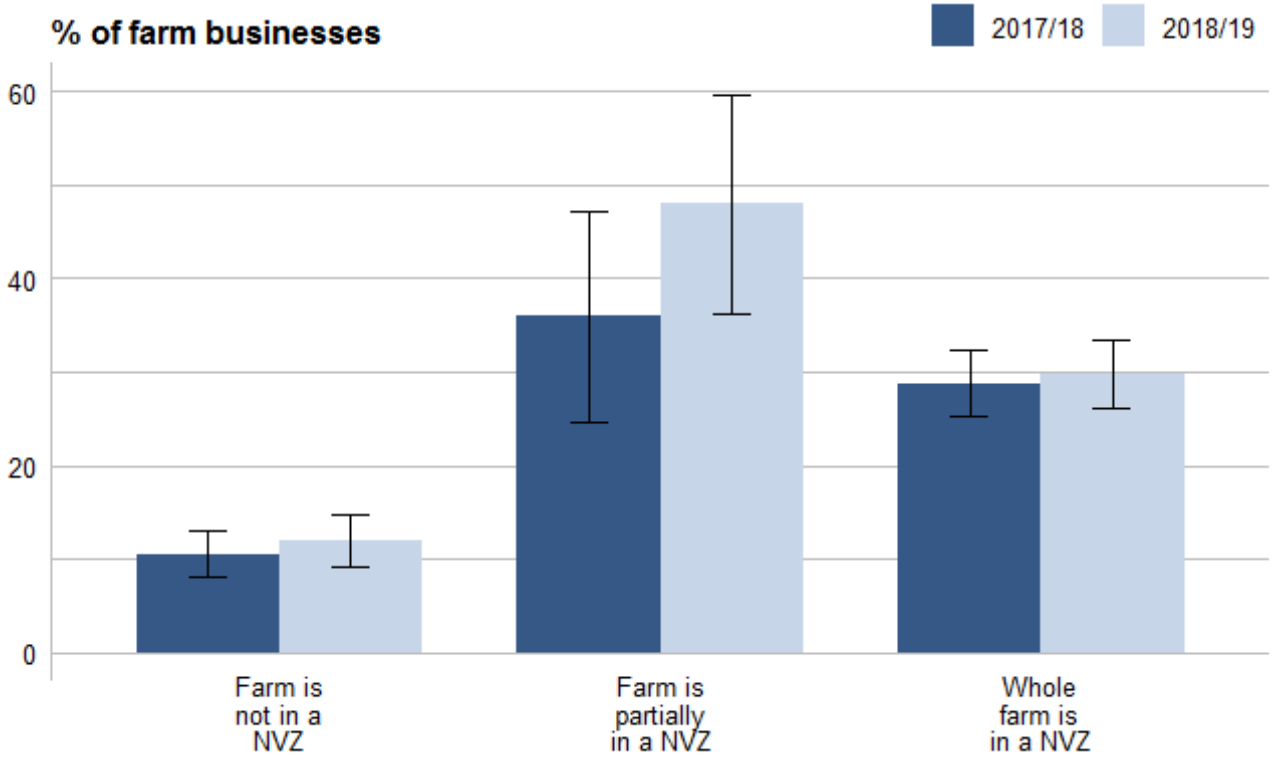


Figure 2: Percentage of farm businesses using precision farming techniques by NVZ status, England 2017/18 to 2018/19



2.2 Soil nutrient software

Effective nutrient management provides sufficient nutrients to meet the growth requirements of crops and grassland whilst managing environmental impacts; it can help minimise greenhouse gas emissions, reduce the incidence of diffuse water pollution and increase productivity by reducing input costs. There are a variety of tools and sources of advice that farmers can use to assess soil nutrient requirements; bespoke software packages provide one such means.

Just over a quarter of farms used soil nutrient software packages to help determine fertiliser applications in 2018/19 (Table 2), little change from the previous year. Results from the British Survey of Fertiliser Practice (BSFB) show similar levels; 29% of farms in England used a computer program to record manufactured fertiliser application rates and 20% for organic manures.

Table 2: Percentage of farm businesses using soil nutrient software packages to help determine fertiliser applications, England 2017/18 to 2018/19

	Percent of farm businesses (%)	
	2017/18	2018/19
Soil nutrient software used	25 (±2)	27 (±2)
No soil nutrient software used	72 (±2)	70 (±3)
Not applicable[(a)]	3 (±1)	3 (±1)

95% confidence intervals shown in brackets.

[(a)] This includes farms that do not use any fertilisers and those that do not grow arable crops.

Similar to previous years, the use of soil nutrient software was related[6] to farm type, farm size and to having land in a Nitrate Vulnerable Zone (NVZ). Usage was most common on cereal and general cropping farms (49% and 59% respectively, Figure 3). Grazing livestock farms were least likely to use such software (4%). Farms not in a NVZ were less likely to use soil nutrient software (13%), while farms partially in a NVZ were more likely to use such software (50%, Figure 4).

[6] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farmer age, farm performance and NVZ status) were related to this practice. Farm type, farm size and NVZ status were found to be significant predictors ($p < 0.05$).

Figure 3: Percentage of farm businesses using soil nutrient software packages by farm type, England 2017/18 to 2018/19

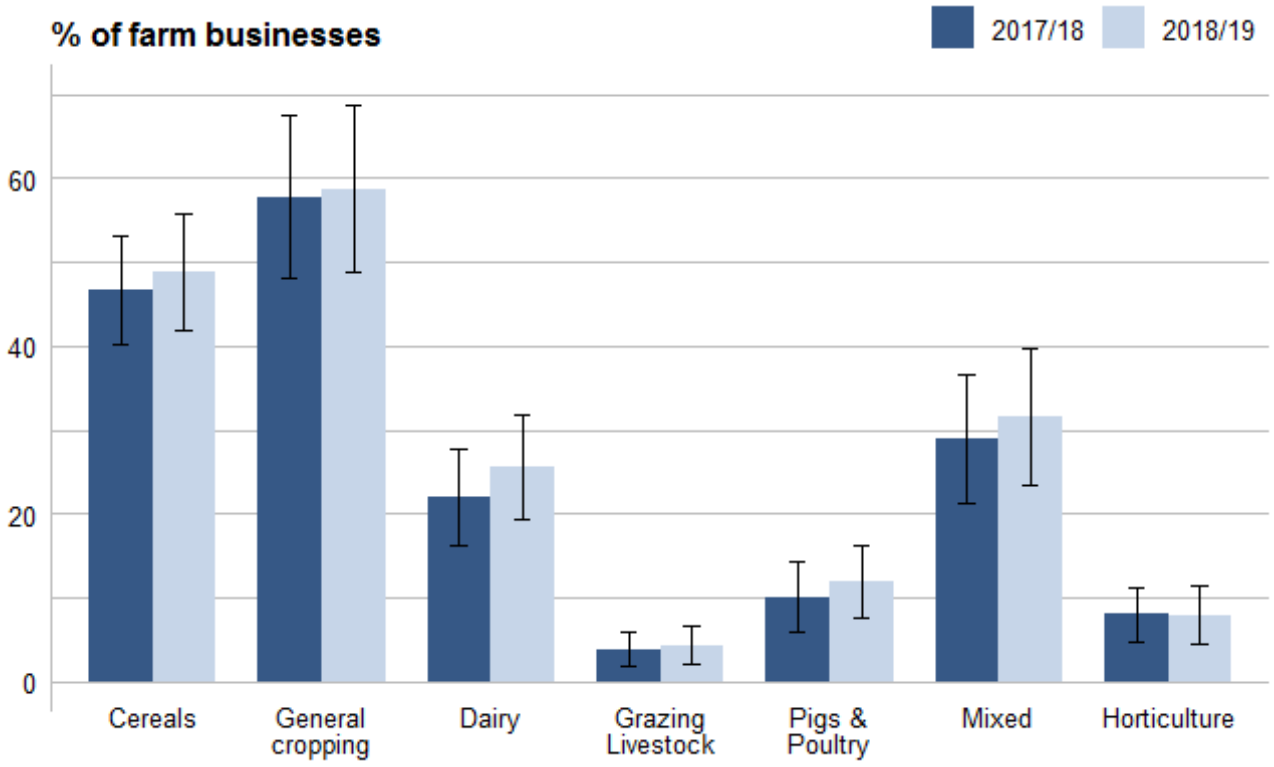
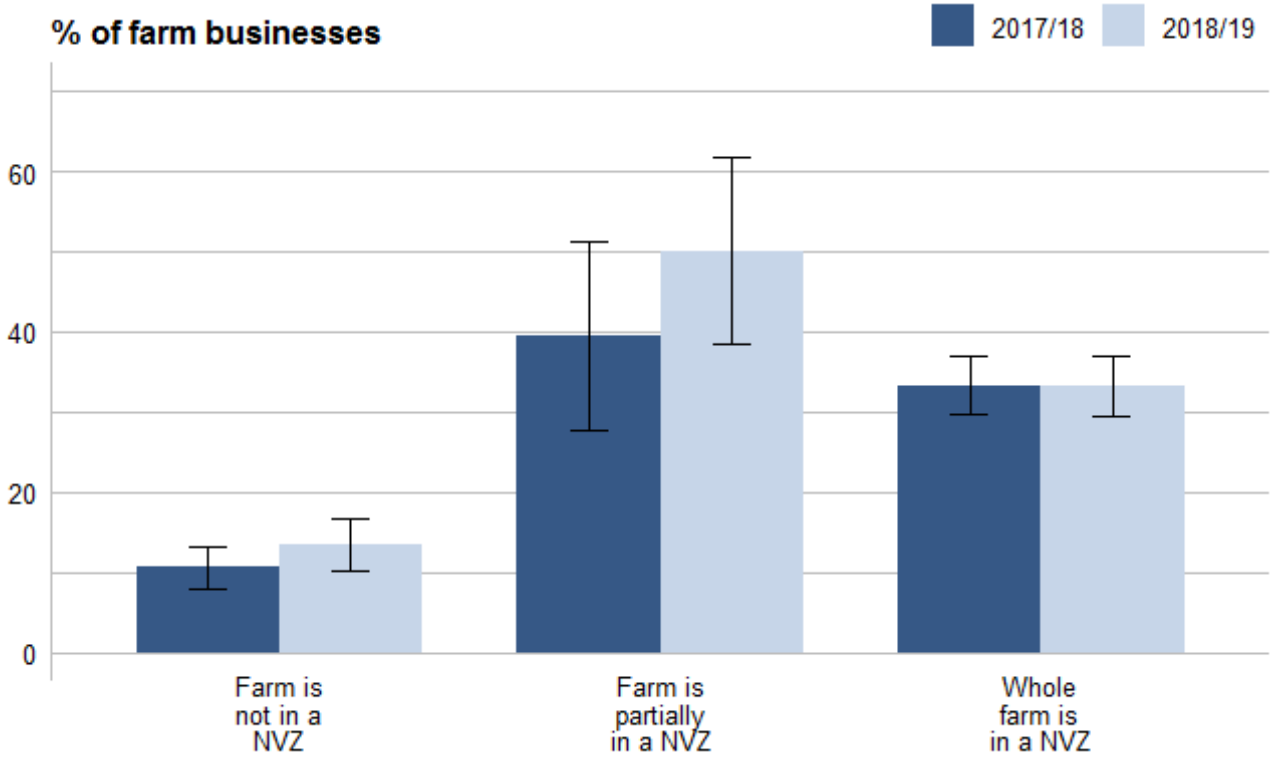


Figure 4: Percentage of farm businesses using soil nutrient software packages by NVZ status, England 2017/18 to 2018/19



2.3 Clover and other legumes in grass swards

In many situations, sowing grassland with a clover mix or other legumes can be a cost effective method of increasing production and improving environmental protection. For example, clover's nitrogen-fixing properties (although not suitable for all soil types) can reduce the amount of nitrogen required and improve grassland yields.

Of those farms with permanent or temporary grass, 49% included clover or other legumes in their grass swards in 2018/19 (Table 3); 8% thought that the method was not applicable.

Table 3: Percentage of farm businesses with temporary and/or permanent grass[(a)] that include clover or other legumes in grass swards, England 2017/18 to 2018/19

	Percent of farm businesses (%)	
	2017/18	2018/19
Includes clover or other legumes	51 (±3)	49 (±3)
Does not include clover or other legumes	40 (±3)	42 (±3)
Not applicable	9 (±2)	8 (±2)

95% confidence intervals shown in brackets.

[(a)] Excludes rough grazing.

The use of clover and other legumes in grass swards was related[7] to farm type, farm size, region and farm tenure. Usage was most common on mixed and dairy farms (66% and 67% respectively, Figure 5) and least likely on pigs & poultry farms (26%). Farms in the South West were more likely to use clover and legumes in grass swards than those in other regions (76%, Figure 6).

[7] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farmer age, farm performance and NVZ status) were related to this practice. Farm type, farm size, region and farm tenure were found to be significant predictors ($P < 0.05$).

Figure 5: Percentage of farm businesses with permanent or temporary grass using clover or other legumes in grass swards by farm type, England 2017/18 to 2018/19

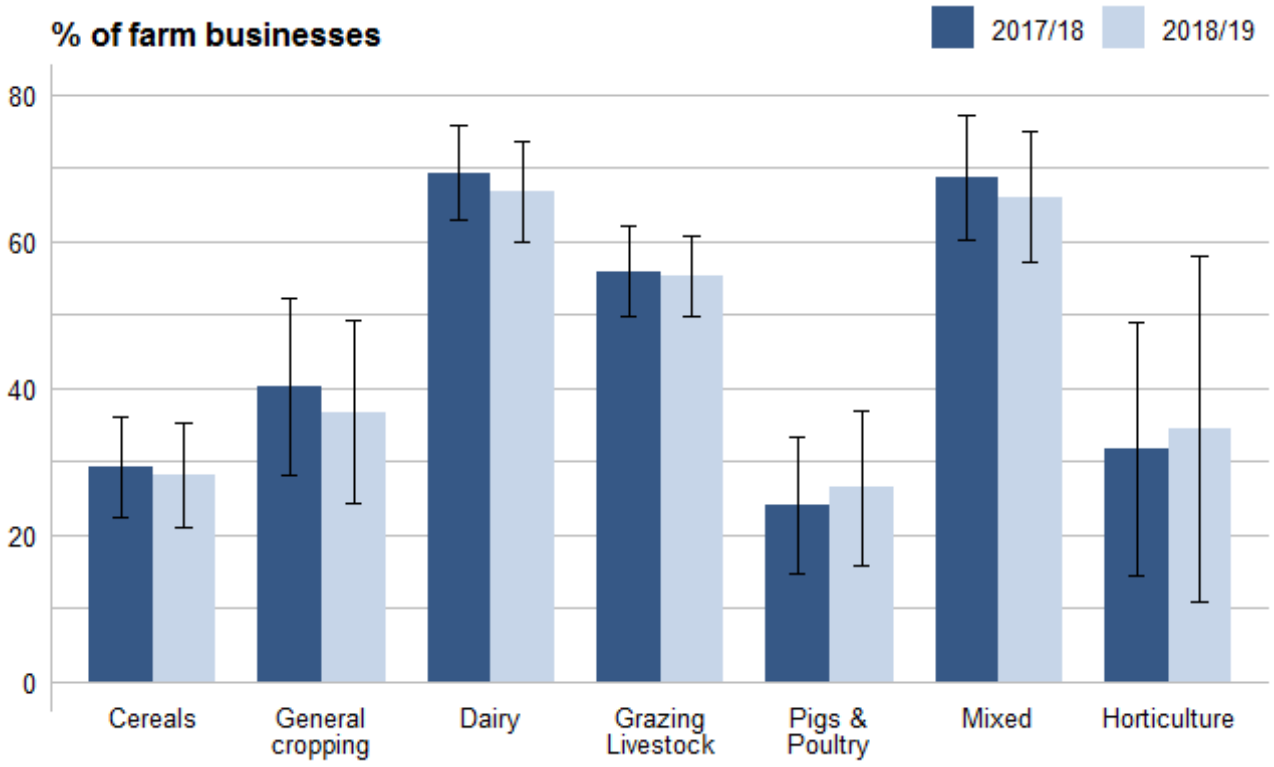
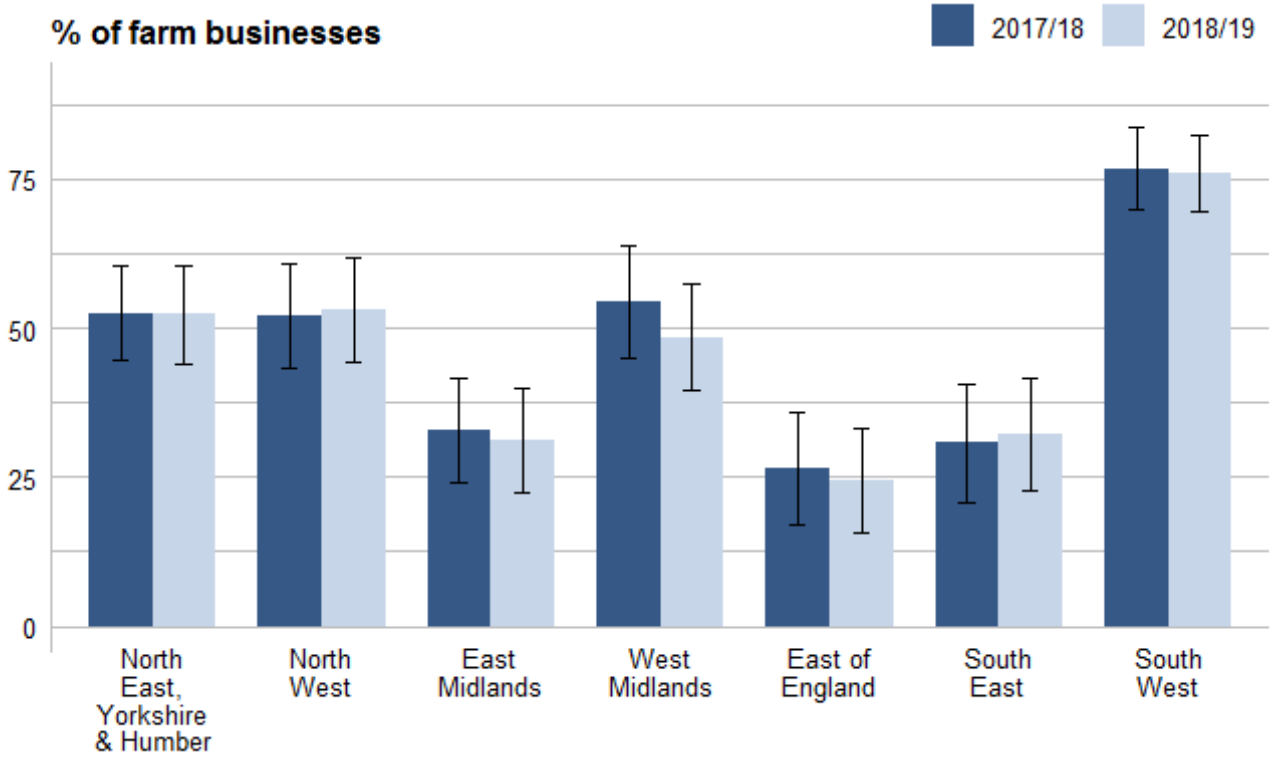


Figure 6: Percentage of farm businesses with permanent or temporary grass using clover or other legumes in grass swards by region, England 2017/18 to 2018/19



2.4 Green manures

Green manures are crops grown specifically for building and maintaining soil fertility and structure, although they may also have other functions such as weed control and preventing leaching of soluble nutrients. They are normally incorporated back into the soil, either directly, or after removal and composting.

A minority (17%) of farmers used green manures in their arable rotations, a slight increase from 14% in 2017/18 (Table 4).

Table 4: Percentage of farm businesses employing green manures in arable rotation, England 2017/18 to 2018/19

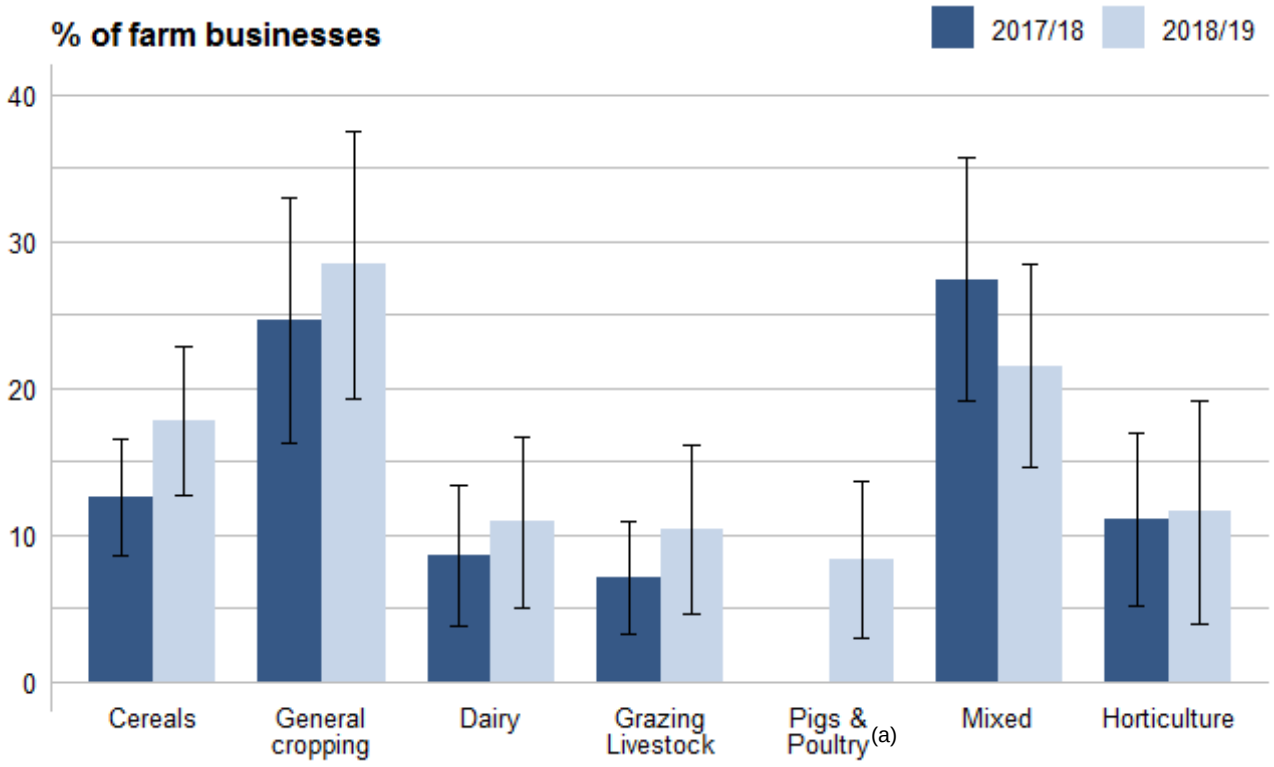
	Percent of farm businesses (%)	
	2017/18	2018/19
Yes	14 (±2)	17 (±3)
No	71 (±3)	67 (±3)
Not applicable	15 (±2)	16 (±2)

95% confidence intervals shown in brackets.

Use of green manures was related[8] to farm type, farm size and organic status. General cropping and mixed farms were more likely to use green manures than other farm types (28% and 22% respectively, Figure 7). Organic farms were more likely to use green manures than conventional farms (33% compared to 17%, Figure 8).

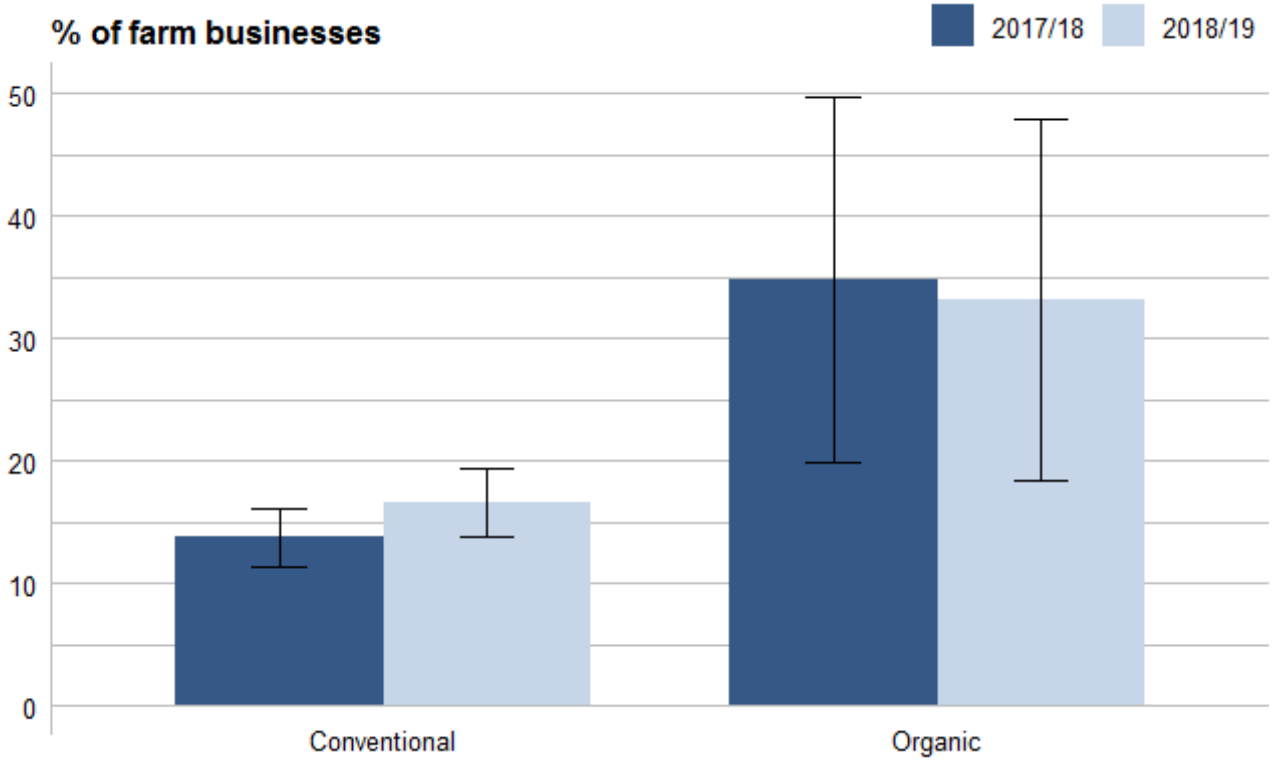
[8] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farmer age, farm performance, NVZ status and organic status) were related to this practice. Farm type, farm size and organic status were found to be significant predictors ($P < 0.05$).

Figure 7: Percentage of farm businesses using green manures in arable rotation by farm type, England 2017/18 to 2018/19



(a) There are insufficient observations to show results for pig and poultry farms in 2017/18

Figure 8: Percentage of farm businesses using green manures in arable rotation by organic status, England 2017/18 to 2018/19



2.5 Adjustments to fertiliser applications

Including legumes or clover in grass swards and using green manures are alternative methods to increase the quantities of available nitrogen and will reduce the requirement for additional nutrients from manufactured fertilisers (or slurry/manures). In 2018/19, 71% of farmers that had used these crops reported that they had made adjustments to their fertiliser application rates (Table 5).

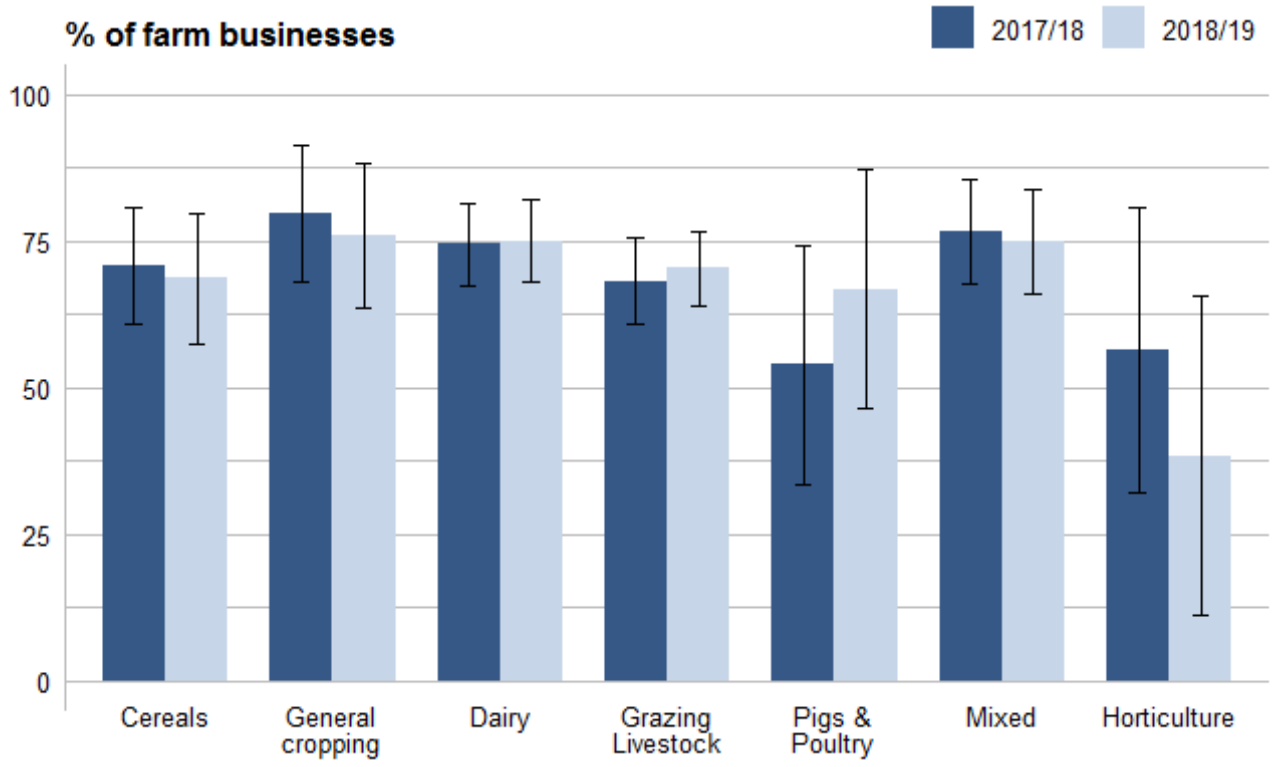
Table 5: Percentage of farm businesses making adjustments to fertiliser application rates after using clover/legumes or green manures, England 2017/18 to 2018/19

	Percent of farm businesses (%)	
	2017/18	2018/19
Yes	71 (±4)	71 (±4)
No	29 (±4)	29 (±4)

95% confidence intervals shown in brackets.

The practice of adjusting fertiliser application after the use of clover/legumes or green manures was related[9] to farm type, farm size, region and the age of the farmer. Approximately three quarters of general cropping, dairy and mixed farms said they adjusted their application rates, more than other farm types (Figure 9).

Figure 9: Percentage of farm businesses adjusting their fertiliser application rates after using clover/legumes or green manures by farm type, England 2017/18 to 2018/19



[9] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farmer age, farm performance and NVZ status) were related to this practice. Farm type, farm size, region and farmer age were found to be significant predictors (P <0.05).

2.6 Sources of nutrient planning advice

Some farmers and their advisors may pay greater attention to the calculation of fertiliser application rates, sourcing their advice from qualified individuals so that their application rates match crop requirements. The Fertiliser Advisers Certification and Training Scheme (FACTS) provides training in an evidence-based approach to fertiliser applications.

There was little change in the source of advice from the previous year, with nearly half (46%) of farm businesses relying primarily on their own non-FACTS qualified advice (Table 6). Very few farm businesses relied on their own FACTS-qualified advice (5%). Just over a quarter (26%), relied primarily on independently supplied FACTS advice and almost a quarter (23%) mainly received advice from their FACTS-qualified fertiliser supplier.

Table 6: Main source of advice for nutrient planning by farm type, England 2018/19[(a)]

	Percent of farm businesses (%)	
	2017/18	2018/19
Own advice (not FACTS)	46 (±3)	46 (±3)
Own advice (FACTS)	5 (±1)	5 (±1)
Independent advice (FACTS)	25 (±2)	26 (±3)
Fertiliser supplier advice (FACTS)	24 (±3)	23 (±3)

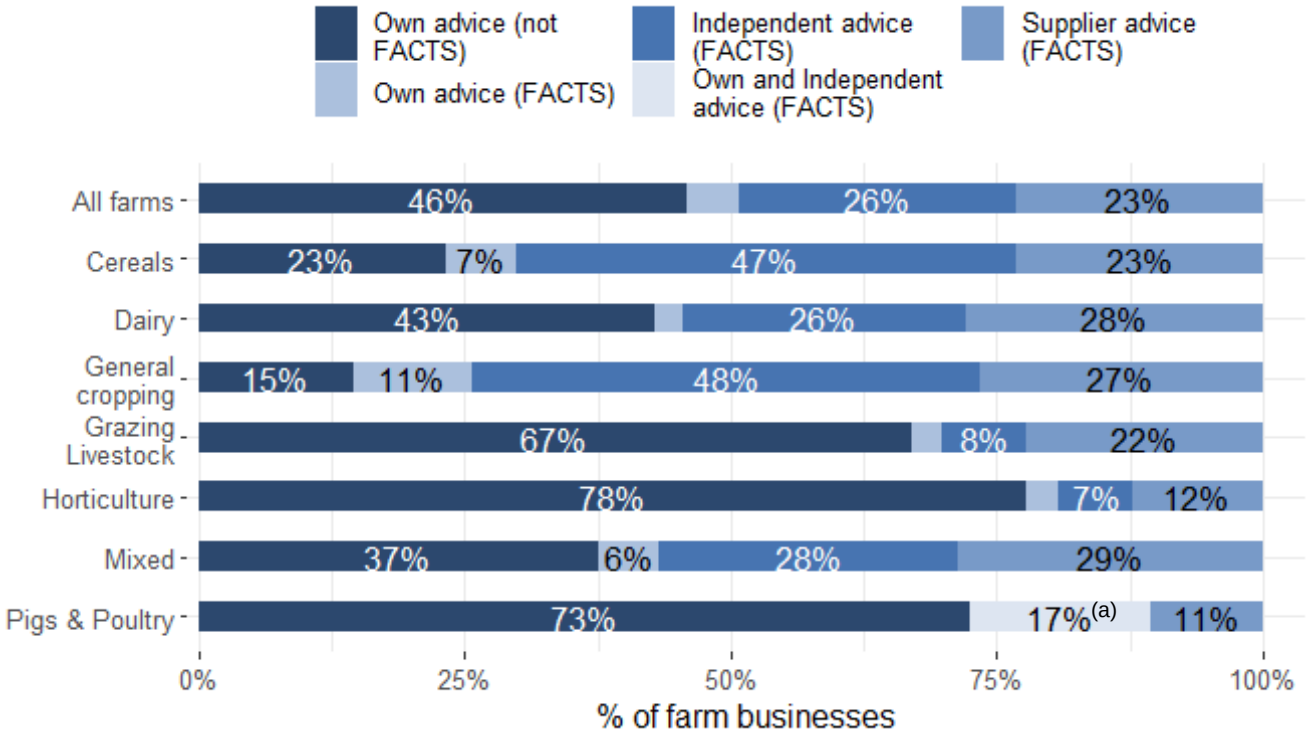
95% confidence intervals shown in brackets.

(a) Based on responses from 1740 farm businesses for which the question was applicable in 2017/18, and 1744 in 2018/19. It was not applicable to farms without a utilised agricultural area (UAA) and farms letting out their full UAA

Sources of nutrient planning advice was related[10] to farm type, farm size, region and having land within a Nitrate Vulnerable Zone (NVZ). Cereal and general cropping farms were more likely to rely on FACTS qualified advice, either from their own FACTS qualification or that of their independent advisor (Figure 10). Grazing livestock, horticulture, and pig & poultry farms were more likely than other farm types to rely on their own non-FACTS qualified advice. Farms which did not have land within a NVZ were more likely to use their own non-FACTS qualified advice (Figure 11). Farms with at least some land within a NVZ were more likely to seek independent FACTS qualified advice, with farms partially within a NVZ being the most likely (43%).

[10] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farmer age, farm performance and NVZ status) were related to this practice. Farm type, farm size, region and NVZ status were found to be significant predictors ($P < 0.05$).

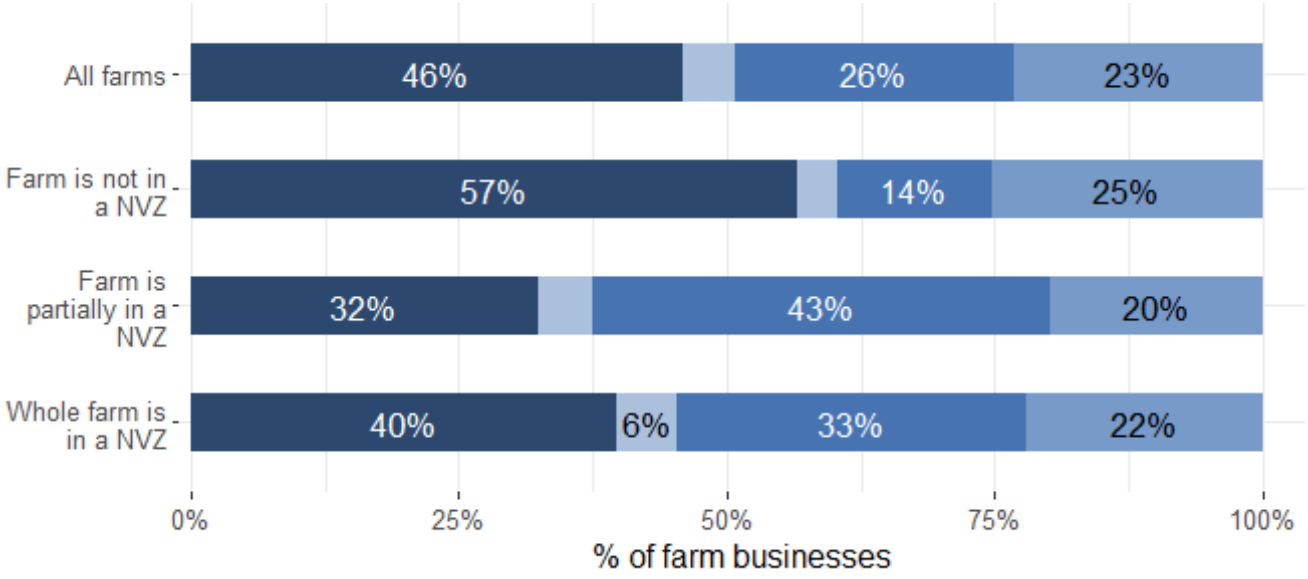
Figure 10: Main source of advice used in nutrient planning by farm type, 2017/18



Proportions below 5% have been hidden, see accompanying dataset here for full results breakdown.

(a) For Pigs & Poultry, Own advice (FACTS) and Independent advice (FACTS) have been merged due to insufficient observations.

Figure 11: Main source of advice used in nutrient planning by NVZ status, 2017/18



Proportions below 5% have been hidden, see accompanying dataset here for full results breakdown.

3 Fertiliser application rates

This section examines the quantity of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) applied by farms from manufactured and organic fertilisers. The quantities of fertiliser were collected for the farm as a whole, not at the crop level. In the case of horticulture farms, application rates describe total levels of nutrients being applied to what might be more than one crop being grown during the year on the same parcel of land. The amount of nutrients applied will be correlated with the types of crops that are grown, for example potato crops require high amounts of potassium. The farmed area includes rough grazing, but this has been excluded from the farmed area when calculating the overall application rate as it doesn't tend to receive applications. All year on year changes are unlikely to be significant.

Organic fertilisers are distinguished from manufactured fertilisers by having undergone minimal processing, having remained in their natural form and being generally less concentrated than manufactured fertilisers. Organic fertilisers applied to agricultural land may be produced on farm by livestock as slurries, farmyard manure (FYM) and poultry manures, or imported from other sources such as treated sewage sludges (also called bio-solids) and some industrial 'wastes' such as compost, paper waste or brewery effluent. Table 7 shows a breakdown of the source of organic fertilisers applied as a proportion of the total application rates recorded in this chapter.

Table 7: Proportion of overall organic application rates per hectare of farmed area (excluding rough grazing) by nutrient type, England 2018/19

	Proportion of overall nutrient applied		
	Nitrogen	Phosphate	Potash
Farmyard manure (FYM) & slurry[(a)]	91%	86%	98%
Digestate from on-farm anaerobic digestion	<1%	<1%	<1%
Digestate from off-farm anaerobic digestion	5%	1%	1%
Other organic products	4%	12%	1%

(a) Includes home produce, imported and purchased FYM and Slurry

Where information is not directly available from the farmer, estimates have been made based on available information. Estimates of manufactured and organic fertiliser usage have been made for 12% and 17% of farms in the sample respectively. Estimates are based on further information available from the farmer or based on their expenditure and known usage on other, similar farms. Horticulture farms are most likely to be in this latter group, see Appendix B Tables B.1 and B.2 for a full breakdown by farm type.

The British Survey of Fertiliser Practice (BSFP) is the primary source of data on fertiliser use in Great Britain, and collects a more detailed breakdown of the crops that fertilisers are applied too. Comparisons in overall manufactured application rates are made throughout this section.

3.1 Nitrogen (N)

The average amount of manufactured nitrogen applied per hectare of farmed area[11] (excluding rough grazing) was 110 kg/ha (Table 8), showing little difference from previous years. This is slightly higher than the overall application rates for manufactured fertilisers for England from the British Survey of Fertiliser Practice (BSFP; 101 kg per hectare in 2018).

Application rates for manufactured nitrogen from the FBS were related[12] to farm type 2018/19. Cereal farms had the highest application rates (145 kg/ha), whilst grazing livestock farms had the lowest (44 kg/ha; Figure 12).

Table 8: Overall nitrogen application rates per hectare of farmed area (excluding rough grazing), England 2017/18 to 2018/19

	Overall application rates (kg/ha)	
	2017/18	2018/19
Manufactured Fertilisers	111 (±4)	110 (±4)
Organic Fertilisers	9 (±1)	9 (±1)

95% confidence intervals shown in brackets

The average amount of organic nitrogen applied per hectare of farmed area (excluding rough grazing) was 9 kg/ha (Table 8), no change from the previous year.

Application rates for organic nitrogen from the FBS were related[13] to farm type, farm size, region, farm tenure and organic status. Dairy and Pigs & Poultry farms had by far the highest organic nitrogen application rates (34 kg/ha and 26 kg/ha respectively) (Figure 13). All other farm types had application rates of <10 kg/ha, with Horticulture having the lowest application rate at approximately 1 kg/ha. Very large farms had the highest application rates of organic nitrogen while spare and part-time farms had the lowest (14 kg/ha compared to 4 kg/ha respectively, Figure 14).

[11] Farmed area = Utilised Agricultural Area + bare land rented in + forage area hired in - bare land let out - forage area let out. Some specialist pig and poultry farms have no farmed area.

[12] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farm performance and NVZ status) were related to manufactured nitrogen application rate. Farm type was found to be the only significant predictor ($P < 0.05$).

[13] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farm performance, NVZ status and organic status) were related to organic nitrate application rate. Farm type, farm size, region, farm tenure and organic status was found to be significant predictors ($P < 0.05$).

Figure 12: Overall manufactured nitrogen application rates per hectare of farmed area (excluding rough grazing) by farm type, England 2017/18 to 2018/19

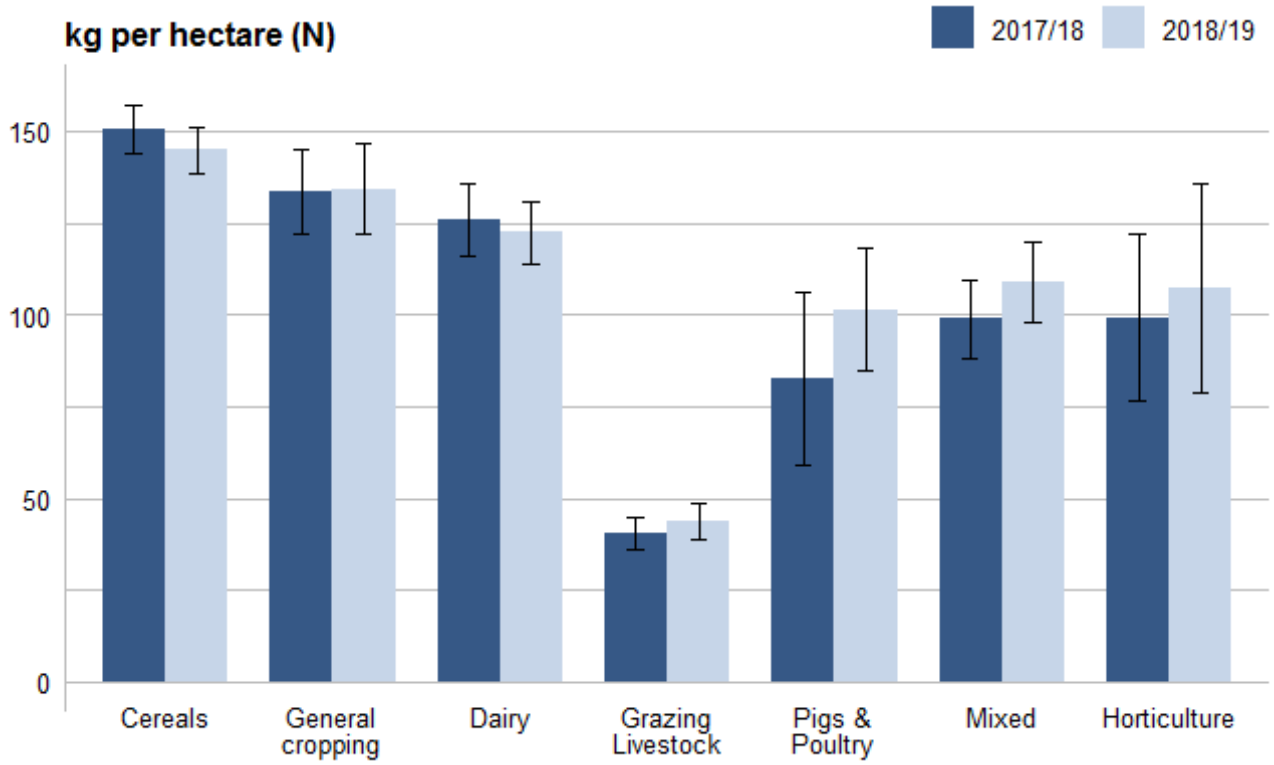


Figure 13: Overall organic nitrogen application rates per hectare of farmed area (excluding rough grazing) by farm type, England 2017/18 to 2018/19

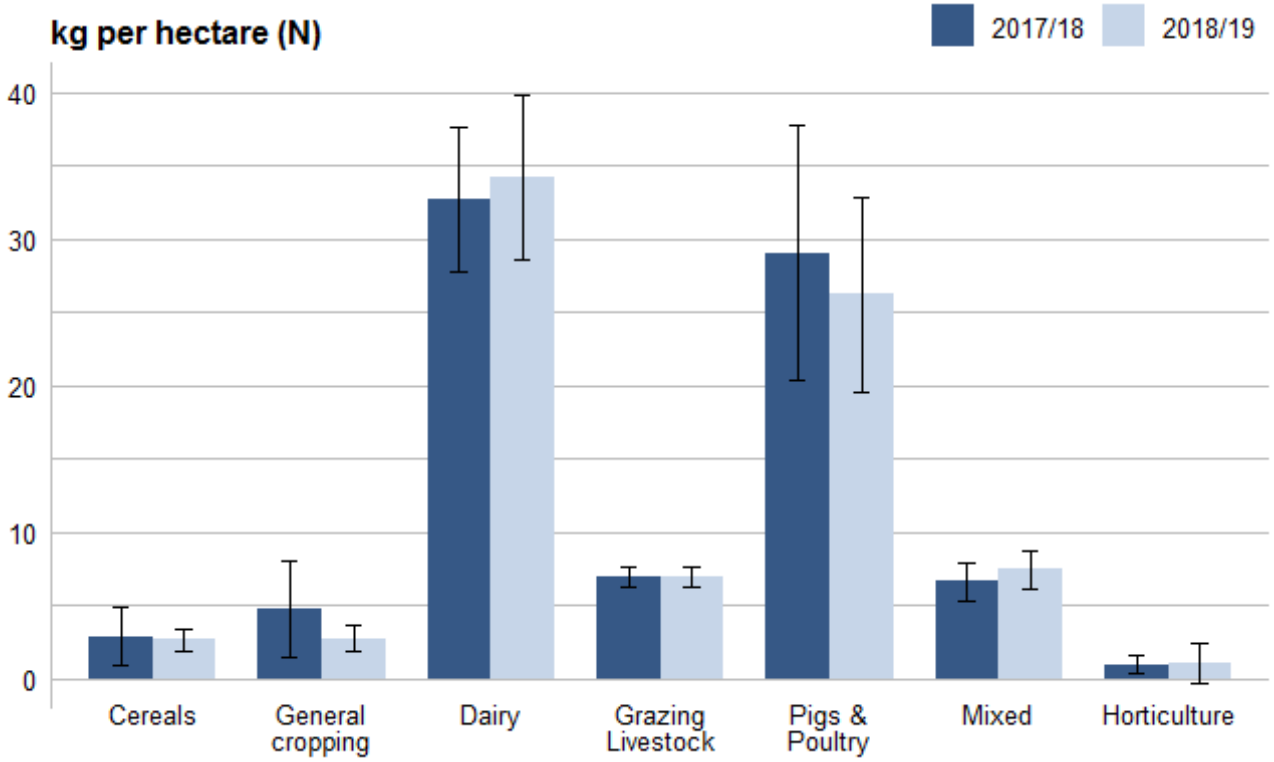
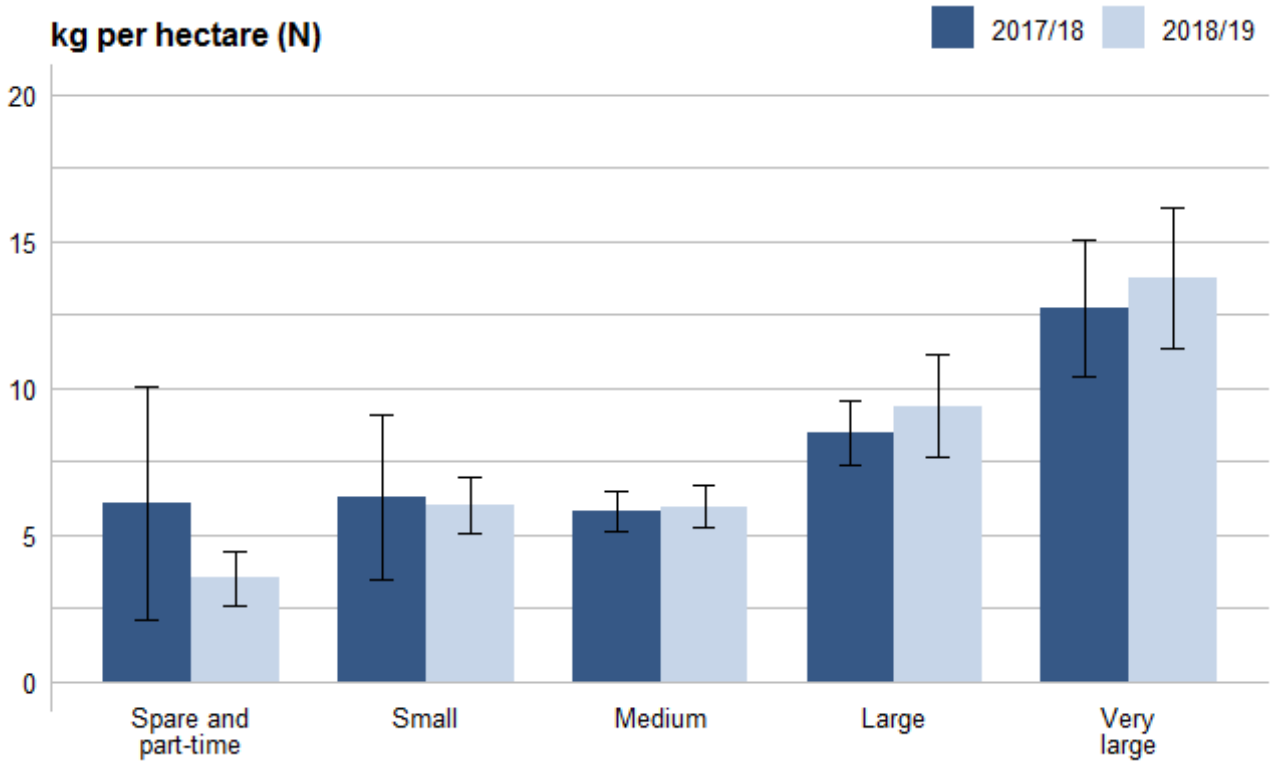


Figure 14: Overall organic nitrogen application rates per hectare of farmed area (excluding rough grazing) by farm size, England 2017/18 to 2018/19



3.2 Phosphate (P_2O_5)

The average amount of manufactured phosphate applied per hectare of farmed area (excluding rough grazing) was 22 kg/ha (Table 9), little changed from the previous year. Manufactured phosphate application rates (for total crops and grassland) for England from BSFP were 15 kg per hectare (sown land area) in 2018, slightly lower than the FBS results.

Table 9: Overall phosphate application rates per hectare of farmed area (excluding rough grazing), England 2017/18 to 2018/19

	Overall application rates (kg/ha)	
	2017/18	2018/19
Manufactured Fertilisers	21 (±2)	22 (±2)
Organic Fertilisers	10 (±1)	10 (±1)

95% confidence intervals shown in brackets.

Application rates for manufactured phosphate from the FBS were related[14] to farm type, region and having land within a NVZ. General Cropping farms had the highest average application rates (36 kg/ha) in 2018/19, up from 27 kg/ha in the previous year (Figure 15).

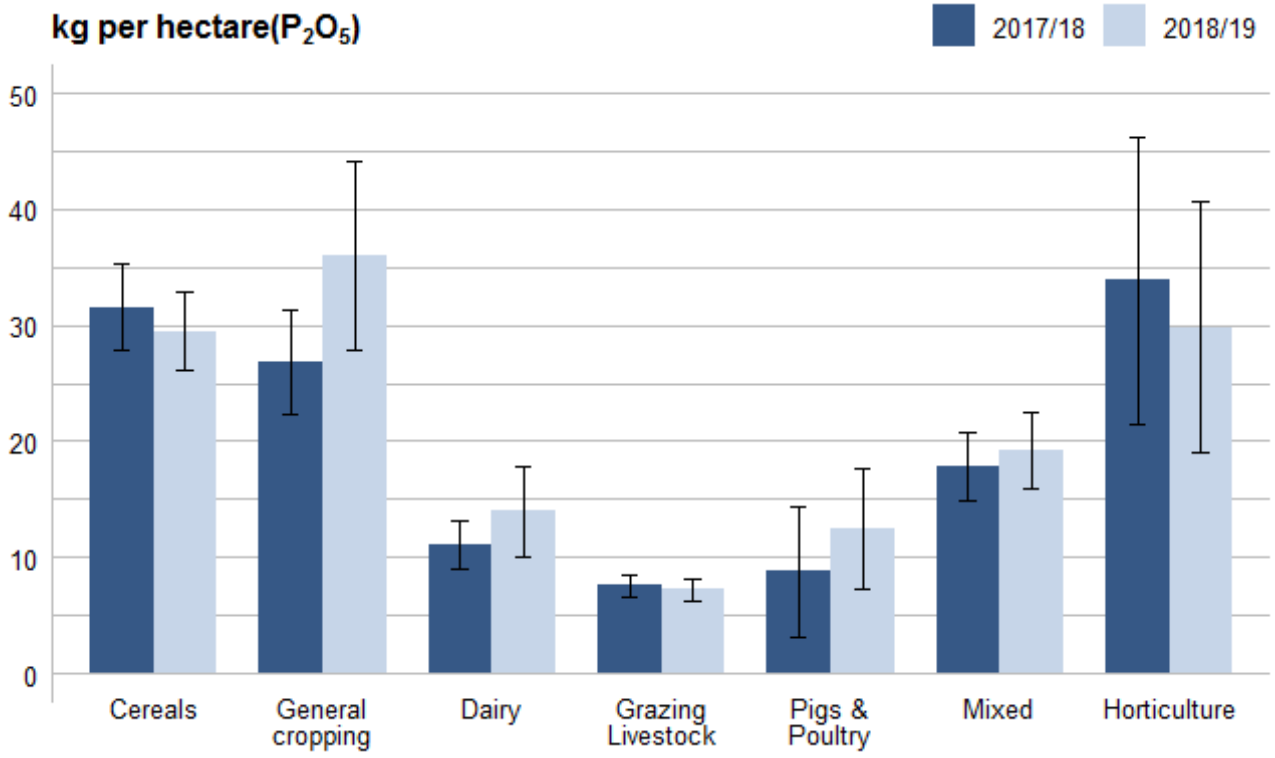
[14] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farm performance and NVZ status) were related to manufactured phosphate application rates. Farm type, region and NVZ status were found to be significant predictors (P <0.05).

Grazing livestock and pig & poultry farms had the lowest rates (7 kg/ha and 12 kg/ha respectively). Farms in the East Midlands and the East of England had the highest application rates of manufactured phosphate (26 kg/ha and 27kg/ha respectively), while farms in the North West had the lowest at 9 kg/ha.

The average amount of organic phosphate applied per hectare of farmed area (excluding rough grazing) was 10 kg/ha (Table 9), no change from the previous year.

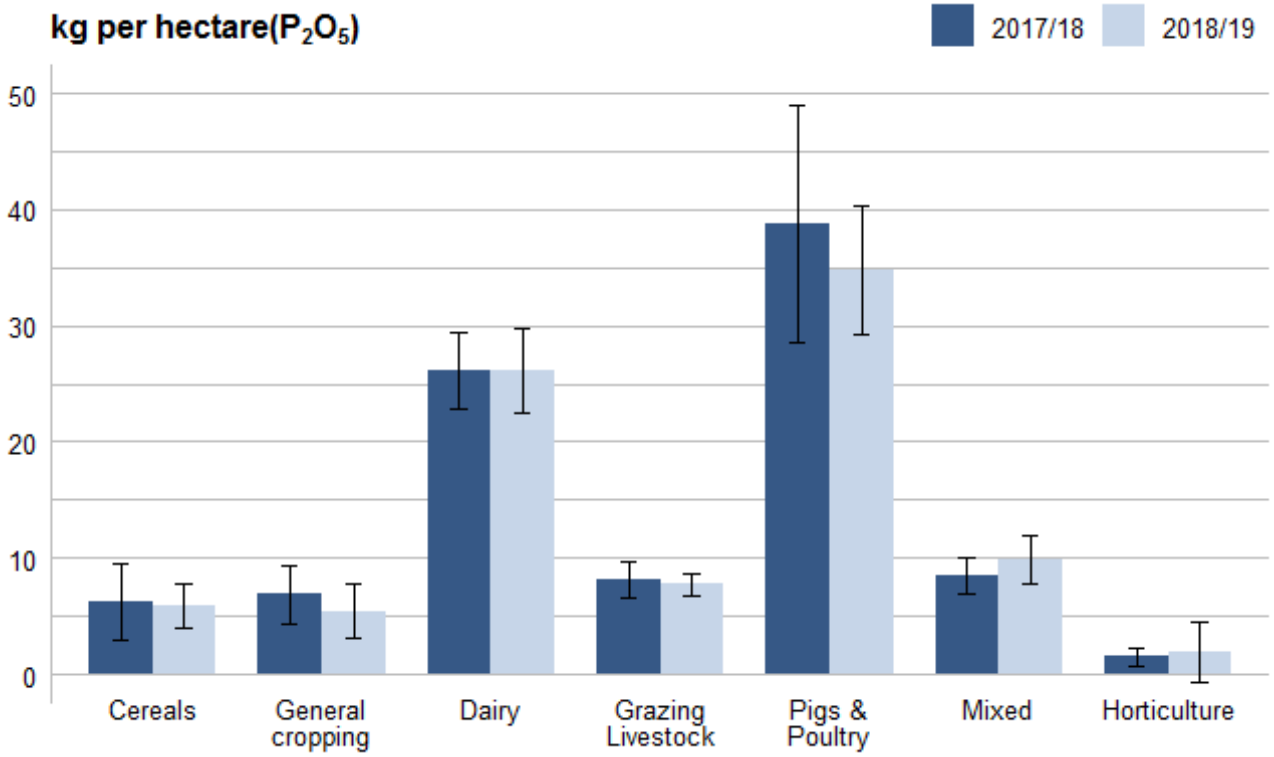
Application rates for organic phosphate from the FBS were related[15] to farm type and region. Dairy and Pigs & Poultry farms had by far the highest organic nitrogen application rates (26 kg/ha and 35 kg/ha respectively, Figure 16). All other farm types had application rates no higher than 10 kg/ha with Horticulture having the lowest application rate at approximately 2 kg/ha. Farms in the North West had the highest application rates of organic phosphate while farms in the South East had the lowest (16 kg/ha Compared to 5 kg/ha, respectively).

Figure 15: Overall manufactured phosphate application rates per hectare of farmed area (excluding rough grazing) by farm type, England 2017/18 to 2018/19



[15] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farm performance, NVZ status and organic status) were related to organic phosphate application rate. Farm type and region were found to be significant predictors (P <0.05).

Figure 16: Overall organic phosphate application rates per hectare of farmed area (excluding rough grazing) by farm type, England 2017/18 to 2018/19



3.3 Potash (K_2O)

The average amount of manufactured potash applied per hectare of farmed area (excluding rough grazing) was 27 kg/ha (Table 10), unchanged from the previous year. Manufactured potash application rates (for total crops and grassland) for England from the BSFP were 19 kg per hectare (sown land area) in 2018, lower than the FBS results.

Table 10: Overall potash application rates per hectare of farmed area (excluding rough grazing), England 2017/18 to 2018/19

	Overall application rates (kg/ha)	
	2017/18	2018/19
Manufactured Fertilisers	27 (±2)	27 (±2)
Organic Fertilisers	28 (±2)	28 (±2)

95% confidence intervals shown in brackets.

Application rates for manufactured potash from the FBS were related[16] to farm type and region. Horticulture farms had the highest average application rates (63 kg/ha, Figure 17). Grazing livestock and pigs & poultry farms had the lowest application rates (10 kg/ha and11 kg/ha respectively). Farms in the North East, Yorkshire & Humber regions had the highest

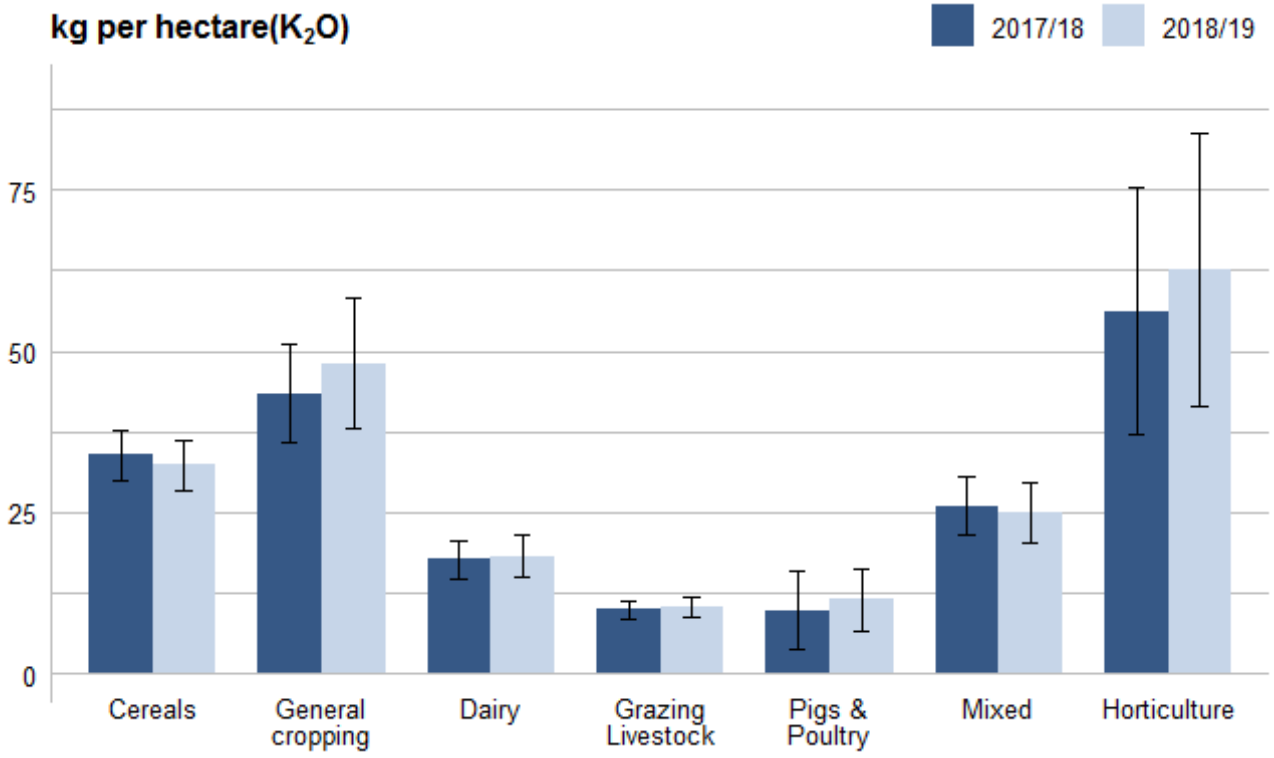
[16] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farm performance and NVZ status) were related to manufactured potash application rate. Farm type and region were found to be significant predictors (P <0.05).

application rate of manufactured potash at 38 kg/ha with all other regions having application rates of <30 kg/ha.

The average amount of organic potash applied per hectare of farmed area (excluding rough grazing) was 28 kg/ha (Table 10), no change from the previous year.

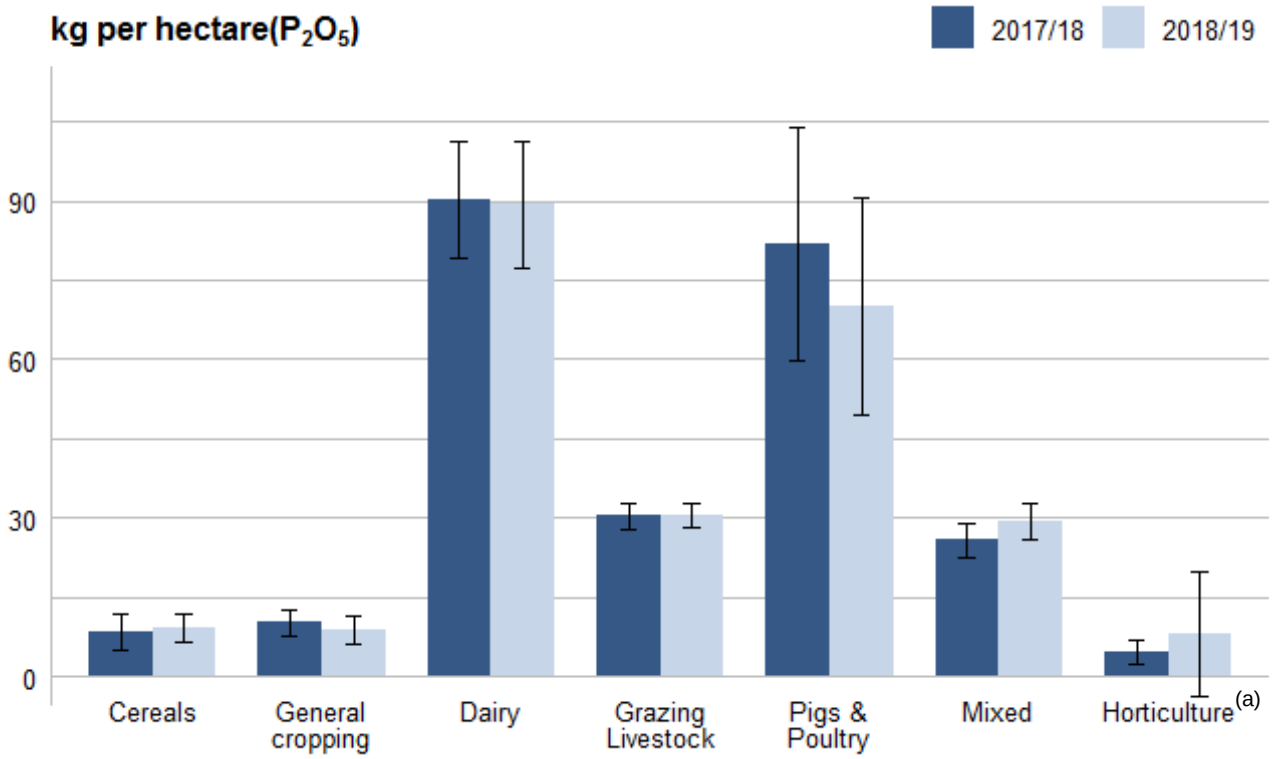
Application rates for organic potash from the FBS were related[17] to farm type and region. Dairy and Pigs & Poultry farms had by far the highest organic potash application rates (89 kg/ha and 70 kg/ha respectively, Figure 18). Grazing livestock and mixed farms had similar application rates of 30 kg/ha and 29 kg/ha, with all other farm types having application rates of <10 kg/ha. Horticulture farms had the lowest application rates in 2018/19 at 8 kg/ha. Farms in the North West had by far the highest application rate of organic potash at 55 kg/ha with all other regions having application rates of <40 kg/ha. Farms in the East of England had the lowest application rate at 14 kg/ha.

Figure 17: Overall manufactured potash application rates per hectare of farmed area (excluding rough grazing) by farm type, England 2017/18 to 2018/19



[17] A generalised linear regression model was fitted to examine which factors (farm type, farm size, region, farm tenure, farm performance, NVZ status and organic status) were related to organic potash application rate. Farm type and region were found to be significant predictors (P <0.05).

Figure 18: Overall organic potash application rates per hectare of farmed area (excluding rough grazing) by farm type, England 2017/18 to 2018/19



(a) Result for horticulture application rates for organic potash in 2018/19 should be treated with cause due to the presence of an influential outlier. This result has been recalculated with this influential farm omitted giving an overall organic potash application rate for horticulture farms of 2 (±2) kg per hectare.

Survey details

Background

Historically, the Farm Business Survey (FBS) has focused on the collection of financial rather than physical data for agricultural inputs. Over recent years attention has turned to agriculture's environmental footprint and the need to develop a more sustainable industry. Nutrients, particularly nitrogen, are the biggest determinant of yield and also have a major impact on crop/sward structure and the quality of the end product. Nutrient losses to ground and surface waters can cause pollution affecting biodiversity (e.g. through eutrophication, increased turbidity, fish kills) and the quality of drinking water. Gaseous losses as ammonia and oxides of nitrogen also cause air pollution, and can contribute to the eutrophication of sensitive habitats and to climate change. Any measures taken to reduce nutrient losses should also result in better financial returns to the farmer.

In order to better measure a farm's environmental footprint one of the most important data gaps to address is the quantity of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) applied as fertiliser in their manufactured form. In 2012/13 these quantities were collected for the first time within the FBS. The data collected:

- Provides important data needed to estimate the environmental footprint of farming
- Enables farms to benchmark their environmental as well as their financial performance
- Meets Farm Accountancy Data Network (FADN) requirements for data on fertiliser quantities.

Survey content and methodology

The Farm Business Survey (FBS) is an annual survey providing information on the financial position and physical and economic performance of farm businesses in England. The sample of around 1,750 farm businesses covers all regions of England and all types of farming with the data being collected by face to face interview with the farmer. Results are weighted to represent the whole population of farm businesses that have at least 25,000 Euros of standard output as recorded in the annual June Survey of Agriculture and Horticulture. In 2018/19, this accounted for approximately 57,100 farm businesses.

For further information about the Farm Business Survey please see:
https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/series/farm-business-survey

Since 2012/13, the FBS has included an additional module to collect information on fertiliser usage. The information collected covered:

- Use of precision farming techniques.
- Use of soil nutrient software packages.
- Inclusion of clover/legumes in grass swards.
- Use of green manures.
- Adjustments to fertiliser application rates.
- Amount of UAA subjected to restricted fertiliser applications (up until 2015/16).

- Sources of nutrient planning advice (since 2016/17).
- Volumes of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) used.

Full details of the information collected on fertiliser usage and other technical notes can be found here: https://www.gov.uk/guidance/farm-business-survey-technical-notes-and-guidance

Completion of the fertiliser module was voluntary until 2017/18 when it became compulsory following a planned phased introduction. The module covered all the main farm types. For some farms (4% of all farms), manufactured nutrient data has been derived using a fertiliser calculator rather than from exact quantities. Horticulture saw the highest use (16% of responses) of the calculator, Table B.1 in Appendix B. The fertiliser calculator was not used to estimate of organic nutrient data, however, 17% of responses were estimated from information provided by the farmer, Table B.2 in Appendix B.

Data analysis

The results from the FBS relate to farms which have a standard output of at least 25,000 Euros. Initial weights are applied to the FBS records based on the inverse sampling fraction for each design stratum (farm type by farm size). These weights are then adjusted (calibration weighting) so that they can produce unbiased estimators of a number of different target variables.

Accuracy and reliability of the results

We show 95% confidence intervals alongside the averages. These show a plausible range of values for the averages based on our sample. They are calculated as the standard errors (se) multiplied by 1.96 to give the 95% confidence interval (95% CI).

The standard errors only give an indication of the sampling variability. They do not reflect any other sources of survey errors, such as non-response bias. For the Farm Business Survey, the confidence limits shown are appropriate for comparing groups within the same year only; they should not be used for comparing with previous years since they do not allow for the fact that many of the same farms will have contributed to the Farm Business Survey in both years.

We have also shown error bars on the figures in this notice. These error bars represent the 95% confidence intervals (as defined above). Where possible we have provided comparisons with other data sources, particularly the British Survey of Fertiliser Practice.

Availability of results

This release contains headline results for each section. The full breakdown of results, by farm type, farm size, region, farm tenure, farmer age, farm economic performance and Nitrate Vulnerable Zones (NVZs), can be found at:
https://www.gov.uk/government/statistics/fertiliser-usage-on-farm-england

Defra statistical notices can be viewed on the Food and Farming Statistics pages on the Defra website at https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/about/statistics. This site also shows details of future publications, with pre-announced dates.

Data Uses

Data from the Farm Business Survey (FBS) are provided to the EU as part of the Farm Accountancy Data Network (FADN). The data have been used to help inform policy decisions (e.g. Reform of Pillar 1 and Pillar 2 of the Common Agricultural Policy) and to help monitor and evaluate current policies relating to agriculture in England (and the EU). It is also widely used by the industry for benchmarking and informs wider research into the economic performance of the agricultural industry.

The data collected will provide important data needed to estimate the environmental footprint of farming. It will enable farms to benchmark their environmental performance as well as their financial performance.

User engagement

As part of our ongoing commitment to compliance with the Code of Practice for Official Statistics http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html, we wish to strengthen our engagement with users of these statistics and better understand the use made of them and the types of decisions that they inform. Consequently, we invite users to make themselves known, to advise us of the use they do, or might, make of these statistics, and what their wishes are in terms of engagement. Feedback on this notice and enquiries about these statistics are also welcome.

National Statistics Status

National Statistics status means that our statistics meet the highest standards of trustworthiness, quality and public value, and it is our responsibility to maintain compliance with these standards. The statistics last underwent a full assessment [Assessment Report 271 Statistics on Agriculture] against the Code of Practice for Statistics in 2014.

Since the last review by the Office for Statistics Regulation, we have continued to comply with the Code of Practice for Statistics across the FBS. For contractual reasons, the fertiliser module was introduced in 2012/13; 2017/18 was the first year that data is available for all farms in the FBS sample. This has generally resulted in improved data quality with smaller confidence intervals produced across all fertiliser questions and within the various breakdowns that are published.

Definitions

Farm Type

Where reference is made to the type of farm in this document, this refers to the ‘robust type’, which is a standardised farm classification system.

Farm Sizes

Farm sizes are based on the estimated labour requirements for the business, rather than its land area. The farm size bands used within the detailed results tables which accompany this publication are shown in the table below. Standard Labour Requirement (SLR) is defined as the theoretical number of workers required each year to run a business, based on its cropping and livestock activities.

Farm size	Definition
Spare & Part time	Less than 1 SLR
Small	1 to less than 2 SLR
Medium	2 to less than 3 SLR
Large	3 to less than 5 SLR
Very Large	5 or more SLR

Farm Economic performance

Economic performance for each farm is measured as the ratio between economic output (mainly sales revenue) and inputs (costs). The inputs for this calculation include an adjustment for unpaid manual labour. The higher the ratio, the higher the economic efficiency and performance. The farms are then ranked and allocated to performance bands based on economic performance percentiles:

- **Low performance band** - farms who took part in the fertiliser survey and were in the bottom 25% of economic performers
- **Medium performance band** - farms who took part in the fertiliser survey and were in the middle 50% of performers
- **High performance band** - farms who took part in the fertiliser survey and were in the top 25% of performers.

Utilised Agricultural Area (UAA)

Utilised Agricultural Area (UAA) is the crop area, including fodder, set-aside land, temporary and permanent grass and rough grazing in sole occupation (but not shared rough grazing) i.e. the agricultural area of the farm. It includes bare land and forage let out for less than one year.

Farmed area

Farmed area = Utilised Agricultural Area + bare land rented in + forage area hired in - bare land let out - forage area let out. Some specialist pig and poultry farms have no farmed area.

Grass swards

Land or soil which features a layer of grass.

Nitrate Vulnerable Zones

The European Commission (EC) nitrates directive requires areas of land that drain into waters polluted by nitrates to be designated as Nitrate Vulnerable Zones (NVZs)[18]. Farmers with land in NVZs must follow rules to tackle nitrate loss from agriculture. The regulations that apply in England and Wales were reviewed and updated in 2013, including NVZ boundaries.

[18] A map of NVZs that apply from 2017 can be found at https://environment.data.gov.uk/farmers/

Appendix A. Weather conditions

2018/19 (2018 harvest)

Autumn 2017 was generally unsettled with sunshine totals in September and October below average across England, mean temperatures were close to the long term average. Many parts of the country had below average rainfall although others had substantially more. November 2017 was sunnier than average in most regions with mean temperature slightly below the long term average and rainfall a third below the average. Winter 2017/18 was unsettled with mild spells but also some widespread frosts. December and January saw rainfall higher than usual for both months. February was a sunny month with around a third more hours of sunshine than average, mean temperature was also above average. The early part of spring 2018 was rather unsettled with spells of very cold, wintry weather. March began with an exceptionally cold easterly airstream which brought widespread snow and below freezing daytime temperatures in many places. April was generally unsettled, with rainfall and mean temperature around the average. May saw less rainfall than usual while sunshine hours were around a third more than the average. Summer 2018 was dominated by warm and largely sunny weather, with only short unsettled spells. June was largely warm and settled, with only around a quarter of the usual levels of rain. July was also warmer and sunnier than average. August saw average amounts of rainfall and sunshine.

Table A.1: Crop areas on agricultural holdings on 1 June[(a)] for England 2017 - 2018.

Crops (Thousand hectares)	June 2017	June 2018
Wheat	1,652.1	1,618.9
Barley - total	842.5	806.7
- winter	360.9	335.7
- spring	481.6	471.1
Total cereals (excluding maize)[(b)]	**2,659.8**	**2,598.3**
Potatoes (early and maincrop)	108.2	105.7
Sugar beet (not for stockfeeding)	111.3	114.2
Oilseed rape - total	523.1	545.1
- winter	514.8	537.5
- spring	8.3	7.6
Linseed	26.4	24.6
Other crops not for stockfeeding	27.6	22.1
Total other arable crops not for stockfeeding [(c)]	796.6	811.7

Source: Defra June Survey of Agriculture

(a) Figure relates to commercial holdings only.

(b) Including minor cereals (oats, rye, triticale, mixed cord)

(c) Includes borage

2017/18 (2017 harvest)

Autumn 2016 started off notably warm compared to previous years, with September having unusually high temperatures in South-East England. November was often cold and sunny, especially in the North. Rainfall was below normal for most of the UK, with September being particularly wet in western parts of England, however October was mostly very dry. Winter 2016/17 was dry and mild, with December and January sunnier than average. However towards the end of February included two of the winter's five 'named storms' which gave the most widespread impacts over farms in England. Spring 2017 was generally warmer than average in March and early April, but the second half of April was cool with some cold nights and numerous late frosts. Top and soft fruit growers benefited from these winter frosts and mild spring conditions. This summer was rather wet, with rainfall above average for the UK in each individual month. It was also slightly warmer than average, but that is largely due to a warm June, as from mid-July onwards the weather was often on the cool side with an unsettled westerly regime.

Appendix B: Characteristics of responders to the FBS fertiliser module

Table B.1: Source of data on manufactured fertiliser application rates for 2018/19 FBS sample

Farm type	Actual data	Data estimated from farmer information	Fertiliser calculator used	No fertiliser usage
Cereals	85%	7%	6%	2%
General cropping	80%	11%	7%	3%
Dairy	72%	11%		17%
LFA Grazing Livestock	74%	6%	0%	20%
Lowland Grazing Livestock	61%	10%		29%
Pigs	42%	7%		51%
Poultry	30%		0%	70%
Mixed	75%	8%	6%	11%
Horticulture	60%	10%	16%	15%
All farms	69%	8%	4%	19%

Figures in merged cells have been combined due to insufficient observations

Table B.2: Source of data on organic fertiliser application rates for 2018/19 FBS sample

Farm type	Actual data	Data estimated from farmer information	No fertiliser usage
Cereals	46%	12%	41%
General cropping	43%	11%	45%
Dairy	72%	28%	0%
LFA Grazing Livestock	81%	19%	
Lowland Grazing Livestock	71%	26%	3%
Pigs	57%	12%	32%
Poultry	44%	9%	46%
Mixed	78%	22%	
Horticulture	8%	3%	89%
All farms	57%	17%	26%

Figures in merged cells have been combined due to insufficient observations