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December Agricultural Survey 2019

Methodology
and Quality



This document provides a summary of the statistical methods used in the December Agricultural Survey 2019 together with information related to the quality of the estimates.

The Scottish Government adheres to the Code of Practice for Official Statistics and the National Statistician's guidance on quality. In addition, the Scottish Government provides its own guidance on quality, which is available to view at the Scottish Government's Statistics internet pages.

Further information on quality:

- [Code of Practice for Official Statistics](#)
- [National Statistician's Guidance on Quality](#)
- [Scottish Government's Corporate Policy Statement](#)
- [Scottish Government Guide to basic quality assurance](#)
- [European Statistics Code of Practice \(including quality framework\)](#)

Methodology

Data collection

The December Agricultural Survey is conducted annually collecting data on land, livestock and machinery. In 2019, the survey was sent to a representative sample of around 14,600 larger holdings. Smaller holdings are not sent a survey but estimates are made to account for them. Data for the Sheep and Goat Inventory (SGAI) are collected at the same time. Businesses understood to keep sheep or goats not already included in the December Survey are sent a short survey requesting information on sheep and goats only. In 2019, the Sheep and Goat Inventory was sent to 11,300 holdings.

Farms were selected for the December Survey using stratified random sampling. The sampling frame was a list of all the larger (generally over one hectare) holdings in Scotland stratified by farm size and region to ensure a good representation across the country and of farms of differing sizes. This list was drawn from the the 2019 June Agricultural Census dataset. Optimal allocation was used to calculate the sample size required in each of the strata in order to maximise the precision of results. A random sample was selected from each strata. The sample was topped up with holdings which were included in the previous December survey (2018) but didn't respond.

The results are based on information returned from approximately 8,900 holdings, providing a response rate of 61 per cent for the December Survey. There were also 7,600 returns from holdings receiving the SGAI form only, providing a response rate of 67 per cent.

Since 2015, respondents have been able to complete their December Survey or Sheep and Goat Inventory online. The number of online responses has been increasing each year. In 2019, there were 9,600 online responses accounting for 58 per cent of all survey returns.

Collection of Cattle Data through the Cattle Tracing System

Since 2013, data on cattle populations have been obtained from the Cattle Tracing System (CTS), an administrative data source held by the British Cattle Movement Service (BCMS) which holds records of cattle numbers and movements across Great Britain. This was done to reduce the burden on survey respondents. Prior to 2013, cattle data were collected in the June Census and December Survey.

Collection of Sheep and Goat Data through the Annual Sheep and Goat Inventory

In order to reduce the burden on survey respondents, data collection for the December Survey and the Sheep and Goat Annual Inventory (SGAI) were merged for the first time in 2015. A section requesting sheep and goat data was incorporated into the December Survey form, while shorter forms asking just about sheep and goats were used for remaining businesses understood to keep sheep. Use of SGAI data allows for a more complete data collection and eliminates the need for separate data collections.

Treatment of non-response

In Scotland there are around 51,300 agricultural holdings registered with the Scottish Government. We use these register details to maintain a full holding-level data set of Scottish agriculture for statistical purposes.

The December Survey is representative of larger holdings (generally over one hectare in size), of which there were 24,400 at June 2019. Estimates are produced for those holdings which were (a) large enough but not sampled, (b) surveyed but did not provide a response, and, for some variables, (c) smaller holdings. The smaller holdings are mostly less than seven hectares in size and in June 2019 accounted for only 6.9 per cent of agricultural land.

Two stages of estimation are undertaken to calculate the December results where holdings are not included in the sample, or do not return data:

- (i) For items collected both in the June Census and December Survey (livestock items and winter crops), a trending technique is applied to estimate the current year December values. The holdings are divided into strata using farm size and region. Where holdings have reported for both surveys, the total change between June and December for holdings within individual stratum are calculated. These rates of change are then applied to June Census results. The trending methodology also accounts for the fact that holdings often report farming a particular crop or livestock in either the December Survey or June Census only.
- (ii) For items only collected in December, such as machinery, arable silage, production and grass sown, data in each strata are simply scaled up proportionally to account for non-response/inclusion in order to calculate estimates for all of those larger holdings within the scope of the survey. Note that the number of holdings classified as larger holdings will change from year to year, which will affect the scaled up figure. We are unable to scale figures up for smaller holdings for these items as

we do not have a proxy measure to use from the June Census. However, for hay and grass silage/haylage this is possible, based on proportions of grass grown recorded in the June Census.

Rents

Among the respondents, 2,790 holdings reported renting-in land in 6,100 leases (including seasonal lets). About 410 tenancies paid entirely or partly 'in kind' were reported, which have been excluded from the analysis.

Average rental value is calculated by weighting the survey data using farm-type and size, and land-type. Prior to 2013, calculations were based on the much smaller Tenanted Land Survey, with values often built up from five-year averages or best estimates for those farm-types with only small representation within the sample.

Data Quality

Accuracy

Data undergo several validation processes as follows; (i) checking for any obvious errors on the paper census forms upon receipt, (ii) the online form incorporates in-form validation, (iii) auto-checking and identifying any internal inconsistencies once loaded onto the initial database, (iii) auto-checking for any sudden changes in comparison with previous annual returns and other holdings, (iv) assessing any trends or switches in item areas or quantities that look unreasonable.

If necessary, farmers are contacted to ensure data are correct. Additional quality assurance is provided at the later stages by utilising expert knowledge within the Scottish Government and the agriculture industry.

Main sources of bias and other error

The December Survey will be subject to measurement bias since we are reliant on farmers completing the form accurately. Ideally livestock counts should be undertaken to ascertain precise numbers of animals but, given time constraints, exact numbers of livestock are likely to be estimated. This bias will impact particularly on sub categories of livestock (e.g. weight categories for pigs or ages of cattle) rather than the total population for a livestock type. Other categories likely to be estimated by farmers include the tonnage of hay and silage produced in the year.

Guidance notes detailing what to include on the form are supplied to avoid farmers misreporting information. With regard to livestock, we require farmers to report those animals located on the holding that are either owned by the farmer or animals that are owned by someone else but are held under formal contract. It has been noted that animals are sometimes double counted in situations where animals are held under contract with both the owner of the livestock and the farmer looking after

the livestock reporting the animals. To avoid this double counting we have added specific guidance on the form itself in attempt to avoid this reporting bias.

The survey may also be subject to an element of non-response bias with farmers on certain farm types being more likely to respond to the survey than others. This means that we need use older information to estimate values for farm types less likely to supply us with current information.

A stratified random sample, grouped by farm size and region, is used to select holdings for the December survey. Individual strata are sampled to different extents. However, in estimating the results we weight by strata in order to produce a full dataset and to counteract the effects of some strata being sampled to a greater degree than others. This helps to address any sampling bias that is inherent in the sample design.

Changes to sheep categories

Since the Sheep and Goat inventory was introduced in 2015, there have been changes made each year to the phrasing of the questions on lambs which have been a source of confusion to farmers. The categories affected by changes to the questionnaire are "Lambs put to ram" and "Lambs not put to ram", but this seems to have affected the numbers put into the "Other sheep" category as well. In addition, the numbers since 2015 aren't directly comparable with the numbers prior to 2015 when the collection of sheep numbers changed. Comparisons over time are valid for "Total sheep" and "Ewes kept for breeding", but changes over time for lambs and other sheep are strongly affected by changes to the questionnaire.

Poultry numbers

The reliability of poultry estimates is affected by the availability of returns from a small number of large poultry producers and year on year changes should be viewed with some caution.

Survey burden

In December 2011, a representative sample of around 110 farmers participated in a telephone survey in order to calculate the burden of participating in the December survey. It was not considered beneficial to repeat this survey each year, however we do have updated figures for hourly rates¹ which we can apply to the time data from the 2011 survey. These give a total compliance cost for the December Survey of £66,500. It should however be noted that since the 2011 survey there have been several changes, namely the removal of the requirement to report cattle data on the form, reducing the burden for holdings with cattle, but added information on tenancy, increasing the burden on holdings with rented land.

¹ Annual Survey of Hours and Earnings (2019 provisional) – full-time median gross hourly pay in Scotland.

Details on how this figure was calculated and the range of times reported were published in the December Agricultural Survey 2011 publication.

Outputs and Uses

The December survey is conducted for a range of purposes. The statistics help the government to form, monitor and evaluate policy, and to assess the economic well-being of the agricultural sector.

Most of the data collected is required by the Statistical Office of the European Communities, specifically Council Regulation No 1165/2008 which sets out requirements for provision of cattle, pig, sheep and goat statistics in both May/June and November/December. It defines the category, age or weight of livestock for which statistics are to be provided and specifies the provision of quarter-year or half-year production forecasts. There is also a separate EC Regulation covering the provision of winter crops. This information is collated by Defra (Department for Environment, Food and Rural Affairs) for submission at member state (UK) level.

December Survey results are not as widely used as results from the June Census as the survey only covers larger holdings, generally of at least one hectare, whereas the June Census is representative of all agricultural holdings in Scotland. However, December results supply supplementary information not available through the June census on rent values, machinery, winter livestock levels and grass sown as well as detail on hay and silage production.

Some examples detailing how the December Survey data are or have been used are:

- Estimates of Total Income From Farming (TIFF), which are used to measure the value of agricultural productivity in Scotland. The December Survey, which gives approximately end-year livestock numbers, are more useful for the calculation of calendar-year production. For example, although the June Census records the number of lambs present in summer each year, it does not (on its own) give an indication of the volumes of finished sheep and lambs that are being processed within the calendar year.
- It is also useful to monitor livestock maintained for the next breeding season and winter crops in December so that the farming industry can better understand what to plan for in the coming year.
- The data on machinery that is collected in the December Survey is also used to help estimate some of the input costs incurred within Scottish agriculture (for example, machinery repairs, depreciation, fuel and asset worth).
- The information on rents is used to monitor the cost of land rental in different categories of land.