

June Agricultural Census 2018: Methodology and Quality Assurance Report

1. Background, Uses and Outputs

1.1 Background

The accompanying publication contains final results for the 2018 June Agricultural Census and trends over the last ten years.

1.2 Uses of the information

The census is conducted for a wide range of purposes. The statistics help the government to form, monitor and evaluate policy, and to assess the economic well-being of the different agricultural sectors. Most of the data collected is required by the Statistical Office of the European Communities. Equally important is the regular contact with farmers, which enables the department's register to be kept up to date. This means, for example, that information on new animal health requirements, or new subsidy schemes can be quickly directed to relevant farmers.

Most of the data collected are required by the Statistical Office of the European Communities, specifically Council Regulation 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 and half-year production forecasts. There is also a separate EC Regulation covering the submission of winter crops. This information is collated by the Department for Environmental and Rural Affairs (Defra) for submission at member state (UK) level.

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

- to estimate the total income from farming, as part of the Scottish GDP figures and to compile the National Accounts for the UK.

- to model various scenarios/options and analyse outcomes/impacts on Scottish agriculture in relation to a range of options on the future of support for Scottish Agriculture.

- to provide disease and epidemiology modellers with a snap-shot of livestock numbers and locations (at 1st June) to assist with real-time and emergency planning procedures for animal disease outbreaks.

- UK ammonia and greenhouse gas inventories – the census provides Scottish agricultural land and livestock data.

to support work on various research packages such as assessing the potential impact of CAP (Common Agricultural Policy) reform on payments to farmers; early environment effects on animal health and welfare; assessing the effectiveness of measures to manage water quality and control diffuse water pollution.

The census is also used by the main research providers working for the Scottish Government on numerous projects and underpins the majority of the analysis and research that is carried out, and to provide sampling frames for this research. In some cases it is also used to identify holdings for receipt of important and relevant information by mail, subject to the terms of Section 80 of the Agriculture Act 1947¹.

1.3 June Census outputs

Results from the June census are available to the public as follows:

The Annual Abstract of Statistics presents a time series from 1982 onwards which also contains some additional detail on selected items (common grazing, land tenure etc.). It is available to download as a spreadsheet along with this publication and can be accessed here:

<http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubAbstract/Abstract2018>

Previous editions of the Abstract can be accessed here:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubAbstract

The outputs from the census on livestock and crops are also used as key inputs to the Total Income from Farming (TIFF) model, which is used to estimate the value of agricultural productivity in Scotland. Headline results are published each January with more detailed analysis presented in the Economic Report on Scottish Agriculture (ERSA) tables, which are published in May or June of each year. Results for TIFF can be accessed as follows:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/ResultsTIFFBI

The Economic Report on Scottish Agriculture (ERSA) is a compendium publication which contains detailed statistics on Scottish agriculture. It contains three sections covering, (i) Total Income From Farming (TIFF – see above for more details), (ii) Farm Accounts analysis (income and expenditure statistics by different farm types) and (iii) additional statistics/analysis from the June census e.g. more detail is provided on the structure and composition of Scottish agriculture in terms of the types of activity on holdings, additional geographic analysis is provided along with some UK comparisons. Since 2017 this is no longer an annual publication, but a full set of tables are published each year.

¹ www.legislation.gov.uk/ukpga/Geo6/10-11/48/part/V/crossheading/statistics-of-agriculture-in-great-britain

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubEconomicReport

Geographical results for the June census in years prior to 2010 are available in the Geographical Summary Sheets which provides analysis by the 14 agricultural geographic areas within Scotland. Results for the June census from 2010 onwards have been incorporated into ERSA.

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubScottishCensus

The Agricultural Facts and Figures pocketbook provides a useful summary of the key statistics in the Scottish agriculture and food sector in a convenient pocketbook format.

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFactsFigures

EC regulations

The EC demands that each member state collect agricultural statistics every year, enforced through a number of EC regulations relating primarily to crops and livestock. Specific regulations are listed on pages 11 to 13 of our annual statistics plan; a link is provided here:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/scotstat/planning

These regulations are legally enforceable by the EC, meaning that member states must comply with the data collection requirements in order to avoid financial penalties. In Scotland, the June census is the main survey that is used to meet these requirements as part of providing a response to the EC at a UK level.

We also use the June census to contribute to the formulation and publication of UK statistics on agriculture. These publications are co-ordinated by Defra and more details are available here:

www.gov.uk/government/publications?departments%5B%5D=department-for-environment-food-rural-affairs&publication_filter_option=statistics

2. Methodology

2.1 Data collection

The June Agricultural Census is conducted annually by the Scottish Government's Rural and Environmental Science Analytical Services division (RESAS). Data are requested from all holdings who submitted a Single Application Form (SAF) in the previous year, together with some other large businesses that would not be eligible for support payments. A sample of holdings which didn't submit a SAF or who didn't return a form last year were also sent a census form.

Data for the June census is collected from three sources:

Land data were extracted from the Single Application Form (SAF) database for around 22,900 holdings that are claiming under the Basic Payment Scheme (BPS). Holdings that submitted a SAF in 2018 were also sent a cut-down census form (22,000 forms) to collect the additional data on livestock and labour. See section 1.8 for more details on the use of SAF data.

From the remaining holdings that did not complete a SAF in 2018, 12,400 (potentially including holdings that submitted a SAF for the first time in 2018) were sent a full census form covering land, livestock and labour.

All cattle data (including data on cattle breeds) were collected from the Cattle Tracing Scheme administrative source. This means that we effectively have 100 per cent coverage, even for those smaller holdings that were not selected for inclusion in the census.

The following table gives a breakdown for forms returned for each category of holding.

Land-use data was received for holdings covering 88 per cent of the total agricultural area, either from returned full census forms or the SAF (shaded grey).

Cattle data was received for 100 per cent of holdings with cattle, from the CTS.

Other data was received for holdings covering 64 per cent of the total agricultural area, from returned census forms (the final column in the table).

Census type ⁽¹⁾	Total number	Number selected ⁽²⁾	Number of returns ⁽³⁾	Total area	Area of selected ⁽²⁾	Area of returns ⁽³⁾
SAF	22,884	22,351	16,039	4,927,409	4,805,488	3,414,972
full form		350	231		49,710	38,252
part form		22,001	15,808		4,755,778	3,376,720
Non-SAF	28,273	12,369	6,333	676,453	357,376	191,844
full form		10,493	5,289		290,383	149,287
part form		1,876	1,044		66,993	42,557
Total	51,157	34,720	22,372	5,603,862	5,162,864	3,606,816

(1) "SAF" refers to holdings where land-use data is available from the Single Application Form dataset.

"Non-SAF" refers to holdings where land-use data is only available through the June Agricultural Census form (if at all).

"full form" refers to the long version of the census form covering land use, livestock (except cattle), and labour, designed for those not completing the SAF.

"part form" refers to the short version of the census form covering livestock (except cattle), and labour, designed for those known to be completing the SAF.

(2) The numbers selected are slightly lower than the total number eventually identified due to annual changes in the list of holdings.

(3) The return numbers quoted here relate to the number of survey forms received. For SAF holdings this masks the fact that we effectively receive 100 per cent response for all land items. Cattle data,

from the CTS database, is also effectively 100 per cent complete. Response rates based on these figures therefore relate to other livestock and employment data.

2.2 Online collection

Since 2017 respondents have been able to complete their census online, through the Rural Payments and Services website. This year, all those in the sample who had completed the June Census online the previous year were sent email notification of the survey, rather than a paper form. However, if the online form was not initially completed, a paper form was sent as a reminder. All other census recipients received paper forms as normal. In total 6,472 SAF holdings returned online data, 40 per cent of SAF census returns or 29 per cent of the SAF sample. In addition, we received 73 online non-SAF returns.

2.3 Treatment of non-response

In Scotland the registered details of the 51,157 agricultural holdings are used to maintain a holding-level dataset of agriculture for statistical purposes. This provides a virtually complete coverage of agricultural activity in Scotland. However, please note that:

- we do not conduct a full census as this would place an unnecessary burden on farmers.
- for the selected holdings that are surveyed, not all farmers return data to us.
- gaps in our holding-level data set are 'maintained' by producing estimates.

Estimates are produced for holdings which were (i) not surveyed and (ii) surveyed but did not provide a response, either to the whole form or to certain questions. Holdings are divided into strata (using farm type and 'economic' size) and estimates are made (using ratio estimation) for non-responders within each separate stratum. Estimates are restricted to a maximum of +/- 2.5% change on the previous year for each holding, in order to avoid artificial distortion in the overall statistics. Artificial distortion can occur when large actual changes in a small number of holdings within a stratum are applied to non-response holdings in the same stratum.

Within each stratum, land, livestock and labour values for non-response holdings are calculated by looking at those holdings that returned data in 2018 and calculating the percentage change since their previous census responses. These percentages are applied to the non-responders' previous data for the corresponding years. That is, if a given non-responder last returned data in 2008, the percentage change for holdings returning data in both 2008 and 2018 is calculated, and this is applied to the 2008 data for the non-responder to give an estimate for 2018. Labour figures are rolled forward using the most recently returned data.

These changes in the method of imputation were introduced for the 2014 Census. More information on these changes can be found in that year's publication.²

2.4 Full tenancies and seasonal tenancies

The methodology for calculating holdings with rented land and full tenancy arrangements was refined in 2014. In order to calculate a breakdown of tenancy types and associated areas, in cases of non-response, data from the most recently returned data was used. In addition, information returned in 2014 on holdings for which there was previously no tenancy type information available was applied to data for 2013. Additional information from the Crofting Commission has also been applied to data for 2013 and 2014. Estimates for remaining cases of non-response were calculated by applying proportions from actual responses to those holdings with rented land for which no tenancy type information was available. Further work was carried out in 2015 to validate data on Small Landholder Act Tenancies, which has led to a reduction in the estimated number of holdings.

Due to changes in the Single Application Form, data on seasonal tenancies were not available this year. It is hoped that we will be able to collect data in future years. Data on seasonal tenancies was previously published in [‘Tenanted Agricultural Land in Scotland 2014’](#)³.

2.5 Farm types, Standard Outputs

Using results from the Census, holdings are classified into farm types, which are allocated based on the main activity on the farm (as defined by the holding's Standard Output value). In 2018, the farm type breakdown uses price-derived coefficients based on a five year (2013) centred average. More information on farm types can be found in the [Economic Report on Scottish Agriculture](#)⁴.

There are eleven basic farm types (cereals, general cropping, horticulture & permanent crops, pigs, poultry, dairy, cattle & sheep (LFA), lowland (non-LFA) cattle & sheep, mixed, forage and unclassified. ‘Unclassified’ related to holdings with no SO value (e.g. holdings with fallow land only), whereas ‘mixed’ is where no single crop or livestock category is dominant.

Information on Standard Labour Requirements (SLRs) will be published in the Economic Report on Scottish Agriculture.

² www.gov.scot/Publications/2014/10/6277/4

³ <http://www.gov.scot/stats/bulletins/01155>

⁴ <http://www.gov.scot/Publications/2015/06/8844/9>

3. Quality assurance

3.1 Accuracy

Data undergo several validation processes as follows; (i) checking for any obvious errors on the paper census forms upon receipt, (ii) 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, and (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.

3.2 Migrant labour estimates

Migrant labour estimates should be viewed with caution. Since 2017 there has been an increase in the amount of migrant labour returned by respondents, but this has been the result of better reporting, probably due to the introduction of the online form and the increased awareness of the importance of migrant labour in the wake of Brexit. It does not seem to reflect a genuine change.

Furthermore, the research study 'Farm workers in Scottish agriculture: case studies' found that the numbers reported in the Census are likely to be an undercount. As noted in the study, 'it is challenging to estimate the extent of seasonal migrant labour use in Scotland for a variety of reasons: (i) variation in the proportion of labour directly employed on farms compared to that indirectly employed through labour providers; (ii) incomplete estimates of seasonal migrant labour provision in administrative databases; (iii) farm businesses leasing their land to specialist growers who undertake all of the farming activity; (iv) the transitory nature of some migrant labour – working on multiple farms'. In light of the findings of the study, the method of collecting migrant labour statistics will be reviewed. The study included some estimates of migrant worker numbers for 2017 and can be accessed here <https://beta.gov.scot/publications/farm-workers-scottish-agriculture-case-studies-international-seasonal-migrant-labour/pages/2/>

3.3 Livestock estimates

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.

In sheep 1 year and over, since 2016 there has been a considerable decrease in those to be used for breeding and an increase in the number of other sheep. This was investigated and found to be a fairly widespread amongst holdings with sheep and seems to reflect a genuine change.

Prior to 2013, statistical data on cattle populations were collected through the June census and December survey in Scotland. In order to reduce the burden on survey respondents, cattle data has been obtained through the Cattle Tracing System (CTS) since June 2013, with data from 2006 onwards being published. CTS, an administrative data source held by the British Cattle Movement Service (BCMS), records cattle movements across Great Britain.

Usable data from the CTS is only available for Scotland from 2006. For those years where both census and CTS data were available (2006 to 2012), CTS numbers were, on average, 3.2 per cent higher than that collected through the census.

3.4 Changes resulting from use of administrative data from the Single Application Form

Since 2009, data on land use has been obtained from the Single Application Form (SAF). These data were combined with land use data from all the other holdings, collected through June Census forms, to generate overall June Census results. This development led to a substantial reduction in statistical data collection and an overall improvement in the quality of land use statistics. In 2018 SAF data was obtained for 22,900 agricultural holdings.

While the method of incorporating SAF data is believed to be more accurate than the previous method, it resulted in a step change in some of the land use results for 2009, especially for rough grazing and grass. This meant that changes between 2008 and 2009 for these land use categories did not represent genuine changes in land use, but rather differences in the way this data had been reported. These should therefore be treated with caution.

Changes were made in 2015 to the ways in which rough grazing, woodland, other land and seasonally let land were collected on the SAF. This has affected the level of detail available in these land use categories for some holdings while data on seasonally let land data could not be collected. In 2015 to 2017 woodland and other land were disaggregated by imputing values for land parcels based on information supplied in 2014. These were becoming less reliable estimates with each passing year, so for 2018 an estimate for the two categories combined has been provided.

In 2015 the definitions of temporary and permanent grass were changed on the SAF. From 2015, temporary grass relates to whether it has been reseeded in the last five years, whereas previously it related to how long it had been used for grass. The new definition only includes land that is included in a

holding's crop rotation. This means changes between 2014 and 2015 in grass under 5 years old, and grass 5 years and older do not represent genuine changes in land use, but instead differences in how grass data were recorded.

A change in the collection of data on strawberries and raspberries led to some discontinuities between 2010 and 2011 and between 2011 and 2012

3.5 Relevance

The content of the census and any changes to it are agreed with a range of Scottish Government divisions and, where necessary, through wider consultation. The survey provides data used by both the Scottish Government and the EU to assess agricultural activity, in the monitoring and development of policy (see section 1.2 above).

4. Timeliness and punctuality

Results have been published just over four months after the census date. The census date was set at 1st June 2018, with returns requested by 15th June. However, forms were still being received through to September, when the census was then closed to finalise results. Forms received after closure of the census are used for imputation of the following year's census, and will be incorporated into revisions published alongside the results of the June 2019 census.

5. Accessibility and clarity

These statistics are made available online at the Scottish Government's statistics website in accessible formats (html and pdf versions are available). All data tables are made available in Excel format to allow users to carry out further analysis. We encourage feedback on the content and format of our publications.

6. Respondent burden

One of the recommendations resulting from the UKSA assessment of Scottish Government agricultural statistics was to report annually on the estimated costs of farmers responding to the agricultural surveys.

To determine how long it took farmers to complete the December survey, around 110 farmers were asked over the telephone for an estimate of the total time it took them to fill in the form itself as well as the time taken to read guidance notes, count livestock or consult business records containing information required to fill in the form etc. More information on how this exercise was conducted can be found in the results from the 2011 December Survey of Main Holdings:

<http://www.gov.scot/Publications/2012/03/7513>

A median time of 30 minutes was derived from this survey of farmers in December and is the figure used as the baseline for calculating respondent burden for the June Census. Calculations for estimating respondent burden for the June Census are based on the assumption that the partial form completed by those also submitting a Single Application Form (SAF) takes around the same time to complete as the December Survey form, while the full June Census form takes twice as long. It has also been assumed that completing the online versions of the forms takes about the same length of time as the paper versions.

The table below employs formulae based on guidance given by the Scottish Government Statistics group. It is estimated that farmers spent 13,900 hours completing the June Census forms in 2018 at a cost of £195,000:

Number of responses (partial form)	16,852
Median time taken to respond in hours	0.5
Time taken to respond to partial form in hours	8,426
Number of responses (full form)	5,520
Median time taken to respond in hours	1
Time taken to respond to full form in hours	5,520
Total hours taken to respond to forms	13,946
Hourly rate of typical respondent*	£13.98
Total cost of responding to June Census forms	£194,965

* 2017 Annual Survey of Hours and Earnings (ASHE) - Table 3.5a Median "Full Time Gross" hourly pay for males and females

7. Revisions

Major revisions to the results from the June Agricultural Census are published on the Scottish Government website:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/revisions

8. Other publications

The next large agricultural survey will be the 2018 December Survey of agricultural holdings. This is a smaller exercise which surveys around 15,000 of the larger holdings, and, since December 2015, has been combined with the Sheep and Goat Annual Inventory. Results will be published in Spring 2019. Results for the 2019 June census will be published in September/October 2019.

Statistics on the production of meat, milk, eggs and other livestock products are published in the Economic Report on Scottish Agriculture (ERSA). These can show different trends in livestock numbers to those shown above, as they are also dependent on factors such as production yields and international trade in livestock for finishing and slaughter. ERSA also provides statistics on the price and value of livestock and other agricultural outputs. Since 2017 it

exists as spreadsheet tables only. These data can be accessed here:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubEconomicReport

Results from all Scottish Government agricultural surveys can be accessed here:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/Publications

Results from previous June censuses can be accessed here:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFinalResultsJuneCensus

Publications relating to cereal and oilseed rape production can be accessed here:

www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubCerealHarvest