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Agricultural Production Survey Frames: Changes over time, issues, and challenges

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Summary

New Zealand has a long history of producing official statistics on agricultural, horticultural, and forestry production. Having a good population or survey frame is a key factor enabling the collection and production of quality statistics. Several population frames have been used over time for agricultural production censuses and surveys. These include land based frames, administrative registers, farmer and grower lists, and combinations of these.

This paper discusses the frame currently used and earlier frames and associated challenges, including: the transition from a land based to administrative frame, coverage issues, frame updating, and issues when comparing statistics based on different frames. The paper discusses frames used for the production of other official agricultural and forestry statistics.

Key Words

Agriculture, statistics, population, survey, frame

Introduction

New Zealand has a long history of producing official statistics on agricultural, horticultural, and forestry production (for example, livestock counts and crop areas). The current Agricultural Production Census and Survey programme is carried out by Statistics New Zealand in partnership with the Ministry of Agriculture and Forestry (MAF). It is important that these statistics are of high quality as they are widely used for monitoring, research, planning, forecasting, and international reporting.

For the purposes of this paper agriculture includes livestock and arable farming, and horticulture and forestry production.

A population frame is the total number of observations of interest. This includes people, businesses, farms and forests, or sub-groups such as dairy farms or vineyards. A census or survey is designed to produce statistical information that represents the subject population. A census is defined as a full-coverage survey,

where all units in the subject population are surveyed. The term survey is used when sampling of the subject population is carried out.

Several different population frames have been used over time for agricultural production censuses and surveys. These include land based registers, administrative (tax based) registers, farmers and growers lists, and combinations of these. The current agricultural statistics programme of censuses and surveys uses the Statistics NZ Business Frame (BF). This is an administrative (tax based) frame that is used by Statistics NZ for all business and economic statistics.

This paper will discuss the current frame together with earlier frames, and the associated challenges. These challenges include:

- the transition from land based to administrative frames
- coverage issues that may lead to double counting or undercounting of production activity
- frame updating and issues when comparing statistics based on different frames.

Initiatives to check and improve frame quality will be discussed, together with a brief look at the frames used for the production of other official agricultural and forestry statistics.

The Statistics NZ Business Frame

The BF is a statistical business register maintained by Statistics NZ. It covers all business sectors including agriculture, horticulture and forestry, other primary industries, and the manufacturing and services sector. It is continuously updated from a range of sources including administrative data (primarily from the tax system), feedback from Statistics NZ surveys, and other publicly available information. The BF is used for all Statistics NZ business surveys.

Frames Used for Agricultural Production Statistics Prior to 2002

Agricultural statistics have been produced since the 1860s, reflecting the importance of the agriculture sector to the wider economy.

An annual agricultural production census, using a land based frame, was carried out between 1956 and 1987. The census included all livestock and arable farmers, horticulturists, and forestry growers. The land based frame used a list of farms specifically developed for these annual censuses. It was maintained (updated) each year from the information collected in the census. This land based frame was costly to maintain, relied totally on the annual census for maintenance, and was only used by Statistics NZ. The existence of the frame relied totally on the annual census, and the census could only be operated with this frame of farms.

In the late 1980s, financial constraints started to affect the annual agricultural statistics programme. The annual census, using a land based frame, became unsustainable. Without an annual census it was impractical to maintain the land based frame. From 1988 to 2001 a mixture of sample surveys and censuses were utilised. In some years there was no survey or census.

In the early 1990s the land based frame was merged with the Statistics NZ Business Frame. The BF provided the frame for the 1994 Agricultural Production Census. It was subsequently used for the 1995 and 1996 sample surveys.

In 1997 and 1998 no agricultural census or surveys were carried out. In 1999 a survey of livestock farmers was carried out using a frame sourced from Agri-Base. This was followed by a survey of horticulturists using a frame based on the BF, supplemented with grower lists. These frame solutions proved to be unsatisfactory, as each had their own coverage, maintenance issues, and challenges. Agricultural production statistics that used a variety of frames resulted in a lower quality statistical series, and issues when comparing data over time. During this time the agriculture sector of the BF was maintained using administrative tax data updates.

Frame Used for the Current Agriculture Production Statistics Programme

From 2002, Statistics NZ, in partnership with MAF, began the current agricultural statistics programme. The programme is based on a five-yearly census (2002, 2007 and 2012) with sample surveys in the other years. The frame is sourced from the Statistics NZ Business Frame. The agriculture, horticulture, and forestry sectors of the BF are maintained to the same high standard as the other industry sectors on the BF. Considerable investment has gone into processes to update the frame with feedback from every agricultural census and survey. This investment was needed to ensure quality 'fit-for-purpose' statistics are produced from the agricultural production statistics programme.

The current frame selects all businesses that may be undertaking agriculture, horticulture or forestry production activity. This includes businesses classified to these industries and businesses where these are carried out as a secondary activity. Sharemilkers are identified to ensure that both the farm owner and the sharemilker are not included in the population as this would lead to duplication. Farms that are leased out by the owner are identified and excluded from the population to prevent duplication.

When the current agricultural statistics programme was introduced in 2002, careful consideration was given to deciding on the most suitable frame. The following key factors were considered:

- The benefits that could be achieved in coherence and consistency with other statistical outputs.
- The lack of a viable alternative frame with an established and consistent level of quality, and ongoing maintenance programme.
- Experience of the frames used for agricultural production surveys prior to 2002. These frames produced their own challenges. For example, land based frames: one farm can consist of many legal land parcels, the owner may not be the farm operator, or the land may not be used for agricultural production. When frames based on grower lists or administrative animal registration systems for disease control were used, there were issues around the lack of complete coverage across all the sectors, and maintenance issues.

- The prohibitive cost of constructing and maintaining a frame specifically for the agricultural production statistics programme.

The use of the tax based BF for agricultural production statistics since 2002 has provided significant benefits, as well as challenges, which have been progressively resolved.

Benefits of Using the Business Frame

As noted above, the BF is used for all Statistics NZ business and economic surveys. This allows coherence and consistency across all statistics, as they use the same statistical units and classification. For example, this allows the publication of comparable data on agricultural production statistics, employment statistics based on administrative tax data, and annual financial statistics (income, expenditure, profit, assets, and liabilities) based largely on administrative tax data. If the agricultural production statistics programme used a frame independent of the BF, any integrated use of statistics would be less robust, and would need to account for differences between frames.

Using the BF for agricultural statistics is a cost effective option. The wide use of the BF across Statistics NZ means most of the frame's operational costs are already covered. The BF makes extensive use of comprehensive administrative tax data sources. This includes the monthly use of GST and employment tax data to add and cease units, and update size measures. The BF has robust coverage of business entities in New Zealand and is continually maintained from feedback collected through Statistics NZ's range of surveys (including agricultural production censuses and surveys).

The BF's quality is improved through ongoing quality checks and data analysis.

Challenges Associated with Using the Business Frame

Multiple Reporting Units

On the BF, an enterprise unit has a one to one match with an administrative legal data unit.

A single farming operation can involve several enterprise units. For example, one unit may carry out the farming activity, while another unit may own the land. Share milking arrangements are common in the dairy industry, with the farming operation split between two enterprise units. Potentially a third unit may own the land. These types of arrangements present a number of challenges when using BF units for agricultural production survey reporting units. If all the enterprises involved in a single farming operation are surveyed, they are likely to report the same farming or forestry production activity. This will over-state the statistics.

These challenges have been addressed by:

- Ensuring enterprise units that own agricultural land and lease the land to other farmers are correctly coded to property ownership, not agriculture, horticulture, or forestry. This is addressed by including questions in the agricultural production survey questionnaire to identify units that require an update to their industry classification on the BF. Annual administrative tax data is used to identify units with only rental income.
- Identifying share milking units by including a question in agricultural production survey questionnaires, and then identifying these units on the BF. There are about 5,000 of these units identified on the BF.

Implementing these solutions (to cleanse the frame) was a process that took several agricultural production surveys. It is ongoing, with extensive updating taking place each year. For example, between 2002 and 2010, approximately 5,500 enterprises had an industry reclassification from agriculture to property owning. Over the same time frame approximately 1,500 enterprises were reclassified from property owning to agriculture. Agricultural survey feedback over this period has provided over 30,000 updates to the industry classification of businesses. Every year survey respondents report changes to the ownership, leasing, or share milking status of

farming businesses. In addition, they report if a farming businesses has ceased trading. These are updated to the BF, which is also updated via the tax system, including with details of business start-ups and ceases.

Business Frame Coverage

New businesses usually come onto the BF via GST registration. The BF covers all economically significant enterprises – for most sectors the threshold is $60,000 GST, in annual turnover. No minimum threshold applies for agriculture, horticulture, and forestry business units. It should be noted that there are many smaller lifestyle or hobby farms that may be outside the tax system, or a secondary activity of another business. This non-coverage is a limitation of the BF, and can't be quantified. Developments such as the National Animal Identification and Tracing (NAIT) initiative and Farms-On-Line database may enable this gap to be quantified in the future.

Comparing land area statistics produced from the Agricultural Production programme and the Ministry for the Environment's (MfE) Land Cover Database gives a reasonable match, despite the different sources and concepts used to collect data. This provides a level of confidence in agricultural production statistics based on the BF.

Future Frame Developments for Agricultural Production Statistics

Current and future developments offer opportunities to enhance the BF for agricultural production statistics, or may offer suitable alternative frames or methods of producing statistics.

Bio-security developments such as the NAIT initiative and Farms-On-Line database have the potential to support agricultural production statistics. This could be through:

- providing alternative statistics
- helping quantify and improve BF coverage and industry classification for the agriculture, horticulture, and forestry sectors
- frame extension or alternatives.

Integration of current agricultural production statistics based on the BF with a land-based frame has been considered for several years. Linking BF based statistics with information such as land ownership, vegetation cover, topography etc, would extend the usefulness of the statistics. This integration could be carried out by geographic area, or at the BF geographic (local) unit. Unit record integration supports a greater depth of analysis, than integration at a more aggregated level.

To date, land-based information on large plantation forests has been successfully matched to BF agricultural production statistics. This was time-consuming and challenging, especially when sorting out the connections between land ownership, forest ownership, and in some cases forest management companies.

Ideally, quality and efficiently produced agricultural production statistics, which maximise the use of administrative data, would be achieved by making links between:

- administrative units on the BF
- land parcel information that gives the location and characteristics, for example vegetation cover and topography
- administrative systems used for biosecurity and livestock tracing purposes.

As initiatives are progressed, the opportunities they offer will be investigated further.

Frames Used in Other Official Agricultural, Horticultural, and Forestry Statistics

MAF produces official statistics on forestry trade and production, using several surveys to collect the information. These surveys use purpose built frames developed and maintained from sector information and feedback from survey respondents. In 2010 MAF and Statistics NZ have been working together to improve these population frames. This work involves matching the population frames of the MAF surveys with the Statistics NZ BF to identify areas where improvements can be made. This work was challenging and relatively resource intensive due to the complex and changing nature of forestry ownership and management.

Geospatial technology, including satellite imaging and remote sensing, are relatively new areas being exploited to produce official statistics. MfE’s Land Cover Database

is one such example. Another is the Land Use and Carbon Analysis System (LUCAS) which tracks and quantifies changes in land use over time. This is a cross government initiative led by MfE to help New Zealand meet its international reporting requirements under the Kyoto Protocol.

Beef & Lamb NZ has been carrying out a Sheep and Beef Farm Survey for several decades. This produces estimates of livestock numbers that are a key component in forecasting. Beef & Lamb NZ aims to carry out a statistically robust survey that produces quality statistical information. Agricultural Production Survey statistics are used during sample design and for post stratification. Statistics NZ also helps ensure the survey frame is supplemented in a robust way by contacting a sample of farmers who meet specific criteria, asking for consent to pass their contact details to Beef & Lamb NZ to take part in their survey.