

Implementing New Zealand's Agriculture Production Census for 2002¹

This year, Statistics New Zealand (SNZ) and the Ministry of Agriculture and Forestry (MAF) are together recommencing the regular collection of New Zealand's official agricultural statistics which was ceased in 1996. Resuming collection of official agricultural statistics creates a number of technical and statistical issues that must be addressed in undertaking official information collection. This paper summarises the issues that needed to be addressed in reinstating a regular collection of agricultural statistics, and preparing for the 2002 Agricultural Census.

Introduction

Every nation needs to produce official agricultural production statistics for planning and policy development, for trade-round negotiations, as well as for reporting to international agencies such as the Organisation for Economic Cooperation and Development (OECD), the Food and Agriculture Organisation (FAO) and the United Nations Framework Convention on Climate Change (UNFCCC). In addition, New Zealand needs reliable statistics in order to understand contributions to Gross Domestic Product, production, employment, and taxation. Statistics are also required to monitor the intensity of land use; the dynamics of inter-related industries (eg the beef and dairy industries); the growth of small industries; and the emergence of new industries.

In 2001, MAF, in partnership with SNZ, sought new funding from Government to reinstate the regular collection of agricultural statistics and received baseline funding in July 2001 to do so. It is intended to undertake a full 'enumeration census' every five years from 2002 onwards. Additionally, sample surveys of key activities (eg forestry, livestock, horticulture, cropping, organic farming, and lifestyle blocks) will be carried out between censuses in order to maintain annual time series, but at a lower cost than is involved in a census.

1. Designing the frame

SNZ has designed and constructed a 'survey frame' (ie a list of farms with contact details) based on the Business Frame (a GST based list of enterprises), with additional information coming from other sources such as the Inland Revenue Department (IRD), growers and industry organisation lists.

Every year, some 8 to 10 percent of the farm population (totalling more than 100,000 farms) changes in some way, either through the creation of new farms, sale of farms, or change of the main activity (eg conversion from beef to dairy farming). Therefore, six years after the previous agricultural census, a significant amount of work was required to get the survey frame up to the required standard for the 2002 Agricultural Census.

In designing the survey frame every effort has been made to ensure the accuracy of contact information – that the list is comprehensive (ie including as many farming enterprises as possible) and up to date. All the database fields required to support the necessary processing and statistical analysis have been included.

Key information on the frame now includes, address and contact details, main farming activity, size indicators (including land area and stock numbers) and regional classifications.

The most critical requirements of the frame are: that it achieves a level of coverage consistent with the accuracy requirements of the statistics produced from the survey programme; that it contains up to date contact details for each farm; and that it reduces unit duplication. It must also be set up and maintained on a consistent basis to avoid introducing discontinuities that impact on time series data derived from the survey programme.

¹ This article was prepared by the Enterprise Production Division of Statistics New Zealand.

2. Census issues

2.1 System design

In order to carry out a high quality postal census, it is necessary to design a survey questionnaire that satisfies diverse needs, and a computer system and database with all the necessary fields to produce national and regional statistics (areas, production and counts) by farm activity (eg dairy, livestock, cropping, horticulture and forestry). In addition to production information, area statistics are important because they tell us about land use, and because they relate directly to productivity. They can also be used as a proxy for production.

2.2 Missing farms

Inevitably, there will be farms that are not recorded on the SNZ frame (undercoverage). However, the use of a spatial database such as the Land Cover Database enables comparison of the areas of farmland within each territorial authority to estimate the degree of undercoverage.

2.3 Accuracy and reliability

The accuracy of official statistics collected through postal surveys depends on a number of factors that include:

- the frequency of collection
- how soon after collection the estimates are made available (timeliness)
- the extent of coverage of the target population
- the extent and type of imputation used to account for missing data
- the accuracy, frequency, coverage and representativeness of the source data.

2.3.1 Frequency

Decisions on the frequency of collection must take account of whether the collections will include data at the necessary temporal resolution (ie capturing important short-term fluctuations); the uses to which the data will be put; respondent burden; and the availability of financial and other resources. For agriculture and forestry, a census of key data every five years will be supplemented by intercensal surveys of particular industries or activities every year (eg a survey of forestry growers of less than 40 ha will be held in 2003). Annual collection will allow SNZ to compile time series for the major agricultural activities, and will provide the necessary information for policy development.

2.3.2 Timeliness

Following any official survey or census collection, a considerable amount of processing is required before the results can be finalised and released. In particular, it is necessary to undertake detailed checking of data and impute for non-response.

Trade-offs must sometimes be made between the amount of detailed data checking that is undertaken and timeliness. For this year's census, provisional national-level data will be released in February 2003 (eight months following collection), and final estimates in May 2003 (11 months following collection). This length of time is required to ensure a high level of response, and to allow sufficient time for data entry and checking the compiled statistics.

2.3.3 Coverage

It is usually impossible to obtain complete coverage of the target population, both because some members of the true population may not have been identified, and therefore, not included on the survey frame, and also because there will usually be some non-response for which we must impute. For this year's census, considerable resources and effort have gone into ensuring that the survey population of 90,000 contains all economically significant units that will allow the production of high quality estimates. Analyses show that the total production of farms not included in the census will contribute less than 2 percent of total output.

2.3.4 Imputation

Statistics New Zealand is empowered by the Statistics Act 1975 to collect agricultural statistics as well as other official statistics. The Forests Act 1949 empowers MAF to collect forestry statistics from growers, distributors, exporters, importers etc. However, neither an Act of Parliament, nor a guarantee of the confidentiality of unit records can ensure that everyone will complete the questionnaire, even when the law provides penalties for failing to do so.

To account for non-response, a suitable imputation technique must be chosen. Several methods are available, each of which has been carefully assessed for its effect on the final statistics. In the 2002 Agricultural Census, a 'hot-decking' approach will be used. Here, a non-responding farm is matched with a similar responding farm and all of the relevant variables of the responding farm are ascribed to the non-responding farm. Areas and production for non-responding farms can then be estimated on that basis.

2.3.5 Quality data

All survey and census statistics ultimately depend on the quality of the source data provided by respondents. Compiled statistics can be adversely affected by respondent error that can arise when the respondent either provides an inaccurate estimate, miscalculates or otherwise misreports. A poorly worded questionnaire can easily result in misreporting, or may fail to request the intended item. For this census, both MAF and SNZ have consulted widely. Statistics New Zealand has also undertaken cognitive tests of the questionnaire with groups of farmers in order to ensure a well designed questionnaire with appropriately worded questions.

3. Designing the questionnaire

3.1 Which statistics are needed?

The first step in designing the questionnaire was to decide on the kinds of statistics and the level of detail needed. SNZ and MAF have engaged in extensive consultation with key agencies that have an interest in the collection of agricultural statistics in order to take on-board their information requirements as much as possible. To this end, a stakeholder group was established to provide the necessary technical, user and business input. SNZ and MAF have also developed clear definitions of the terms 'target population', 'the farm', 'horticulture', 'livestock', 'grain and arable cropping' and 'planted production forest' in terms of the Australian and New Zealand Standard Industrial Classification (ANZSIC).

For the most part, SNZ will continue to produce similar output tables to those of previous censuses, but this time, some new issues must be addressed such as greenhouse gas reporting. Some difficult decisions on priorities and levels of detail had to be made, given that not all data requirements could be included in the questionnaire.

It has also been necessary to balance the number of questions relating directly to agricultural activity and production, and those designed specifically to obtain information for updating the survey frame (improving the frame is a major objective of any census, and is necessary for performing rigorous random sampling and stratification in any follow-up sample surveys).

3.2 Designing and testing the questionnaire

Cognitive testing of the individual questions was carried out on a sample of farmers at agricultural shows, and other venues, prior to finalising the questionnaire design (agricultural shows are particularly useful vehicles for pilot testing of questionnaires). Farmers were invited to complete draft questionnaires and return them with comments about their readability and technical accuracy. In particular, they were observed closely as they completed the draft questionnaires so that the practical problems they experienced in interpreting the questions and formulating responses could be seen.

4. Final statistics

Provisional estimates, in the form of summary tables and reports, will be available in February 2003 through Statistics New Zealand's *Hot Off The Press* releases. The final estimates will be published in May 2003. The census statistics will be provided on New Zealand's main agricultural activities, including the following:

Business type

Farms will be classified by business type (eg individual ownership, private companies, partnerships, central or local government, and Māori trusts, etc).

Livestock

Livestock numbers will be produced for the following classes: sheep and lambs; dairy cattle and calves; beef cattle and calves; deer and fawns; pigs (including breeding sows); poultry and eggs; goats and kids; and horses and other livestock (including emus, ostriches, alpacas and buffalo).

Grain and arable crops

Area and production statistics will be produced for, wheat, barley, oats, field and processed peas, maize, lentils, oilseed crops, herbage seeds (including rye and clover) and silage.

Vegetables, flowers, fruit and nuts

Areas and production statistics will be collected on the main kinds of vegetables grown in New Zealand. Data will also be collected on total areas and production of nursery crops, herbs and flowers, and the main kinds of fruit (including olives) and nuts (chestnuts, macadamias, walnuts and other nuts).

Fodder crops

Fodder crop statistics (areas and production) will be produced for silage maize, greenfeed or silage oats and turnips.

Organic crops and livestock

Statistics will be collected on areas and production for: organic horticulture and arable cropping; organic dairying and organic sheep; and beef and other livestock farming.

Forestry

Statistics on the total area of planted forests, along with estimates of planting and harvesting, will provide valuable information on forests. This information will supplement the more detailed information collected in MAF's report *A National Exotic Forest Description as at 1 April 2001*.

Fertiliser statistics

Statistics about fertiliser usage are important because fertilisers are used to maintain and improve the productive capability of soils and pastures. In addition, data on fertiliser application rates is needed for monitoring the impacts of fertiliser usage on the environment.

Land use

Estimates of land use are useful for monitoring patterns of land use, and understanding how land use changes over time. In addition, New Zealand needs to provide estimates of nitrous oxide emissions from soils as part of its annual greenhouse gas inventory to the UNFCCC. Nitrous oxide emissions are influenced by land use as well as a number of other factors.

Irrigation

Areas irrigated during the year.

5. Climate change issues

Shortly, New Zealand will pass the Climate Change Response 2002 Bill, the purpose of which is to give effect to New Zealand's international obligations under the UNFCCC and the Kyoto Protocol. Signatories to the Kyoto Protocol must make available for scrutiny their national inventories of anthropogenic greenhouse gas emissions by sources and removals by sinks. These inventories, and the mathematical models that support them, will eventually be audited by expert panels

nominated by the UNFCCC Secretariat. New Zealand must be able to defend, not only its inventories, but also the principles underlying the models, and all baseline data used within them.

Information from the agricultural census will underpin the calculation of methane and other greenhouse gas emissions from the agriculture sector, including nitrous oxide emissions from soils. Key input here may include livestock numbers for methane emission calculations; total production of nitrogen-fixing crops; and fertiliser application rates for calculation of nitrogen release.

6. Incorporating a geospatial layer

A key medium-term objective of the agricultural statistics programme is to incorporate geospatial information, using a geographic information system (GIS) layer, so that farms and forests can be mapped, and analysis of key census variables can be conducted for specific localities. Spatial analysis will be especially useful for pest and disease management. For example, if foot and mouth disease broke out in New Zealand, a management plan could be developed if all farms were mapped (ie had a geospatial reference). It would then be possible to determine which farms were likely to be at risk and act accordingly. As another example, if toxic effluent were accidentally released into a waterway, we could immediately identify which farms hold livestock likely to be exposed to contaminated water. In fact, New Zealand already has an excellent database of this type, known as AgriBase, which is owned and managed by AgriQuality New Zealand. Subject to the consent of the farmers or growers, the census frame will be harmonised with the AgriBase frame. Should this occur, it would result in the development of a very powerful integrated system that supports both the preparation of high quality agricultural and forestry statistics, and the enabling of the best practice management of disease and pest incursion.