



# New Zealand Agricultural and Resource Economics Society (Inc.)

## **The Agricultural Production Survey: The purpose and operation**

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# **The Agricultural Production Survey: The purpose and operation**

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The Agricultural Production Survey (APS) is Statistics New Zealand's vehicle for collecting important information about New Zealand's primary production. It is an annual postal survey and covers land use, livestock and arable farming, horticultural and forestry production, and selected farm practices.

| The APS programme started with a census in 2002, and continues a history of official statistics that covers agriculture over the past 150 years. The programme has been designed to provide a relevant and stable time series of data, which this paper will demonstrate by describing the programme's methodology and operation.

Key words:

agriculture, survey, methodology, statistics

## **Background and Focus**

The Agricultural Production Survey (APS) programme is conducted in partnership with the Ministry of Agriculture and Forestry (MAF). It is an annual postal survey which currently covers land use, livestock and arable farming, horticultural and forestry production, and selected farm practices. MAF is a key stakeholder and the resulting statistics are a core part of MAF's monitoring, policy development, and forecasting activities. The statistics are also used for:

- calculating agricultural production and productive capacity
- monitoring, research, and decision making by agricultural sector organisations and businesses by providing context to their data collections and analysis
- producing volume measures for use as a component of Statistics New Zealand's gross domestic product (GDP)
- New Zealand's climate change reporting requirements
- international reporting requirements for organisation such as the OECD and the Food and Agriculture Organisation (FAO)
- trade negotiations
- research by organisations, including local government, into land-use changes and farming practices
- updating the frame of eligible farms and forestry units used for selection in, and design of, the ongoing sample surveys of agricultural production.

## **Steps in conducting the Agricultural Production Survey**

### **The Questionnaire**

#### **Content Consultation**

A couple of months after the questionnaires are posted in July, submissions are asked for for any additions or changes to the questionnaire in the following year. Relevant government departments, research institutes, and industry organisations are asked for submissions.

The APS is a powerful tool for garnering agricultural information because it has wider coverage than other agriculture surveys and is collected under the provisions of the Statistics Act 1975. For these reasons submissions are collated and carefully assessed for their suitability in the survey and the value to be gained by their inclusion.

The suitability is assessed on the basis that the APS is:

- a production survey
- run annually, with samples and census years

- not the only source of agricultural data.

Some questions are not suited to obtaining robust data in certain sample years. For example, during a horticulture-focused sample year, the number of non-horticulture farms in the sample is reduced. This means that a question on farm practices that applies primarily to dairy farms may not be well covered by the sample.

A key element in designing surveys at Statistics NZ is to minimise respondent burden. This simply means questions are only included if they need to be and they are to be as easy as possible to answer. There are many other surveys and sources of information that either directly or indirectly cover aspects of the agriculture industry. If there is another source that can be used or altered to provide the level of information required, then Statistics NZ would not consider the question for inclusion in the APS.

### **Questionnaire Development**

Once changes have been decided upon by content consultation, they are made in a draft of the questionnaire. The first challenge is to identify exactly what data is wanted from a particular question, as a subtle wording change can elicit quite different responses. For example, a question related to the area of land cultivated can get different responses because the same area of land can be cultivated many times in one year. The question would be tailored for the required response – whether the amount of cultivation or just the total land area cultivated is wanted. A second challenge in designing the agriculture questionnaire is that the respondents are in a wide variety of agriculture-related activities and practices vary from region to region.

If content changes are significant, the changed questions are put through a cognitive testing process. This involves visiting a number of respondents to observe them as they complete the new content. The respondents can ask questions or point out issues as they fill in the questionnaire, and the tester can ask pertinent questions where they observe the respondent is having difficulty. This is potentially the greatest tool in structuring the question and in highlighting where guide notes should be added to help the farmer respond correctly and quickly.

Another testing option is postal testing – a number of respondents are sent the questionnaire and their responses checked for accuracy in the questions being tested. The advantage of postal testing is that it can efficiently cover many respondents and is close to the actual delivery practice of the survey.

## **Survey Methodology**

### **Population**

The APS currently covers a population of about 65,000 businesses engaged in agricultural production activity that own land intended for agricultural activity. This includes all units identified on Statistics NZ's Business Frame as having agricultural activity. The Business Frame is a list of businesses in New Zealand, which is based on their registration for goods and services tax (GST) with Inland Revenue.

GST data is used mainly to identify new businesses or detect when businesses have

ceased operation. As the compulsory registration level for GST is \$60,000, there is a partial, and unquantifiable, coverage of units below this level. Examples are lifestyle blocks and hobby farms.

The agriculture components of the Business Frame are continuously updated by using administrative data, census and survey feedback, and other information sources.

Agricultural units are identified on the Business Frame through their industry classification – the Australian and New Zealand Standard Industrial Classification (ANZSIC). The population includes units classified as agriculture, forestry, or parts of agriculture-related industries such as ‘horse and dog racing administration and track operation’. The ANZSIC classification can be the business’s primary or secondary activity as the APS aims to cover all agricultural activity.

### **Sample Design**

The sample’s composition, based on these ANZSIC categories, differs year by year. Every five years there is a census, which includes all units identified in the relevant ANZSIC categories. The first census was in 2002, another was in 2007, and the next will be in 2012. In the years between there are stratified random samples, which alternate between a livestock, arable, and forestry sample and a horticulture-focused sample.

In 2005 and 2009 horticulture-focused sample surveys were held. All farms identified with a horticulture ANZSIC classification were included in the postal samples. In these years livestock and arable farming and forestry are still included. However, as the total sample size is consistent in sample years the number of non-horticultural units is reduced to accommodate the horticulture units. In 2004, 2006, and 2008 the surveys collected information on livestock, arable farming, and forestry (horticulture production information was not collected). In 2003 a full sample including horticulture was held.

The samples are stratified by a combination of region, ANZSIC classification, size measure, and land area. Smaller farms are weighted to represent farms in the same stratification but not covered by the postal sample. Larger farms are classed as ‘full coverage’ and forced into the sample – without their data the survey would be lacking vital production data.

The survey’s design targets national sample errors of 3–4 percent for the major design variables of total sheep, dairy cattle, beef cattle, deer, lambs, pigs, eggs, plantation forestry area, and wheat/barley/maize area. Regional targets of 8–10 percent are applied where a particular activity is significant in those regions.

### **Imputation**

Record non-response is dealt with by using a method called ‘hot deck imputation’. All farms in the survey are grouped into imputation cells, based on their industry, region, land area, and size. A non-respondent is attributed data from a responding farm in the same imputation cell as they have similar activity.

‘Single item imputation’ is automated for several variables where the respondent has not filled in all the logical categories. These categories include missing offspring,

total livestock where the age/sex breakdowns have been supplied, and arable tonnage where the area harvested has been given.

## **Post out and collection**

Questionnaires are posted in early July or as close as possible to the survey end period of 30 June.

To help respondents fill in their return, the Statistics NZ survey help desk and a webpage with further instructions are available to respondents. To achieve response rates, reminder letters are sent, and phone calls made. These calls are targeted at farms in industries and regions with a low response at that point in time. Key respondents are handled outside the standard postal system as their complex structures are difficult to capture on questionnaires and their responses are vital to producing good results.

The survey aims to get a response rate of 80 percent by head count and 85 percent by 'estimated value of agricultural operations' (EVAO). EVAO is derived by multiplying the commodities data returned by predetermined values for each commodity and summing to a value. Under this calculation, a large farm would produce more and therefore be more valuable to the survey's response calculation. The head count response means the survey still requires at least 80 percent of the posted questionnaires to be returned. Cooperation from respondents has been good, with these target response rates being exceeded every year.

The questionnaires are collected and scanned by Statistics NZ. The imaged data is processed and cleaned to ensure the respondent's intended responses are captured; that is, where the handwriting is ambiguous to the imaging system. This data is forwarded into the system for the analytical team to validate.

## **Analysis**

A large proportion of the APS work is in analysis and data cleaning. There are several steps to this work, which include:

- expectation reports and analysis plans
- quality checks and data cleaning
- final analysis reports.

Both the expectation reports and final analysis reports require Statistics NZ and other sources of data and information to be collated, to produce a cohesive message about factors affecting the industry. Other sources can include prices, exports and imports, weather patterns, stock flows.

Any combination of these factors can be used to estimate an industry's health in the survey year. When combined, these factors can be used to model the data being captured, and where that data differs, more time can be spent in data checking. Analysis plans are used to set out and record the specific checks required for each variable and each agricultural sector.

Expectation reports are written for each industry before the responses arrive to be scanned into the database. This report summarises the real world trends that may be seen in the resulting statistics. Expectation reports aim to highlight where there may have been problems in the collection, if the received data does not match expectations.

Quality checks and data cleaning are a mix of manual and automatic work. The editing processing system highlights inconsistencies and any missing 'required data' fields that need some form of action.

Missing data fields are largely dealt with automatically through the 'single item imputation' mentioned earlier, but many instances require manual intervention. A returned questionnaire without data often indicates a business has ceased or left the agriculture industry.

Returned data is checked using programmed outlier reports, which highlight units that have had the greatest change in data from one year to the next. Many of these changes are valid but others may indicate a greater business change or respondent error which can be corrected manually.

After most checks and cleaning are done, the results are compared against figures in the expectation reports. The analyst will focus attention where they differ significantly, double checking the outlier reports, and trying other checks as suits the industry. Checking may also highlight the need to look at other analysts' work to see if there is an issue affecting several industries. Often one industry is suffering at the expense of another, or there could have been a regional problem depressing all industries.

The final analysis report is written once the analyst has made all the necessary data checks. The final report summarises the movement in the industry and shows how this has been validated. Final reports are peer reviewed internally and sometimes extra checks can be carried out. The reasoning used in these reports to explain the changes in the industry data provide the stories to be used in dissemination.

## **Dissemination**

The APS has two releases. A provisional release is made six to eight months after the questionnaire is posted out. The provisional results cover the key items at a national level.

The final release comes out in May of the year following the survey. The data released covers all variables, and at regional levels.

The main vehicle for the releases is the Statistics NZ website. Tables of the most frequently used data are available, and through the online tools Infoshare and TableBuilder users can generate their own tables.

Further information about the survey is available on the website, which may be of interest to different users. Information to help users interpret the data is useful when looking at the data for the first time. Technical notes that accompany each release cover sample and population information, sample error, and imputation levels.

Customised data requests can be made through Statistics NZ's Information centre. This data is subject to confidentiality and is priced on a case-by-case basis.

## **Reference**

[www.stats.govt.nz/methods\\_and\\_services/information-releases/agricultural-production.aspx](http://www.stats.govt.nz/methods_and_services/information-releases/agricultural-production.aspx)