



Australian Government
**Australian Bureau of Agricultural and
Resource Economics and Sciences**



Survey methods and definitions

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ABARES has conducted surveys of selected Australian agricultural industries since the 1940s. These surveys provide a broad range of information on the economic performance of farm business units in the rural sector. This comprehensive set of information is widely used for research and analysis which forms the basis of many publications, briefing material and industry reports.

The annual agricultural surveys currently undertaken are:

- Australian Agricultural and Grazing Industries Survey (AAGIS)
- Australian Dairy Industry Survey (ADIS).

Definitions of industries

Industry definitions are based on the 2006 Australian and New Zealand Standard Industrial Classification (ANZSIC06). This classification is in line with an international standard applied comprehensively across Australian industry, permitting comparisons between industries, both within Australia and internationally. Farms assigned to a particular ANZSIC have a high proportion of their total output characterised by that class. Further information on ANZSIC and on the farming activities included in each of these industries is provided in Australian and New Zealand Standard Industrial Classification (ABS 2006, cat. no. 1292.0).

The five broadacre industries covered by AAGIS are:

- Wheat and other crops industry (ANZSIC06 Class 0146 and 0149)
 - farms engaged mainly in growing rice, other cereal grains, coarse grains, oilseeds and/or pulses
- Mixed livestock-crops industry (ANZSIC06 Class 0145)
 - farms engaged mainly in running sheep or beef cattle, or both, and growing cereal grains, coarse grains, oilseeds and/or pulses
- Sheep industry (ANZSIC06 Class 0141)
 - farms engaged mainly in running sheep
- Beef industry (ANZSIC06 Class 0142)
 - farms engaged mainly in running beef cattle
- Sheep-beef industry (ANZSIC06 Class 0144)
 - farms engaged mainly in running both sheep and beef cattle.

The Australian Dairy Industry Survey (ADIS) covers farms that are engaged in dairying.

Target populations

The AAGIS is designed from a population list drawn from the Australian Business Register (ABR) and maintained by the Australian Bureau of Statistics (ABS). The ABR comprises businesses registered with the Australian Taxation Office (ATO). The ABR-based population list provided to ABARES consists of agricultural establishments with their corresponding statistical local area, ANZSIC, and a size of operation variable.

The population list for the ADIS is a list of dairy farms that have paid levies based on their milk deliveries, sourced from the Levies Revenue Service. This list is provided by Dairy Australia and consists of dairy businesses with their corresponding region and total milk production. The design measure for ADIS is total milk production for each dairy business on the frame.

ABARES surveys target farming establishments that make a significant contribution to the total value of agricultural output (i.e. commercial farms). Farms excluded from ABARE surveys will be the smallest units, and in aggregate will contribute less than 2 per cent to the total value of agricultural production for the industries covered by the surveys.

The size of operation variable used in ABARES survey designs is usually 'estimated value of agricultural operations' (EVAO). However, in some surveys in recent years other measures of agricultural production have also been used. EVAO is a standardised dollar measure of the level of agricultural output. A definition of EVAO is given in *Agricultural Industries: Financial Statistics* (ABS 2001, cat. no. 7506.0). Prior to 1986–87 the survey included establishments with an EVAO of \$10 000 or more. Between 1987–88 and 1991–92 the survey included establishments with an EVAO of \$20 000 or more. Between 1991–92 and 2003–04 the survey included establishments with an EVAO of \$22 500 or more. Since 2004–05 ABARES farm surveys included establishments classified as having an EVAO of \$40 000 or more.

Survey design

The target population is grouped into strata defined by ABARES region, ANZSIC and size of operation. The sample allocation is a compromise between allocating a higher proportion of the sample to strata with high variability in the size variable, and an allocation proportional to the population of the stratum.

A large proportion of sample farms is retained from the previous year's survey. The sample chosen each year maintains a high proportion of the sample between years to accurately measure change while meeting the requirement to introduce new sample farms to account for changes in the target population, as well as to reduce the burden on survey respondents.

The sample size for AAGIS is usually around 1600 and for ADIS around 300.

The main method of collection for both surveys is face to face interviews with the owner manager of the farm. Detailed physical and financial information is collected on the operations of the farm business during the preceding financial year. Respondents to the AAGIS and ADIS are also contacted by telephone in October each year to obtain estimates of projected production and expected receipts and costs for the current financial year. ABARES surveys also allow supplementary questionnaires to be attached to the main or to the telephone surveys. These additional questions help to address specific current issues.

Sample weighting

ABARES survey estimates are calculated by appropriately weighting the data collected from each sample farm and then using the weighted data to calculate population estimates. Sample weights are calculated so that population estimates from the sample for numbers of farms, areas of crops and numbers of livestock correspond as closely as possible to the most recently available ABS estimates from data collected from Agricultural Census and Surveys. The weighting methodology for AAGIS and ADIS uses a model-based approach, with a linear regression model linking the survey variables and the estimation benchmark variables. The details of this method are described in Bardsley and Chambers (1984)¹.

For AAGIS, the benchmark variables provided by the ABS include:

- total number of farms in scope
- area planted to wheat, rice, other cereals, grain legumes (pulses) and oilseeds
- closing numbers of beef and sheep.

For ADIS, the benchmark variables provided by Dairy Australia are:

- total number of in-scope dairy farms
- total milk production.

Generally, larger farms have smaller weights and smaller farms have larger weights, reflecting both the strategy of sampling a higher fraction of the large farms than small farms (the former

¹ Bardsley, P. and Chambers, R.L. 1984, *Multipurpose estimation from unbalanced samples*, Journal of Royal Statistical Society, Series C (Applied Statistics), vol. 33, pp. 290–9.

having a wider range of variability of key characteristics and accounting for a much larger proportion of total output) and the relatively lower numbers of large farms.

Reliability of estimates

The reliability of the estimates of population characteristics published by ABARES depends on the design of the sample and the accuracy of the measurement of characteristics for the individual sample farms.

Sampling errors

Only a subset of farms out of the total number of farms in a particular industry is surveyed. The data collected from each sample farm are weighted to calculate population estimates. Estimates derived from these farms are likely to be different from those which would have been obtained if information had been collected from a census of all farms. Any such differences are called 'sampling errors'.

The size of the sampling error is most influenced by the survey design and the estimation procedures, as well as the sample size and the variability of farms in the population. The larger the sample size, the lower the sampling error is likely to be. Hence, national estimates are likely to have lower sampling errors than industry and state estimates.

To give a guide to the reliability of the survey estimates, standard errors are calculated for all estimates published by ABARES. These estimated errors are expressed as percentages of the survey estimates and termed 'relative standard errors'.

Calculating confidence intervals using relative standard errors

Relative standard errors (RSEs) can be used to calculate 'confidence intervals' that give an indication of how close the actual population value is likely to be to the survey estimate.

To obtain the standard error, multiply the relative standard error by the survey estimate and divide by 100. For example, if average total cash receipts are estimated to be \$100 000 with a relative standard error of 6 per cent, the standard error for this estimate is \$6000. This is one standard error. Two standard errors equal \$12 000.

There is roughly a two in three chance that the 'census value' (the value that would have been obtained if all farms in the target population had been surveyed) is within one standard error of the survey estimate. This range of one standard error is described as the 66 per cent confidence interval. In this example, there is an approximately two in three chance that the census value is between \$94 000 and \$106 000 (\$100 000 plus or minus \$6000).

There is roughly a 19 in 20 chance that the census value is within two standard errors of the survey estimate (the 95 per cent confidence interval). In this example, there is an approximately

19 in 20 chance that the census value lies between \$88 000 and \$112 000 (\$100 000 plus or minus \$12 000).

Comparing estimates

When comparing estimates between two groups, it is important to recognise that the differences are also subject to sampling error. As a rule of thumb, a conservative estimate of the standard error of the difference can be constructed by adding the squares of the estimated standard errors of the component estimates and taking the square root of the result.

For example, suppose the estimates of total cash receipts were \$100 000 in the beef industry and \$125 000 in the sheep industry – a difference of \$25 000 – and the relative standard error is given as 6 per cent for each estimate. The standard error of the difference can be estimated as:

$$\sqrt{((6 \times \$100\,000 / 100)^2 + (6 \times \$125\,000 / 100)^2)} = \$9605$$

A 95 per cent confidence interval for the difference is:

$$\$25\,000 \pm 1.96 * \$9605 = (\$6174, \$43\,826)$$

Hence, if a large number (towards infinity) of different samples are taken, in approximately 95 per cent of them, the difference between these two estimates will lie between \$6174 and \$43 826. Also, since zero is not in this confidence interval, it is possible to say that the difference between the estimates is statistically significantly different from zero at the 95 per cent confidence level.

Regions

Broadacre and dairy statistics are also available by region. These regions, shown in maps 2 and 3, represent the finest level of geographical aggregation for which the survey is designed to produce reliable estimates.

map 2 Australian broadacre zones and regions

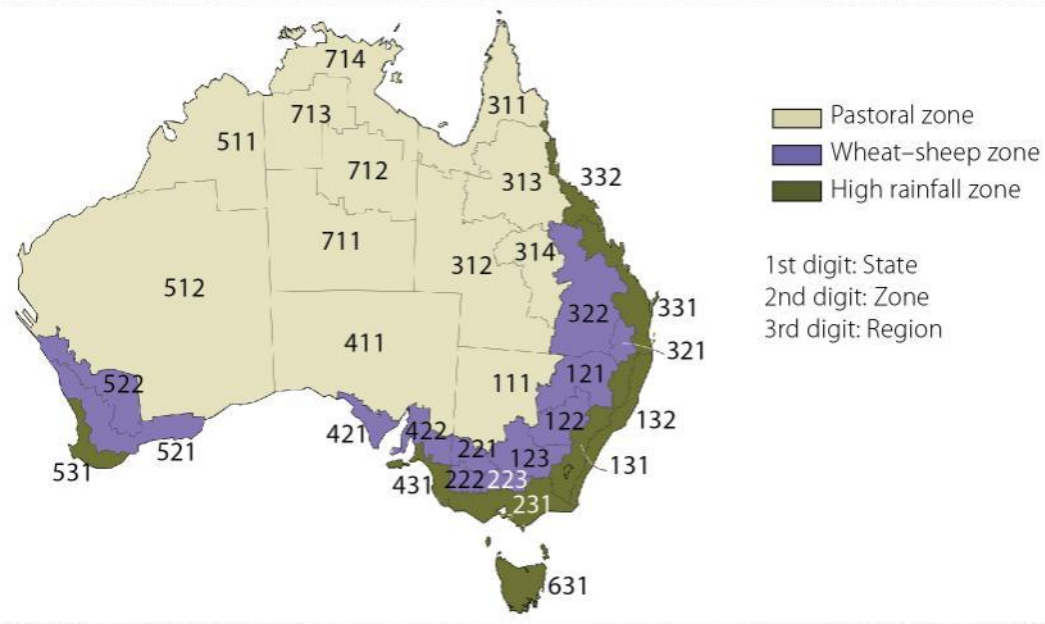


Figure 1 Map of Australia showing Australian broadacre zones and regions

For states other than New South Wales and Victoria, the Australian Dairy Industry Survey regions comprise the entire state.

map 2 Australian dairy industry survey regions of New South Wales and Victoria

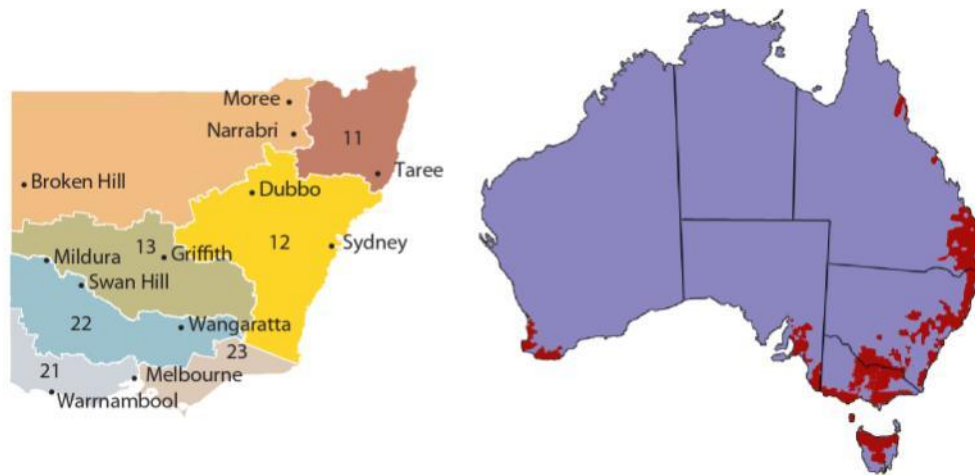


Figure 2 map of NSW and Victoria showing Australian Dairy industry survey regions

Definitions of items

Owner manager The primary decision-maker for the farm business. This person is usually responsible for the day-to-day operation of the farm and may own or have a share in the farm business.

Physical items

Total area operated Includes all land operated by the farm business, whether owned or rented by the business, but excludes land share farmed on another farm.

Labour Measured in work-weeks, as estimated by the owner manager or manager. It includes all work on the farm by the owner manager, partners, family, hired permanent and casual workers and sharefarmers but excludes work by contractors.

Hired labour Excludes the farm business manager, partners and family labour, and work by contractors. Expenditure on contract services appears as a cash cost.

Beef cattle Cattle kept primarily for the production of meat, irrespective of breed.

Dairy cattle Cattle kept or intended mainly for the production of milk or cream.

Financial items

Capital The value of farm capital is the value of all the assets used on a farm, including the value of leased items but excluding machinery and equipment either hired or used by contractors. The value of 'owned' capital is the value of farm capital excluding the value of leased machinery and equipment.

ABARES uses the owner manager's valuation of the farm property. The valuation includes the value of land and fixed improvements used by each farm business in the survey, excluding land sharefarmed off the sample farm. Residences on the farm are included in the valuations.

Livestock are valued at estimated market prices for the land use zones within each state. These values are based on recorded sales and purchases by sample farms.

Prior to 2001-02, ABARES maintained an inventory of plant and machinery for each sample farm. Individual items were valued at replacement cost, depreciated for age. Each year, the replacement cost was indexed to allow for changes in that cost.

Since 2001-02, total value of plant and machinery has been based on market valuations provided by the owner manager for broad categories of capital such as tractors, vehicles, irrigation plant, etc.

The total value of items purchased or sold during the survey year was added to or subtracted from farm capital at 31 December of the relevant financial year, irrespective of the actual date of purchase or sale.

Farm business debt Estimated as all debts attributable to the farm business, but excluding personal debt, lease financed debt and underwritten loans including harvest loans. Information is collected at the interview, supplemented by information contained in the farm accounts.

Change in debt Estimated as the difference between debt at 1 July and the following 30 June within the survey year, rather than between debt at 30 June in consecutive years. It is an estimate of the change in indebtedness of a given population of farms during the financial year and is thus unaffected by changes in sample or population between years.

Farm liquid assets Assets owned by the farm business which can be readily converted to cash. They include savings bank deposits, interest bearing deposits, debentures and shares. Excluded are items such as real estate, life assurance policies and other farms or businesses.

Receipts and costs Receipts for livestock and livestock products sold are determined at the point of sale. Selling charges and charges for transport to the point of sale are included in the costs of sample farms.

Receipts for crops sold during the survey year are gross of deductions made by marketing authorities for freight and selling charges. These deductions are included in farm costs. Receipts for other farm products are determined on a 'farm-gate' basis. All cash receipt items are the revenue received in the financial year.

Farm receipts and costs relate to the whole area operated, including areas operated by on-farm sharefarmers. Thus, cash receipts include receipts from the sale of products produced by sharefarmers. If possible, on-farm sharefarmers' costs are amalgamated with those of the sample farm. Otherwise, the total sum paid to sharefarmers is treated as a cash cost.

Some sample farm businesses engage in off-farm contracting or sharefarming, employing labour and capital equipment also used in normal on-farm activities. Since it is not possible to accurately allocate costs between off-farm and on-farm operations, the income and expenditure attributable to such off-farm operations are included in the receipts and costs of the sample farm business.

Total cash receipts Total of revenues received by the farm business during the financial year, including revenues from the sale of livestock, livestock products and crops, plus the value of livestock transfers off a property. It includes revenue received from agistment, royalties, rebates, refunds, plant hire, contracts, sharefarming, insurance claims and compensation, and government assistance payments to the farm business.

Total cash costs Payments made by the farm business for materials and services and for permanent and casual hired labour (excluding owner manager, partner and other family labour). It includes the value of livestock transfers onto the property as well as any lease payments on capital, produce purchased for resale, rent, interest, livestock purchases and payments to sharefarmers. Capital and household expenditures are excluded from total cash costs.

- Handling and marketing expenses include commission, yard dues, levies etc. for farm produce sold.
- Administration costs include accountancy fees, banking and legal expenses, postage, stationery, subscriptions and telephone.
- Contracts paid refers to expenditure on contracts such as harvesting. Capital and land development contracts are not included.
- Other cash costs include stores and rations, seed purchased, electricity, artificial insemination and herd testing fees, advisory services, motor vehicle expenses, travelling expenses and insurance. While 'other cash costs' may comprise a relatively large proportion of total cash costs, individually the components are relatively small overall, and as such, have not been listed.

Financial performance measures

Farm cash income The difference between total cash receipts and total cash costs.

Buildup in trading stocks The closing value of all changes in the inventories of trading stocks during the financial year. It includes the value of any change in herd or flock size or in stocks of wool, fruit and grains held on the farm. It is negative if inventories are run down.

Depreciation of farm improvements plant and equipment Estimated by the diminishing value method, based on the replacement cost and age of each item. The rates applied are the standard rates allowed by the Commissioner of Taxation. For items, purchased or sold during the financial year, depreciation is assessed as if the transaction had taken place at the midpoint of the year. Calculation of farm business profit does not account for depreciation on items subject to a finance lease because cash costs already include finance lease payments.

Imputed labour cost Payments for owner manager and family labour may bear little relationship to the actual work input. An estimate of the labour input of the owner manager, partners and their families is calculated in work-weeks and a value is imputed at the relevant Federal Pastoral Industry Award rates.

Farm business profit Farm cash income plus buildup in trading stocks, less depreciation and the imputed value of the owner manager, partner(s) and family labour.

Profit at full equity Farm business profit, plus rent, interest and finance lease payments, less depreciation on leased items. It is the return produced by all the resources used in the farm business.

Rates of return Calculated by expressing profit at full equity as a percentage of total opening capital. Rate of return represents the ability of the business to generate a return to all capital used by the business, including that which is borrowed or leased. The following rates of return are estimated:

- rate of return excluding capital appreciation
- rate of return including capital appreciation.

Farm business equity The value of owned capital, less farm business debt at 30 June. The estimate is based on those sample farms for which complete data on farm debt are available.

Farm equity ratio Calculated as farm business equity as a percentage of owned capital at 30 June.

Off-farm income Collected for the owner manager and spouse only, including income from wages, other businesses, investment, government assistance to the farm household and social welfare payments.