australian dairy industry

technology and farm management practices 2004-05

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foreword

Increasing farm productivity is vital to the viability of the Australian dairy industry. This can be achieved mainly through adoption of better farm and natural resource management practices and uptake of new technologies. Over the years, Dairy Australia has put in place programs to assist farmers to make improvements. Since 1991-92, Dairy Australia has funded ABARE to conduct dairy technology surveys to develop a database that can be used to monitor farm management practices and the adoption of technologies in the dairy industry.

The database on the use of technology and farm management practices provides the Australian dairy industry with the opportunity to identify the characteristics of farms that adopt various technologies.

This report presents findings of the 2004-05 survey as well as trends based on previous dairy technology surveys. The insights gained from this research can be used in the development of effective strategies for managing the adoption of new technologies and better farm management practices so that the industry is able to capture the benefits that these technologies and practices offer.

Phillip Glyde
Executive Director
April 2007

acknowledgments

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Detailed national, state and regional survey results are available on ABARE's website, ***abare****conomics.com*

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summary

» This report presents results from the dairy technology survey conducted by ABARE in 2004-05 and funded by Dairy Australia. The previous technology surveys (six in all) were conducted biannually between 1991-92 and 2001-02. These surveys are conducted as supplementary surveys to ABARE's annual Australian dairy industry survey.

» The dairy technology survey obtains information from dairy farmers on milking shed setup and management, feeding regimes, fodder conservation, soil testing, herd and farm management, participation in training courses, workshops and extension projects and intended changes in farm management.

» Australian dairy farmers have continued to change their management practices and have adopted various technologies to improve performance and productivity. Improvements are mainly in the areas of dairy cattle genetics, herd health, shed management, supplementary feeding and pasture management.

» The trends evident in adoption of different technology and management practices over the survey period have coincided with gains in milk production per cow, increased labour productivity and farm size.

milking shed

» Labour productivity – measured in cows per operator and cows per milking hour – has increased. The average number of cows milked per operator at peak periods increased by 66 per cent between 1991-92 and 2004-05. At the peak period, the average number of cows milked per dairy farm increased from 115 in 1991-92 to 191 in 2004-05. This increase was achieved with the same number of milking hours and operators as in 1991-92. This performance is a reflection of changes to milking sheds, including the increased use of automatic cup removers, and an increase in milking shed bails.

» In 2004-05, 86 per cent of dairies were herringbone milking sheds. To improve labour productivity, the number of herringbone milking sheds has increased significantly since 1991-92. Farms with rotary milking sheds also increased – from around 4 per cent in 1991-92 to 11 per cent in 2004-05.

Very few farms had a walkthrough milking shed. Dairy farmers have also increased the use of large bulk vats, with a capacity of 4500 litres or more.

» **Effluent disposal has improved significantly**. In 2004-05 the most prevalent effluent disposal system was the ponding system, used by 65 per cent of farms. Only 10 per cent of dairy farms in 2004-05 drained effluent directly into paddocks, compared with 52 per cent in 1991-92.

feeding regimes and fodder conservation

» **Supplementary feeding of cows on concentrates and grains has increased since 1991-92**. An estimated 93 per cent of dairy farms used concentrates or grains as supplementary feed for their cows in 2004-05, an increase of 13 percentage points from 1991-92. The quantity of concentrates, grains and byproducts used per dairy herd increased by more than 50 per cent over this period, to 0.9 tonnes per dairy cow in 2004-05.

» **On-farm silage production more than doubled between 1991-92 and 2004-05**. In addition to the more widespread use of purchased feed, there has also been a trend toward more on-farm production of hay and silage. Silage production increased from an average of 64 tonnes per dairy farm in 1991-92 to 170 tonnes in 2004-05.

» **The number of farms cutting and storing hay or silage on farm increased**. In 2004-05, over half of the surveyed dairy farms purchased hay or silage and the main reasons for cutting or purchasing hay or silage were: to continue normal feeding practices; to boost offseason production; to have a reserve in case of a drought; reduce dependence on purchased feed or irrigation, and as a pasture management measure.

» Since the beginning of the 1990s, dairy farmers have used a number of techniques to improve the quality, production and storage methods of silage. On average, around 40 per cent of the total silage was wilted and wrapped.

soil testing, fertliser use and advice

» **A high percentage of dairy farmers analyse and test the condition of the soil and apply fertilisers accordingly**. Over 60 per cent of Australian dairy farms tested or analysed soil in 2004-05. Of the dairy farmers who tested their soil,

83 per cent changed their fertiliser management following the soil tests. Over half of these farmers indicated that they developed a fertiliser application plan.

» Company representatives have become important providers of advice to dairy farmers on use of fertilisers.

herd breeding and health

» **Use of artificial insemination (AI) for herd breeding remained static**. On average around half of the cows on survey farms were calved using AI in 2004-05 and in 1991-92. Of the dairy farms that used AI in 2004-05, 38 per cent had the AI carried out by the farmer and 29 per cent of dairy farms used a professional AI technician.

» **Mastitis and milk fever are the two prominent animal health issues in the Australian dairy herd**. On average, dairy farms had eighteen cases of mastitis (6 per cent of the dairy herd) and thirteen cases of milk fever (4 per cent of the dairy herd) in 2004-05. Dairy farmers are taking measures to prevent, monitor and control mastitis in their dairy herds. Around 62 per cent of dairy farms used a published mastitis control program in 2004-05.

changes in management practices

» **The majority of dairy farmers intended to increase fertiliser use and planning, improve grazing and pasture management, and change irrigation plant and layout in the twelve months following the survey**. Close to 20 per cent of farmers indicated that they needed assistance to make further improvements in supplementary feeding and herd nutrition, and assistance to improve fertiliser usage and planning also ranked highly.

» **About 40 per cent of dairy farmers had no intention of making changes to management practices in the next twelve months**. On average, these farmers operated smaller dairy farms and had a smaller dairy herd than those who intended to make changes. Farmers who intended not to make significant changes used less purchased feed and consequently their feed costs per cow were lower than that for farmers who intended to make significant changes.

» Farmers who intended to make significant changes in the next twelve months had operations that performed better in terms of milk production and milk yield per cow.

1

introduction

ABARE's dairy technology survey contributes to Dairy Australia's first business objective of increasing farm productivity. The survey provides a way of monitoring and assessing Dairy Australia's focus areas, including farm business management, feed base development, natural resource management and vocational education and training (Dairy Australia 2007). To help in the monitoring process and to provide feedback to the industry and dairy farmers, Dairy Australia funded ABARE to develop a database that can be used to analyse farm management practices and use of technology in the Australian dairy industry.

The dairy technology survey was first developed for 1991-92 as a supplement to the annual Australian dairy industry survey (ADIS) conducted by ABARE. From 1991-92 to 2001-02 the supplementary survey was conducted biannually. The most recent survey was conducted for 2004-05. Results from previous surveys are reported in Boero Rodriguez (2003).

The collection of data on the use of technology and farm management practices provides the Australian dairy industry with the opportunity to identify the characteristics of farms that adopt various technologies and to analyse the potential for further adoption of particular technologies. The collected data can also be used to assess technology practices on dairy farms in different regions and how they have changed over time. Profiles of farms using similar technologies and management practices can be formed by linking supplementary survey results to the ADIS collection of physical and financial farm data. The insights gained from this research are likely to facilitate the development of effective strategies for managing the adoption of new technologies, thereby ensuring that the industry is able to capture more of the benefits that these technologies can provide.

For future dairy industry technology surveys, the questions need to be modified to collect information on the effectiveness of particular research and development projects developed in recent years.

The survey results for 2004-05 are reported in the tables at the end of this report, along with the 1991-92, 1993-94, 1995-96, 1997-98, 1999-2000 and 2001-02 survey results for reference and comparison where possible. The tables include national, state data (tables 1–9) and regional data for New South Wales

and Victoria (tables 11–19). Selected performance variables are presented at national and state level in table 10. For the 2004-05 survey, some questions were changed to enable monitoring of the responses to some major Dairy Australia extension programs. As a result, time series data for these questions are not available. Outlined in chapter 2 are highlights of the survey results at the national level.

2

results of the survey

Between 1991-92 and 2004-05 the number of dairy farms in Australia declined from 13 600 to 10 100 farms (figure A, table 1). Over this period, milk production doubled to 975 000 litres a farm in 2004-05. The average number of cows milked (for over three months) on each farm increased by 62 per cent between 1991-92 and 2004-05 to 189 cows. Milk yield per cow also increased from around 4050 litres in 1991-92 to 5160 litres in 2004-05.

fig A **Australian dairy farm numbers and total milk production**

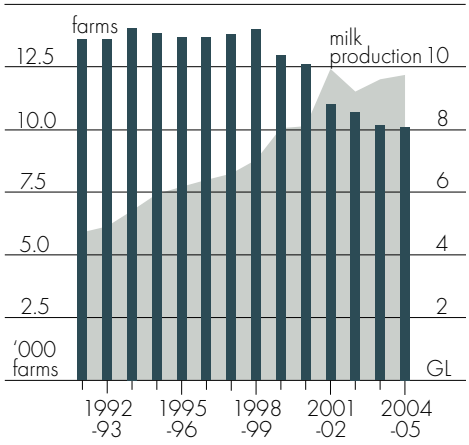


table 1 **key variables for Australian dairy farms**
Australian dairy industry survey average per farm

		1991-92	1993-94	1995-96	1997-98	1999-2000	2001-02	2004-05
estimated number of farms		13 592	14 059	13 674	13 815	12 960	10 995	10 112
area of land operated 30 June	ha	178 (4)	189 (4)	214 (5)	214 (4)	217 (4)	257 (5)	225 (5)
area utilised by milking cows	ha	95 (3)	95 (4)	102 (4)	100 (4)	111 (5)	112 (4)	112 (3)
dairy herd at 30 June	no.	182 (3)	195 (2)	227 (3)	243 (2)	256 (3)	310 (3)	293 (3)
dairy cows at 30 June	no.	121 (3)	126 (2)	148 (3)	157 (3)	165 (3)	197 (3)	193 (4)
cows milked for more than 3 months	no.	117 (3)	120 (2)	135 (3)	151 (2)	158 (3)	192 (3)	189 (3)
milk production	L	472 254 (4)	541 258 (2)	617 813 (4)	659 792 (3)	805 177 (4)	994 404 (4)	975 079 (4)
milk yield per cow	L	4 054 (2)	4 526 (2)	4 584 (2)	4 377 (2)	5 111 (2)	5 193 (3)	5 163 (2)
stocking rate	cows/ha	1 (3)	1 (3)	1 (4)	2 (4)	2 (5)	2 (4)	2 (3)
milk production per effective ha	L	4 995 (4)	5 728 (4)	6 043 (4)	6 627 (5)	7 287 (5)	8 859 (5)	8 701 (4)

Note: Figures in parentheses are standard errors expressed as percentages of the estimates provided. A guide to interpreting these is included in the survey methods section.

These increases mainly reflect the increased adoption of technologies and farm management practices, such as improved dairy cattle genetics, shed management, supplementary feeding, and more intensive pasture management.

milking shed and equipment

Between 1991-92 and 2004-05 there has been a general trend toward installing or improving milking sheds and equipment to improve labour use efficiency and to cater for large scale milk production. Herringbone milking sheds are the most prevalent on Australian dairy farms, followed by rotary sheds. There has been a notable decrease in the number of dairy farms with walkthrough sheds (figure B).

In 2004-05 the most prevalent herringbone shed was the swingover unit, with almost 57 per cent of dairy farms having this type of shed. Around 24 per cent of farms had double unit high line herringbone sheds, while 6 per cent had double unit low line sheds (table 2).

Among farms with herringbone milking sheds, the most popular herringbone angle in 2004-05 was 90 degrees (51 per cent of farms), followed by 45 degrees herringbone angle (20 per cent of farms). Between 1991-92 and 2004-05, the proportion of farms with 90 degrees herringbone angle more than tripled, whereas those with 45 degrees declined by nearly two-thirds (table 2).

In 2004-05, most dairies had mechanised bail feeding (56 per cent of farms), while 28 per cent of dairy farms used manual bail feeding (table 2).

The average number of cows milked per dairy farm at peak period increased from 115 cows per dairy farm in 1991-92 to 191 cows in 2004-05. This increase was achieved with the same number of milking hours and operators at peak periods as in 1991-92. In 2004-05, on average, each farm used two operators at peak period and the milking time was two hours (table

fig B **distribution of dairy sheds**
Australian dairy farms

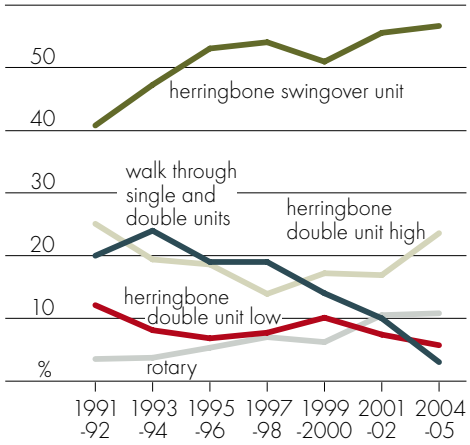
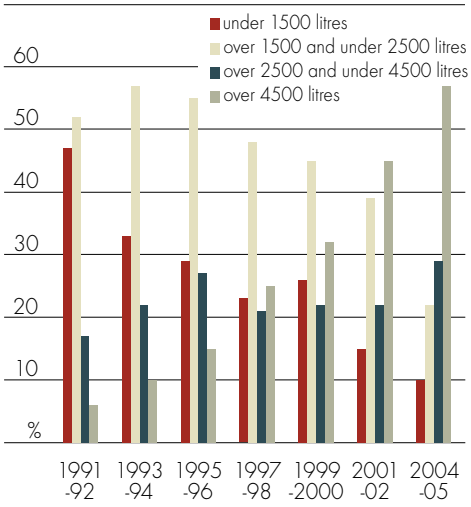


fig C **distribution of bulk vats, by capacity** Australian dairy farms



2). This is a major improvement in labour productivity in the dairy industry, pointing to the adoption of better management practices and equipment in the milking sheds. For example, the proportion of farms using automatic cup removers nearly doubled between 1991-92 and 2004-05 and a high proportion of farms (83 per cent) conducted performance tests of their milking machines annually (table 2).

In line with the general trend toward large scale milking sheds, the proportion of dairy farms using large capacity bulk vats also increased between 1991-92 and 2004-05 (figure C). The proportion of farms having bulk vats with a capacity of 4500 litres or more rose from 6 per cent in 1991-92 to 57 per cent in 2004-05. At the same time, dairy farms using small vats with capacity under 1500 litres declined from 47 per cent in 1991-92 to 10 per cent in 2004-05.

table 2 **milking shed and equipment – Australian dairy farms**
percentage of farms or average per farm

		1991-92		1993-94		1995-96		1997-98		1999-2000		2001-02		2004-05	
types of milking shed															
walk through single	%	3.1	(49)	3.4	(39)	2.3	(46)	5.1	(40)	2.4	(46)	4.2	(34)	0	(92)
walk through double unit	%	16.7	(15)	20.2	(15)	16.2	(19)	13.8	(19)	11.8	(22)	5.9	(26)	3.1	(32)
herringbone swingover unit	%	40.8	(8)	47.3	(7)	53.1	(8)	54.1	(8)	51.0	(8)	55.6	(7)	56.7	(7)
herringbone double unit															
– high	%	25.1	(13)	19.4	(16)	18.6	(22)	13.9	(20)	17.2	(16)	16.9	(19)	23.6	(15)
– low	%	12.1	(25)	8.1	(23)	6.8	(26)	7.7	(31)	10.1	(23)	7.4	(25)	5.7	(33)
rotary	%	3.5	(35)	3.7	(26)	5.3	(24)	7	(23)	6.2	(27)	10.5	(18)	10.8	(21)
herringbone angle a															
45 degrees	%	57.2	(9)	43.3	(10)	40.7	(13)	36.6	(12)	47.9	(9)	37.4	(10)	20.0	(16)
60 degrees	%	11.1	(24)	10.6	(27)	6.7	(28)	8.7	(41)	1.3	(40)	2.0	(41)	8.4	(29)
70 degrees	%	2.1	(42)	4.3	(26)	1.4	(49)	2.3	(45)	5.0	(41)	4.2	(39)	9.8	(31)
80 degrees	%	13.1	(26)	12.0	(19)	13.3	(24)	6.9	(24)	11.8	(23)	16.6	(20)	10.8	(29)
90 degrees	%	15.8	(26)	27.8	(14)	37.8	(15)	43.1	(11)	34.2	(13)	40.5	(11)	50.7	(9)

continued...

table 2 **milking shed and equipment – Australian dairy farms** *continued*
percentage of farms or average per farm

		1991-92		1993-94		1995-96		1997-98		1999-2000		2001-02		2004-05	
milking shed equipment															
bail feeder type															
– none	%	25.9	(17)	19.3	(17)	15.8	(16)	20.6	(17)	17.4	(19)	12.6	(22)	7.2	(32)
– manual	%	42.1	(10)	42.5	(10)	31.4	(14)	36.8	(12)	35.6	(11)	31.9	(11)	28.1	(14)
– mechanised	%	32.7	(12)	37.4	(9)	53.0	(8)	41.8	(9)	44.1	(9)	50.4	(8)	56.4	(8)
– computerised	%	0	(73)	1.7	(63)	1.0	(37)	2.3	(40)	3.2	(44)	5.4	(26)	9.0	(28)
total number of milking shed bails	no.	15.5	(4)	16.7	(3)	19.5	(4)	21.0	(4)	21.4	4)	24.4	(3)	24.0	(4)
performance testing of milk machine															
never	%	24.3	(14)	14.0	(15)	10.2	(21)	7.0	(26)	9.3	28)	4.1	(42)	2.0	(72)
annually	%	55.8	(7)	67.3	(5)	76.3	(5)	70.9	(6)	75.4	5)	81.6	(4)	82.5	(5)
biennially	%	20.2	(16)	18.8	(17)	14.1	(24)	23	(18)	15.3	22)	14.4	(21)	15.5	(23)
third line washing															
none	%	33.4	(13)	31.5	(11)	28.3	(15)	20.9	(17)	25.8	15)	15.9	(17)	7.2	(29)
manual	%	51.3	(8)	54.6	(7)	59.2	(8)	64.5	(7)	62.5	7)	63.8	(6)	65.5	(7)
fully automatic	%	15.7	(20)	14.2	(15)	13.1	(20)	14.8	(19)	11.8	22)	20.5	(15)	27.5	(14)
use of automatic cup removers	%	14.0	(17)	13.0	(14)	12.0	24)	12.0	(15)	14.0	18)	17.0	(15)	25.0	(16)
effluent disposal system for the dairy															
runoff into paddock	%	52.3	(8)	44.2	(8)	40.2	(10)	38.3	(10)	23.4	14)	21.0	(15)	10.0	(28)
pump and spray	%	16.9	(18)	15.4	(15)	12.4	(20)	16.6	(17)	19.0	17)	18.4	(15)	23.3	(15)
ponding systems															
– 1 pond	%	18.7	(19)	24.7	(14)	30.2	(13)	25.7	(13)	32.7	(12)	32.5	(11)	39.8	(11)
– 2 ponds	%	8.7	(24)	12.1	(17)	14.2	(16)	16.9	(19)	22.1	(13)	26	(12)	24.8	(14)
mechanical removal	%	2.6	(47)	2.9	(44)	2.8	(53)	2.7	(54)	1.3	(78)	1.0	(48)	2.6	(41)
other systems	%	1.8	(73)	2.2	(39)	1.7	(45)	1.2	(41)	1.6	(39)	2.5	(57)	1.0	(77)
performance – peak season															
number of cows milked	no.	115	(3)	122	(2)	137	(3)	148	(3)	159	(3)	193	(3)	191	(3)
milking hours	hrs	2	(2)	2	(2)	2	(2)	2	(3)	2	(3)	2	(2)	2	(3)
number of operators	no.	2	(3)	2	(2)	2	(3)	2	(3)	2	(3)	2	(2)	2	(3)

a Only farms with herringbone milking sheds.
Note: Figures in parentheses are standard errors expressed as percentages of the estimates. A guide to interpreting these is included in the survey methods section. Year to year changes in both sample and population may affect the comparability of estimates between years. A zero with a standard error indicates that the estimate is greater than zero but less than 0.05 per cent.

In response to environmental concerns and changes in state based regulations, effluent disposal methods have changed significantly on dairy farms across Australia since the early 1990s. In 2004-05 the most prevalent effluent disposal system was the ponding system. Another popular method was the pump and spray system. The number of dairy farms draining effluent directly into paddocks decreased significantly over the period (table 2).

feeding regimes

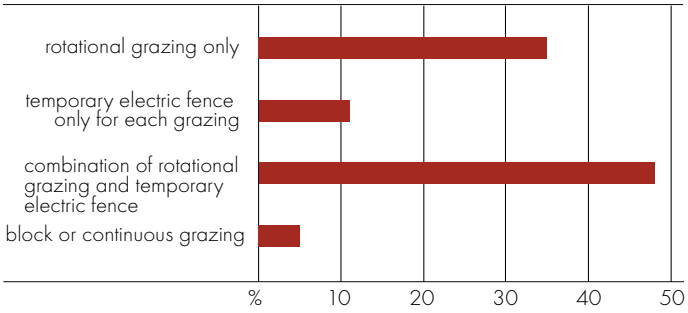
Milk production in Australia is mainly pasture based. Over the past two decades there has been a large increase in intensity of production systems on dairy farms, with higher stocking rates and more intensive feeding practices (ABARE 2006). Feed production systems have changed, with pasture improvement and greater use of fertilisers, irrigation water, fodder crops and supplementary feeds such as concentrates and grains.

grazing

In 2004-05 the majority of dairy farms used some form of rotational grazing to manage pasture. The other popular grazing method was temporary electric fencing. Nearly half the farms combined rotational grazing and temporary electric fencing for grazing management (figure D).

Thirty per cent of dairy farms indicated that they used pasture height to monitor pasture availability and growth. Other pasture monitoring techniques that ranked highly were: the leaf stage or leaf appearance interval technique; pasture growth or quantity; and assigning a standard period of time for particular paddocks. These three techniques were each practised by around 20 per cent of dairy farms.

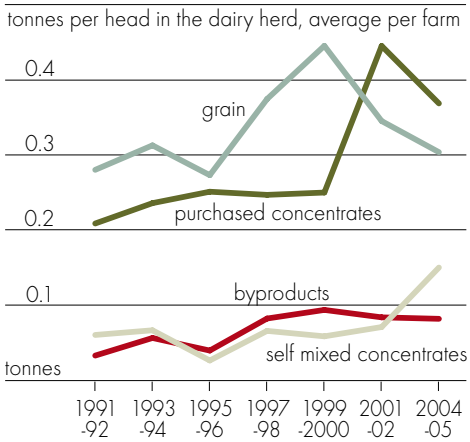
fig D **grazing systems used in 2004-05**
Australian dairy farms



feed grains, concentrates and byproducts

The use of feed grains increased strongly in the second half of the 1990s as feed prices fell from the highs of 1994-95 and 1995-96 (ABARE 2006). However, feed grain prices at the time of the past two dairy technology surveys were higher than in 1999-2000 and the volume of feed grains per head in the dairy herd was consequently lower in 2001-02 and 2004-05, despite the drought conditions at the time and the general trend of increased feeding of grains since the beginning of the 1990s (figure E).

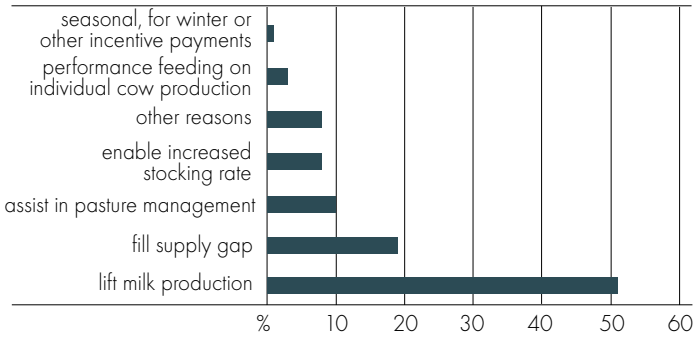
fig E **use of concentrates, grains and byproducts** Australian dairy farms



Between 1991-92 and 2004-05 the proportion of dairy farms feeding concentrates or grain rose by 13 percentage points to an estimated 93 per cent of Australian dairy farms in 2004-05 (table 3).

The quantity of concentrates, grains and byproducts used per head in the dairy herd increased by 55 per cent over this period, from an average of 0.58 tonnes in 1991-92 to 0.90 tonnes in 2004-05. In particular the growth in the amount of concentrates (mixed or purchased) used per head in the dairy herd nearly doubled, increasing from 0.27 tonnes in 1991-92 to 0.52 tonnes in 2004-05 (table 3).

fig F **primary reason for feeding concentrates or grains, 2004-05** Australian dairy farms



The main reasons for feeding concentrates or grains to cows is still to lift milk production (51 per cent of dairy farms) and to fill the pasture supply gap (19 per cent) (figure F, table 3).

table 3 **feeding regimes – Australian dairy farms**
percentage of farms or average per farm

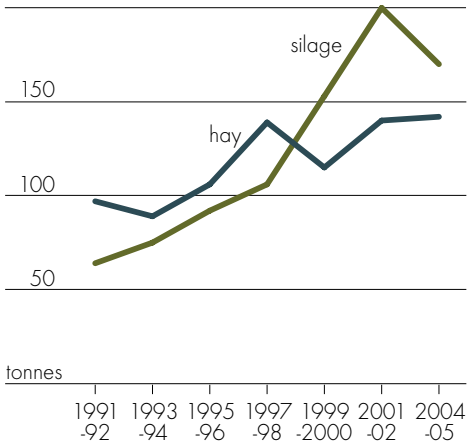
		1991-92		1993-94		1995-96		1997-98		1999-2000		2001-02		2004-05	
estimated number of farms		13 592		14 059		13 674		13 815		12 960		10 995		10 112	
dairy herd															
at 30 June	no.	182	(3)	195	(2)	227	(3)	243	(2)	256	(3)	310	(2)	293	(3)
dairy cows															
at 30 June	no.	121	(3)	126	(2)	148	(3)	157	(3)	165	(3)	197	(3)	193	(4)
concentrates or grain feed															
proportion of farms feeding															
concentrates or grain	%	80	(5)	85	(3)	89	(3)	90	(4)	91	(3)	89	(3)	93	(2)
quantity used **a**															
– self mixed concentrates	t	11	(20)	13	(22)	6	(28)	16	(44)	15	(18)	22	(32)	44	(24)
– purchased concentrates	t	38	(12)	46	(8)	57	(11)	60	(10)	64	(10)	138	(9)	108	(11)
– grain	t	51	(15)	61	(8)	62	(10)	91	(9)	114	(9)	107	(10)	89	(11)
– byproducts															
(eg brewers grain)	t	6	(31)	11	(62)	9	(27)	20	(25)	24	(30)	26	(29)	24	(43)
primary reason for feeding concentrates **a**															
– to lift milk production	%	52	(9)	53	(7)	52	(6)	61	(6)	73	(4)	70	(5)	51	(9)
– to raise performance of															
individual cows	%	7	(34)	2	(40)	5	(44)	2	(26)	1	(40)	1	(41)	3	(53)
– seasonal, to receive winter or															
other incentive payment	%	5	(30)	10	(23)	6	(33)	4	(48)	2	(34)	4	(37)	1	(77)
– to fill supply gap	%	32	(14)	30	(13)	31	(9)	23	(14)	22	(14)	19	(16)	19	(16)
– other reasons	%	5	(35)	6	(24)	5	(20)	10	(26)	3	(59)	6	(36)	8	(33)
– to increase															
stocking rate **b**	%	–		–		–		–		–		–		8	(32)
– to assist in pasture															
management **b**	%	–		–		–		–		–		–		10	(30)

a Includes only those farms feeding concentrates, grains etc. **b** These two reasons were only included in 2004-05. Figures may not add to 100 per cent due to nonresponse.
Notes: Figures in parentheses are standard errors expressed as percentages of the estimates. A guide to interpreting these is included in the survey methods section. Year to year changes in both sample and population may affect the comparability of estimates between years.

fodder conservation

In addition to the more widespread use of purchased feeds, there has been a trend toward more on-farm production of hay and silage since the early 1990s. Silage production increased from an average of 64 tonnes per dairy farm in 1991-92 to almost 170 tonnes per farm in 2004-05 (figure G, table 4). The peak of 200 tonnes of silage on average per dairy farm occurred in 2001-02 when seasonal conditions were very good. The total quantity of hay cut increased from an average of 97 tonnes per dairy farm in 1991-92 to 142 tonnes in 2004-05 (figure G, table 4).

fig G **hay and silage production**
Australian dairy farms, average per farm

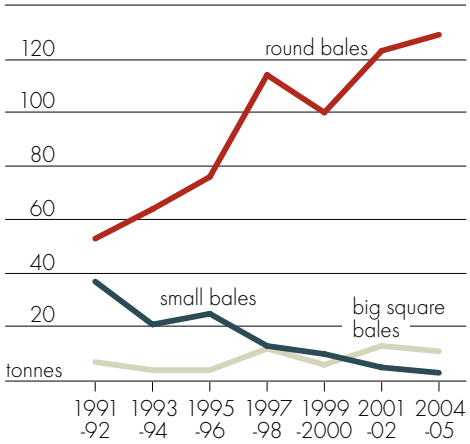


Over the thirteen year period, dairy farmers made changes to the way in which they store hay cut on farms. Between 1991-92 and 2004-05 the proportion of hay cut and stored in round bales to total hay cut rose from 55 per cent to 91 per cent. This rise was largely at the expense of small bales (figure H, table 4).

The majority of silage cut on farm was wilted and wrapped – on average, 41 per cent of the total silage was prepared and stored in this way. This was followed by wilted silage in bulk storage, with 29 per cent of the total silage stored in this form (table 4).

Increases in hay or silage cut and stored on farm reflect intensified fodder conservation. The most common reason given for cutting or purchasing fodder was 'normal practice'. Other reasons given, in order of frequency, were to boost offseason

fig H **quantity of hay cut, by bale type**
Australian dairy industry, average per farm



milk production, to have a reserve in case of a drought, reduce dependence on purchased feed or irrigation, and as a pasture management practice (table 4).

table 4 **fodder conservation – Australian dairy farms**
percentage of farms or average per farm

		1991-92	1993-94	1995-96	1997-98	1999-2000	2001-02	2004-05
area of land operated at 30 June	ha	178 (4)	189 (4)	214 (5)	214 (4)	217 (4)	257 (5)	225 (5)
farms that purchased hay or silage	%	52 (9)	49 (8)	50 (9)	54 (9)	53 (7)	54 (7)	54 (8)
total silage cut	t	64 (16)	75 (13)	92 (13)	106 (14)	153 (11)	200 (11)	170 (9)
total hay cut	t	97 (6)	89 (5)	106 (6)	139 (8)	115 (8)	140 (7)	142 (8)
silage cut and stored; direct cut crop								
direct cut crop **a**	t	–	–	–	–	–	18 (33)	26 (28)
wilted silage bulk store	t	29 (21)	31 (21)	39 (25)	44 (28)	54 (24)	90 (18)	49 (25)
normal silage bulk store	t	18 (31)	14 (36)	17 (31)	24 (32)	41 (25)	6 (58)	3 (73)
wilted silage baled bulk store **a**	t	–	–	–	–	–	11 (90)	16 (31)
normal silage baled bulk store **a**	t	–	–	–	–	–	1 (62)	4 (95)
wilted silage wrapped	t	10 (36)	27 (20)	30 (16)	32 (13)	52 (14)	74 (13)	69 (12)
normal silage wrapped	t	6 (97)	3 (39)	6 (37)	5 (55)	6 (31)	1 (59)	1 (92)
reasons why hay/silage was cut or purchased b								
normal practice	%	84 (2)	80 (4)	87 (3)	67 (6)	81 (4)	90 (2)	77 (5)
boost off-season milk production	%	51 (8)	47 (9)	40 (9)	46 (9)	54 (6)	67 (6)	65 (7)
drought measure	%	40 (8)	30 (8)	25 (12)	38 (10)	42 (9)	38 (9)	55 (8)
for sale	%	6 (32)	4 (41)	3 (48)	4 (51)	2 (51)	3 (35)	3 (56)
pasture control measure	%	37 (12)	36 (10)	25 (15)	21 (16)	39 (11)	33 (11)	47 (10)
reduce dependence on purchased feed or irrigation **a**	%						26 (12)	52 (9)
other reasons	%	13 (23)	10 (28)	12 (26)	6 (36)	4 (39)	1 (37)	3 (40)

a These options were only included in 2001-02 and 2004-05. **b** Figures will not add to 100 per cent as more than one reason was collected.
Notes: Figures in parentheses are standard errors expressed as percentages of the estimates. A guide to interpreting these is included in the

soil testing, fertiliser and drainage

Soil testing assists farmers in understanding the condition of the soil and provides guidance on nutrient requirements. Matching fertiliser application with plants' needs also helps to address nutrient runoff issues.

Sixty-two per cent of Australian dairy farms tested or analysed soil in 2004-05 (table 5). It should be noted that the 2004-05 results are not directly comparable with previous surveys, when farmers were asked if they had ever soil tested. Of the dairy farms that tested their soil, 83 per cent changed their fertiliser management

table 5 **soil testing and drainage – Australian dairy farms**
percentage of farms or average per farm

		1991-92		1993-94		1995-96		1997-98		1999-2000		2001-02		2004-05	
farms that soil test/analyse	%	61	(6)	71	(5)	80	(4)	81	(4)	85	(4)	92	(2)	62	(7)
provider of fertiliser advice															
company representative	%	26	(12)	40	(8)	48	(8)	46	(9)	60	(7)	62	(6)	43	(10)
farm management consultant	%	9	(34)	7	(20)	11	(20)	12	(20)	14	(21)	21	(15)	13	(18)
department of agriculture	%	22	(11)	19	(13)	16	(16)	11	(17)	8	(21)	5	(29)	1	(44)
other advice providers	%	5	(29)	5	(29)	5	(37)	12	(24)	3	(32)	3	(44)	2	(47)
milk company field staff **a**	%	–		–		–		–		–		–		2	(34)
drainage – farm drainage situation **b**															
fully drained															
– natural	%	55	(9)	50	(6)	45	(8)	41	(9)	54	(7)	49	(8)	52	(8)
– with improvements	%	28	(16)	34	(8)	39	(12)	40	(9)	38	(10)	42	(8)	33	(12)
work required	%	17	(20)	16	(20)	16	(20)	18	(21)	8	(30)	9	(24)	6	(37)
drainage improvements in past 3 years	%	26	(16)	31	(9)	37	(11)	26	(16)	22	(15)	26	(12)	17	(17)
area drained in the last three years by type of drainage															
open drains	ha	34	(15)	47	(10)	35	(19)	35	(18)	43	(15)	43	(15)	90	(22)
mole drains	ha	1	(62)	0	(56)	1	(67)	1	(36)	0	(78)	1	(73)	2	(72)
tile drains	ha	1	(76)	0	(60)	2	(106)	2	(82)	1	(104)	0	(81)	1	(100)

a This option was only included in 2004-05. **b** Some columns may not add to 100 per cent due to nonresponse. **na** Not available.
Notes: Figures in parentheses are standard errors expressed as percentages of the estimates. A guide to interpreting these is included in the survey methods section. Year to year changes in both sample and population may affect the comparability of estimates between years.

following the soil tests. The changes included: developing a fertiliser application plan (52 per cent of farms), increasing the application of fertiliser (17 per cent of farms) or decreasing the application of fertiliser (12 per cent of farms).

The average area of pasture oversown to strengthen existing pasture in 2004-05 was 23 hectares per farm (10 per cent of total farm area) and the average area of pasture fully renovated to replace existing pasture was 6 hectares per farm (3 per cent of total farm area).

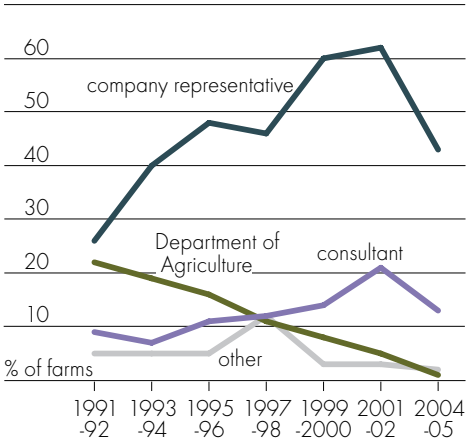
In 2004-05 just over half of the dairy farms indicated that they relied on natural drainage and their farms were fully drained (table 5). A further 33 per cent of farms were fully drained with some improvements made on their drainage systems and 6 per cent of farms indicated that their drainage systems required work.

Seventeen per cent of farms indicated that they had made drainage improvements in the previous three years. Of these farms on average 90 hectares were drained by open drains, 2 hectares by mole drains and 1 hectare by tile drains.

advice on fertiliser use

Company representatives have been the most important providers of advice to dairy farmers on the use of fertilisers. The number of farms using company representatives to obtain advice on fertiliser use increased from 26 per cent in 1991-92 to 62 per cent in 2001-02 but then fell back to 43 per cent of farms in 2004-05. Thirteen per cent of farms obtained advice on fertilisers from farm management consultants. There has been a drop in the number of farmers obtaining advice on fertilisers from the relevant state department of agriculture or its equivalent (figure I). One possible explanation for the decline in 2004-05 in farmers obtaining advice on fertiliser use from the sources mentioned above is an increase in the use of the internet (not covered in the survey question).

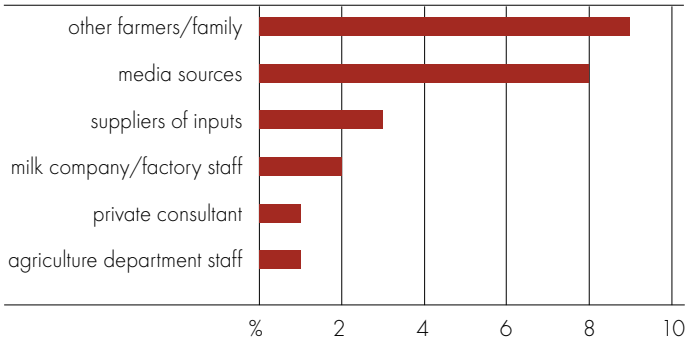
fig I **source of advice on fertilisers**
Australian dairy farms



management advice, computer use and herd management

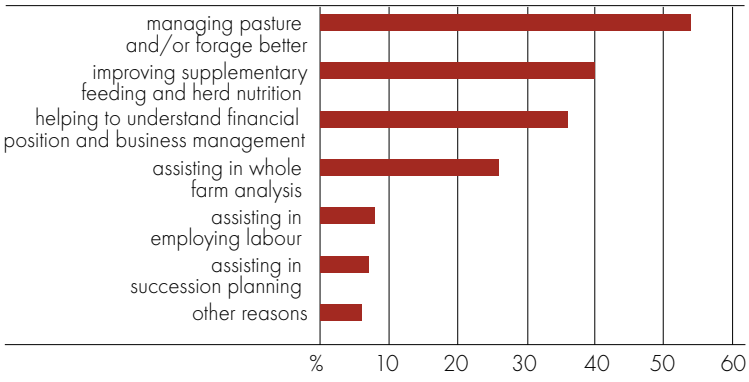
Dairy farmers are actively seeking information to better manage their farms. Farmers are seeking advice from various sources, attending training courses, workshops, field days, regional programs and discussion groups. The main sources of advice in 2004-05 were other farmers or family – on average these sources were consulted nine times a year. Second in popularity was the media, followed by suppliers of inputs (figure J).

fig J **source of management advice, 2004-05**
Australian dairy farms



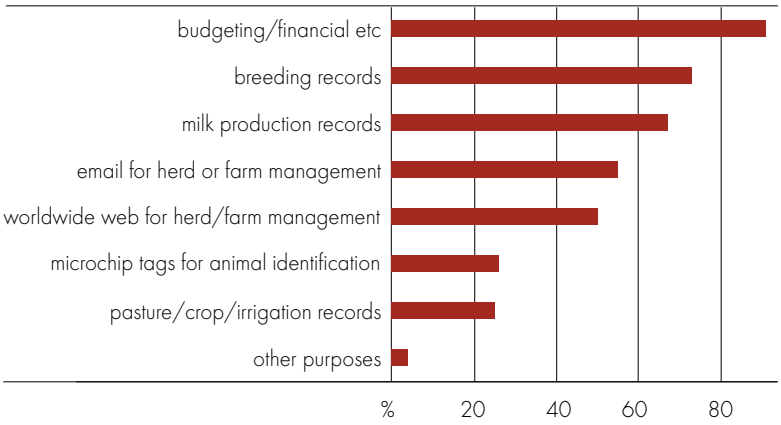
Dairy farmers indicated that, in 2004-05, management advice helped to improve productivity through better management of pasture and/or forage (54 per cent of dairy farms) and supplementary feeding and herd nutrition (40 per cent of farms). Advice also helped farmers to better understand the financial position and business management of their farms (figure K).

fig K **management advice, 2004-05**
proportion of Australian dairy farms helped to improve productivity by:



In 2004-05 nearly half of dairy farmers used a computer for their farm and herd management. Of the dairy farmers who used a computer, the three most popular uses of the computer were for budgeting and financial purposes (91 per cent of dairy farms), maintaining records on breeding (73 per cent of farms), and milk production records (67 per cent of farms) (figure L).

fig L **uses of computers, 2004-05**
proportion of Australian dairy farms using computers for:



herd breeding

In 2004-05, 58 per cent of dairy farms used the rectal method to test for pregnancy, while 14 per cent used the ultrasound method (table 6).

Each farm on average calved half of their cows using artificial insemination (AI) in 2004-05, a similar proportion to rates in previous years. Of the dairy farms that used AI in 2004-05, AI was performed by the farmer on 38 per cent of farms and by a professional AI technician on 29 per cent of farms

In 2004-05, 26 per cent of farms carried out synchronised oestrus by injection and 12 per cent of dairy farms used controlled intravaginal drug release (CIDR) devices.

Nationally, the estimated proportion of dairy farms breeding their own replacements remained high throughout the 1990s at above 94 per cent. The average age at which heifers are calved also remained at around 26 months.

table 6 **herd breeding – Australian dairy farms** [a]
average per farm or percentage of farms

		1991-92	1993-94	1995-96	1997-98	1999-2000	2001-02	2004-05
method used for pregnancy test								
rectal	%	–	–	–	–	–	61 (6)	58 (8)
ultrasound	%	–	–	–	–	–	4 (47)	14 (24)
other	%	–	–	–	–	–	3 (37)	7 (37)
don't test	%	–	–	–	–	–	31 (12)	17 (17)
cows calved by artificial insemination	no.	61 (6)	66 (4)	80 (5)	87 (4)	87 (4)	109 (5)	100 (6)
artificial insemination by								
the farmer	%	–	–	–	–	–	55 (8)	38 (14)
a professional	%	–	–	–	–	–	40 (11)	29 (17)
practice synchronised oestrus by								
injection	%	–	–	–	–	–	27 (12)	26 (15)
CIDR device	%	–	–	–	–	–	21 (15)	12 (20)
cows induced	no.	5 (17)	6 (10)	7 (15)	12 (14)	10 (13)	7 (13)	6 (15)
breed own replacement heifers	%	94 (3)	98 (2)	99 (1)	96 (2)	96 (2)	98 (1)	95 (2)
average age heifers are calved	months	26 (1)	26 (1)	25 (1)	26 (1)	26 (1)	26 (1)	26 (1)

a Some options to questions were only included in 2001-02 and 2004-05. **b** Some columns may not add to 100 per cent due to nonresponse. CIDR = controlled intravaginal drug release.
Notes: Figures in parentheses are standard errors expressed as percentages of the estimates. A guide to interpreting these is included in the survey methods section. Year to year changes in both sample and population may affect the comparability of estimates between years.

herd health

In 2004-05, 84 per cent of dairy farms devised their own herd health programs (table 7). Veterinarians devised herd health programs for 10 per cent of farms, while 2 per cent of farms used farm advisers. Similar results were observed for the previous dairy technology surveys.

Incidences of clinical mastitis cases in the dairy herd reduce milk quality and quantity and can cause substantial production losses. In 2004-05 the proportion of cows in the dairy herd with mastitis was around 6 per cent, making mastitis the condition with highest occurrence. However, the incidences of occurrence of all the other listed conditions have not changed substantially since the early 1990s (figure M). Among the listed conditions, the two with the highest occurrence per

table 7 **herd health – Australian dairy farms**

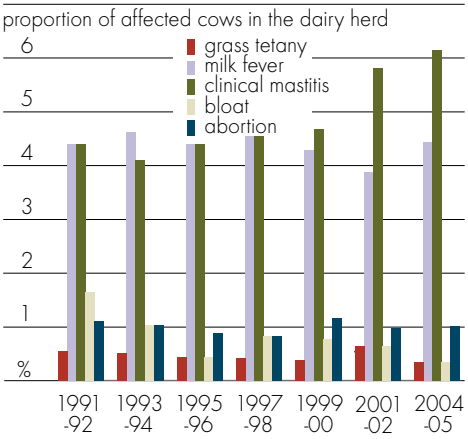
percentage of farms or average per farm

		1991-92		1993-94		1995-96		1997-98		1999-2000		2001-02		2004-05	
herd health program devised by															
self	%	85	(3)	86	(2)	86	(3)	83	(4)	86	(3)	81	(4)	84	(3)
vet	%	13	(21)	10	(17)	12	(20)	9	(26)	11	(20)	15	(18)	10	(22)
farm advisor	%	0	(0)	1	(58)	1	(72)	3	(54)	1	(53)	3	(48)	2	(51)
dept of agriculture	%	0	(53)	2	(66)	1	(81)	0	(150)	0	(136)	0	(90)	0	(0)
other	%	1	(79)	1	(33)	0	(62)	5	(33)	2	(47)	1	(39)	1	(95)
farms which used a defined mastitis control program	%	56	(6)	69	(5)	85	(4)	74	(6)	70	(6)	80	(4)	62	(7)
year mastitis control program began [a]															
before 1980	%	29	(20)	26	(15)	17	(19)	14	(18)	15	(21)	14	(23)	11	(36)
between 1980 and 1989	%	62	(10)	56	(7)	48	(9)	35	(13)	32	(12)	25	(14)	17	(20)
1990 onwards	%	9	(29)	18	(13)	35	(13)	51	(9)	53	(8)	61	(7)	72	(7)
mastitis control comprised of [a]															
cell count on individual cows	%	66	(8)	70	(6)	68	(8)	77	(5)	79	(5)	80	(4)	78	(6)
dry cow treatment	%	96	(2)	94	(2)	92	(4)	89	(4)	93	(2)	87	(3)	88	(3)
dry cows treated	no.	72	(7)	79	(5)	82	(5)	85	(7)	156	(21)	124	(6)	93	(13)
teat dipping/ spraying	%	76	(6)	82	(3)	82	(5)	88	(4)	88	(4)	91	(3)	91	(3)
other control method	%	28	(14)	17	(21)	11	(27)	9	(30)	10	(27)	8	(26)	5	(32)
farms vaccinating against leptospirosis by stock type															
heifers	%	52	(7)	55	(7)	60	(8)	60	(6)	72	(5)	73	(5)	73	(6)
milkers	%	52	(7)	46	(7)	51	(9)	54	(8)	60	(7)	65	(6)	58	(7)
dry cows	%	47	(7)	45	(8)	50	(9)	52	(8)	58	(7)	62	(6)	57	(8)
occurrence of the following diseases in the dairy herd															
grass tetany	no.	1	(26)	1	(15)	1	(23)	1	(20)	1	(24)	2	(28)	1	(18)
milk fever	no.	8	(9)	9	(7)	10	(8)	11	(8)	11	(7)	12	(9)	13	(9)
leptospirosis	no.	0	(44)	0	(71)	0	(67)	0	(99)	0	(93)	0	(77)	0	(66)
clinical mastitis	no.	8	(6)	8	(6)	10	(6)	11	(7)	12	(7)	18	11)	18	(8)
bloat	no.	3	(34)	2	(20)	1	(16)	2	(18)	2	(26)	2	(44)	1	(29)
abortion	no.	2	(10)	2	(8)	2	(13)	2	(10)	3	(11)	3	(11)	3	(8)

a Includes farms that had a defined mastitis control program.

Notes: Figures in parentheses are standard errors expressed as percentages of the estimates. A guide to interpreting these is included in the survey methods section. Year to year changes in both sample and population may affect the comparability of estimates between years. Some columns may not add to 100 per cent due to nonreponse. A zero with a standard error indicates that the estimate is greater than zero but less than 0.05 per cent.

fig M **diseases in the Australian dairy herd**



farm were clinical mastitis and milk fever (figure M).

Dairy farmers are taking measures to monitor and control mastitis in the dairy herd. Projects like Countdown Downunder provide dairy farmers with recommendations on best practices on farm to prevent and control the occurrence of mastitis (see www.countdown.org.au). Farmers are encouraged to devise mastitis action plans unique to their farms. In 2004-05 around 62 per cent of dairy farms indicated that they used a published mastitis control program (table 7). There is a notable reduction in the proportion of farms using a published program between 2001-02 and 2004-05. This might be due to farmers not necessarily considering a farm specific plan to be a published mastitis control program.

Of the farms that had a published mastitis control program, a high percentage included cell count of milk from individual cows (78 per cent of farms), dry cow treatment (88 per cent) and teat dipping (91 per cent) in their program. On average, farms treated about 93 cows with dry cow treatment (32 per cent of the dairy herd) (table 7).

management changes

Results from the survey indicate that in 2004-05 some dairy farmers planned to attend a number of training courses in the next twelve months. High on the list were training courses in pasture management, herd nutrition and concentrate and feed management (figure N). Forty-five per cent of farms indicated that they did not plan to attend training courses in the next twelve months.

In 2004-05, while 40 per cent of dairy farmers did not expect to make farm management changes in the next twelve months, the majority (60 per cent) expected to make some farm management changes (figure O). The changes were mainly in relation to grazing, pasture and feed management, pointing to a continued trend toward more intensive production systems on Australian dairy

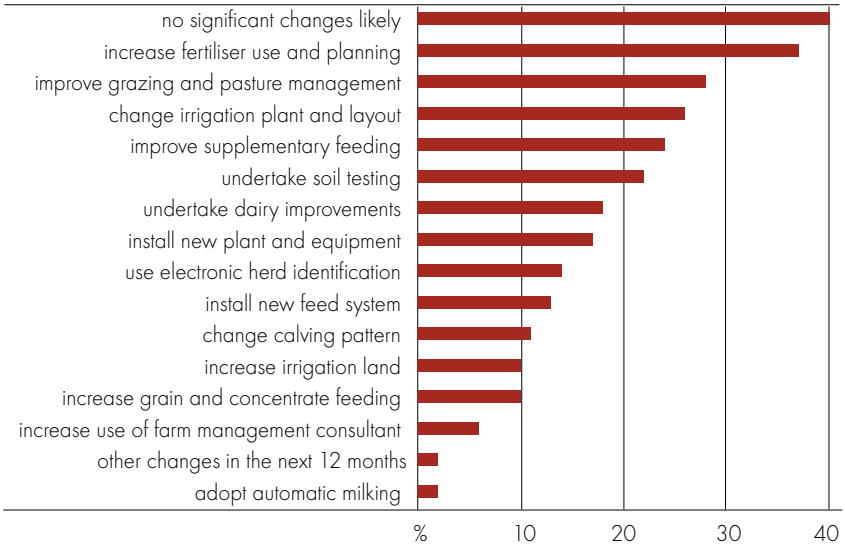
farms. Close to 40 per cent of farmers indicated that they intended to increase fertiliser use and planning and 28 per cent of farmers intended to improve grazing and pasture management. Other changes that ranked highly were changing irrigation plant and layout, improved supplementary feeding and soil testing.

fig N **intended training courses, 2004-05**

proportion of Australian dairy farmers intending to undertake courses in the next 12 months

fig O **intended farm management changes, 2004-05**

proportion of Australian dairy farmers intending to make changes in the next 12 months



A high proportion of farmers (40 per cent) indicated that workload or labour issues are limiting change on their farms. Other issues that ranked highly were access to funding to increase borrowings (38 per cent of dairy farms), age (37 per cent) and attitude to the viability of the dairy industry (33 per cent) (figure P).

Over 40 per cent of dairy farmers indicated that they did not have potential management or technology changes that required further assistance to enable them to make changes (figure Q). For those who needed further assistance, the

fig P **factors limiting change, 2004-05**
proportion of Australian dairy farms affected by:

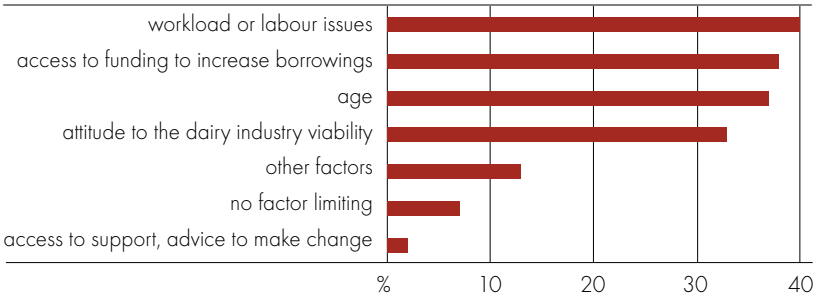
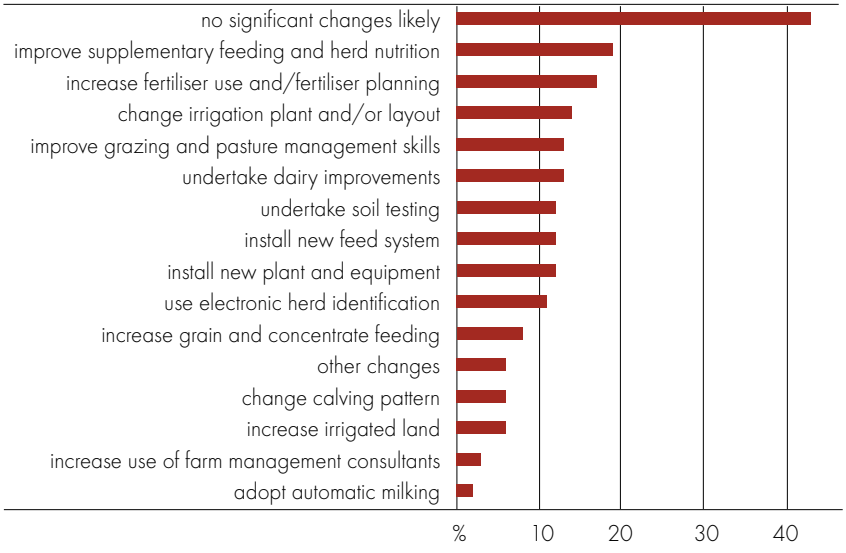


fig Q **management or technology changes, 2004-05**
proportion of Australian dairy farmers requiring further assistance or advice to



main areas were in improving supplementary feeding and nutrition techniques, increasing fertliser use and planning, improving irrigation plant and layout and improving grazing and pasture management skills.

Dairy farmers who had no intention of making changes in the next twelve months (40 per cent of dairy farms) on average operated smaller farms and had a smaller dairy herd than those who intended to make changes (table 8). Farmers who intended not to make significant changes used less purchased feed and consequently their feed costs per cow were lower than that for farmers who indicated intentions to make significant changes.

table 8 **selected performance variables by intention to make changes in 12 months, 2004-05 – Australian dairy farms** average per farm

		no significant changes		significant changes	
estimated number of farms		3961		6152	
area of land operated 30 June	ha	176	(8)	257	(6)
area utilised by milking cows	ha	97	(5)	122	(4)
area farm irrigated	ha	18	(18)	45	(11)
dairy herd at 30 June	no.	256	(8)	317	(4)
dairy cows at 30 June	no.	175	(8)	205	(4)
cows milked for at least 3 months	no.	167	(7)	203	(4)
milk production	L	832 925	(7)	1 066 597	(4)
labour units	no.	2.9	(4)	3.6	(4)
milk income	$	274 564	(8)	353 582	(5)
farm cash income	$	78 122	(12)	85 018	(9)
farm business profit	$	21 241	(51)	19 934	(39)
purchased feed to total feed	%	63	(5)	70	(2)
milk yield per cow	L	5 002	(4)	5 247	(2)
feed cost per cow	$	487	(8)	621	(5)
herd costs per cow	$	77	(9)	75	(6)
shed costs per cow	$	68	(7)	77	(7)
grain and concentrates per cow	kg	889	(9)	1 463	(7)
supplementary dry matter fed per cow	kg	1.7	(8)	2.1	(5)
stocking rate	cows/ha	1.8	(6)	1.7	(4)
milk production per effective hectare	L	8 566	(7)	8 771	(5)
milk production per labour unit	L	283 380	(6)	298 395	(5)
milking cows per labour unit	no.	57	(6)	57	(5)

Note: Figures in parentheses are standard errors expressed as percentages of the estimates . A guide to interpreting these is included in the survey methods section.

table 9 **advice, training and likely management changes by intention to make changes in 12 months, 2004-05 – Australian dairy farms**
average per farm

		no significant changes		significant changes	
estimated number of farms		3961		6152	
number of times advice obtained from:					
milk company/factory staff	no.	1.6	(24)	2.5	(11)
private consultant	no.	0.7	(24)	1.7	(28)
agricultural department staff	no.	0.7	(46)	1.3	(18)
suppliers of inputs	no.	1.7	(33)	3.5	(11)
media sources	no.	5.6	(59)	8.6	(31)
other farmers/family	no.	4.7	(38)	11.2	(55)
number of times farmers participated in:					
farmer discussion groups	no.	2.0	(27)	2.9	(15)
industry training sessions	no.	0.5	(44)	0.9	(24)
farm research days or workshops	no.	0.3	(39)	1.2	(19)
field days run by public sector (CMAS DPI)	no.	0.3	(43)	0.7	(15)
field days run by private sector	no.	0.6	(19)	0.9	(16)
farmer political/representative groups	no.	0.5	(35)	2.2	(33)
regional R&D groups	no.	0.4	(52)	0.8	(36)
catchment management authority committees	no.	0.1	(57)	1.5	(35)
environmental programs (eg. landcare)	no.	0.8	(61)	0.6	(27)
how management advice helped to improve productivity:					
understand financial position	%	17.6	(31)	35.7	(13)
better pasture management	%	38.5	(21)	50.2	(10)
improved supplementary feeding and herd nutrition	%	14.3	(33)	44.2	(13)
whole farm analysis	%	9.8	(36)	26	(17)
succession planning	%	0.2	(99)	9.4	(25)
in employing labour	%	1.7	(76)	8.1	(31)
other	%	4.2	(95)	4.3	(44)
farms using computers	%	33.8	(24)	50.2	(9)
courses likely to be undertaken in the next 12 months:					
business management	%	2.3	(57)	12.3	(24)
herd management	%	2.4	(81)	16.7	(23)
herd nutrition	%	4.9	(72)	25.3	(19)
concentrate and feed management	%	6.4	(70)	21.3	(22)
pasture management	%	9.2	(38)	24.6	(21)
milk quality	%	3.7	(87)	7.1	(29)
people management and employment	%	1.5	(70)	8.2	(29)

continued...

table 9 **advice, training and likely management changes by intention to make changes in 12 months, 2004-05 – Australian dairy farms**
average per farm *continued*

		no significant changes		significant changes	
courses likely to be undertaken in the next 12 months: *continued*					
computer skills	%	4.8	(55)	16.8	(23)
soils and fertiliser	%	6.1	(53)	17.3	(20)
fodder conservation	%	0.2	(136)	9.3	(23)
no training likely to be undertaken	%	62.4	(12)	29.7	(16)
other training	%	5.5	(78)	6.0	(37)
management/technology changes in the next 12 months:					
dairy improvements	%	5.2	(61)	24.7	(17)
new plant and equipment	%	1.4	(71)	26.0	(15)
installation of new feed system	%	3.5	(60)	17.2	(20)
improved grazing and pasture management	%	10.4	(24)	37.2	(14)
improved supplementary feeding	%	0.7	(95)	36.3	(14)
irrigation plant and layout	%	17.0	(38)	29.9	(15)
additional land irrigated	%	0	(154)	15.4	(26)
increased fertiliser use and planning	%	13.7	(43)	49.0	(9)
changes to calving pattern	%	3.2	(99)	15.1	(27)
soil testing	%	8.7	(62)	28.6	(12)
electronic herd identification	%	1.3	(135)	20.1	(15)
factors limiting change:					
access to support, advice to make change	%	0.6	(94)	3.0	(33)
access to funding to increase borrowings	%	27.8	(30)	41.3	(11)
workload or labour issues	%	26.4	(26)	45.5	(11)
attitude to the dairy industry viability	%	39.8	(19)	24.9	(17)
age	%	53.0	(16)	22.7	(16)
no factor limiting	%	8.3	(50)	6.0	(34)
other factors	%	21.3	(35)	6.8	(35)

a Some dairy farms that indicated not to make significant changes overall, indicated minor changes to some aspects of their farm business.

Notes: Figures in parentheses are standard errors expressed as percentages of the estimates . A guide to interpreting these is included in the survey methods section. A zero with a standard error indicates that the estimate is greater than zero but less than 0.05 per cent.

In 2004-05, dairy farmers who did not intend to make changes in the next twelve months also did not frequently seek advice. The number of times that these farmers obtained advice was much less than that for farmers who intended to make significant changes (table 9). They also participated less in discussion groups, workshops and training courses.

Over half of the dairy farmers who did not intend to make changes in the next twelve months indicated that age was a limiting factor in making changes, compared with just 23 per cent of farmers who intended to make changes.

For farmers who intended to make changes in the next twelve months, the two most limiting factors to making changes were access to funding to increase borrowings and workload or labour issues (table 9).

performance indicators

The trends evident in technology and management practice adoption over the survey period coincided with gains in milk production per cow, increased labour productivity and farm size. Milk yield per cow increased over the survey period from 4050 litres in 1991-92 to 5160 litres in 2004-05 (table 10). Milk production per labour unit (defined as one year of full time work at 40 hours a week) increased from 177 000 litres per labour unit in 1995-96 to 293 000 litres per labour unit in 2004-05. In terms of area operated, milk production increased from 6000 litres per hectare used by milking cows in 1995-96 to 8700 litres in 2004-05 (figure R, table 10).

The number of cows milked per labour unit increased from an average of around 39 cows per labour unit in 1995-96 to 57 cows per labour unit in 2004-05, reflecting changes in milking shed equipment and management.

fig R **milk productivity measures**
Australian dairy farms

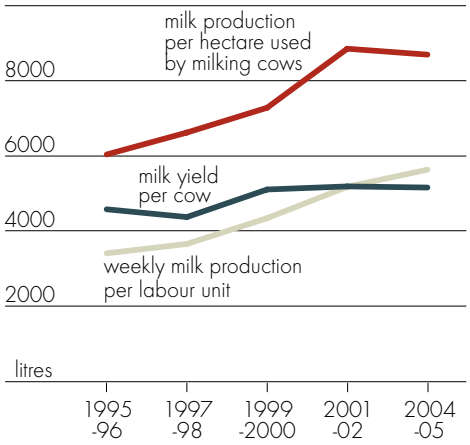


table 10 **selected performance estimates – Australian dairy farms**
percentage of farms or average per farm

		1991-92		1993-94		1995-96		1997-98		1999-2000		2001-02		2004-05	
estimated number of farms		13 592		14 059		13 674		13 815		12 960		10 995		10 112	
area of land operated at 30 June	ha	178	(4)	189	(4)	214	(5)	214	(4)	217	(4)	257	(5)	225	(5)
area utilised by milking cows	ha	95	(3)	95	(4)	102	(4)	100	(4)	111	(5)	112	(4)	112	(3)
area of farm irrigated	ha	26	(8)	29	(6)	31	(8)	37	(9)	41	(11)	46	(10)	34	(10)
dairy herd at 30 June	no.	182	(3)	195	(2)	227	(3)	243	(2)	256	(3)	310	(2)	293	(3)
dairy cows at 30 June	no.	121	(3)	126	(2)	148	(3)	157	(3)	165	(3)	197	(3)	193	(4)
cows milked for more than 3 months	no.	117	(3)	120	(2)	135	(3)	151	(2)	158	(3)	192	(3)	189	(3)
milk production	L	472 254	(4)	541 258	(2)	617 813	(4)	659 792	(3)	805 177	(4)	994 404	(4)	975 079	(4)
labour units [a]	no.	–		–		4	(2)	4	(2)	4	(2)	4	(2)	3	(3)
milk income	$	193 535	(3)	226 414	(2)	262 268	(4)	251 443	(3)	279 445	(3)	382 685	(4)	322 635	(4)
farm cash income	$	62 473	(5)	74 443	(4)	80 043	(6)	67 994	(6)	82 443	(6)	125 447	(6)	82 317	(7)
farm business profit	$	–2 829	(134)	18 474	(15)	17 909	(24)	–5 220	(85)	4 712	(112)	67 698	(10)	20 446	(30)
purchased feed to total feed	%	–		–		68	(2)	66	(2)	68	(2)	71	(2)	68	(2)
milk yield per cow	L	4 054	(2)	4 526	(2)	4 584	(2)	4 377	(2)	5 111	(2)	5 193	(3)	5 163	(2)
feed cost per cow	$	–		–		521	(4)	488	(3)	508	(4)	619	(4)	575	(4)
herd costs per cow	$	–		–		69	(4)	71	(6)	77	(4)	73	(5)	76	(5)
shed costs per cow	$	–		–		77	(5)	63	(3)	71	(5)	73	(5)	74	(5)
grain and concentrates per cow	kg	734	(6)	925	(7)	887	(6)	1 101	(6)	1 245	(6)	1 338	(5)	1 265	(6)
supplementary dry matter feed per cow	kg	2	(3)	2	(4)	2	(4)	2	(4)	2	(4)	2	(4)	2	(4)
stocking rate cows/ha		1	(3)	1	(3)	1	(4)	2	(4)	2	(5)	2	(4)	2	(3)
milk production per hectare used by milking cows	L	4 995	(4)	5 728	(4)	6 043	(4)	6 627	(5)	7 287	(5)	8 859	(5)	8 701	(4)
milk production per labour unit	L	–		–		177 438	(4)	190 375	(3)	226 041	(3)	269 516	(3)	293 197	(4)
milking cows per labour unit	no.	–		–		39	(3)	44	(3)	44	(3)	52	(3)	57	(4)

a Based on a 40 hour week. **na** Not available.
Note: Figures in parenthesis are standard errors expressed as percentages of the estimates provided.

A appendix

survey method

target population

ABARE surveys are designed and samples selected on the basis of a framework drawn from the Business Register maintained by the Australian Bureau of Statistics (ABS). This framework includes agricultural establishments in each statistical local area, classified by size and major industry.

The estimates published in this report cover establishments with an estimated value of agricultural operations of $22 500 or more. A definition of the estimated value of agricultural operations is given in ABS, *Australian Standard Industrial Classification, 1983* (ABS cat. no. 1201.0).

definitions of industries

Industry definitions are based on the Australian and New Zealand Standard Industrial Classification (ANZSIC). This classification is in line with an international standard that is applied comprehensively across Australian industry, permitting comparisons between industries, both within Australia and internationally.

Farms assigned to a particular ANZSIC class 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 ABS, *Australian and New Zealand Standard Industrial Classification, 1993* (ABS cat. no. 1292.0).

The sample included only those properties classified into the dairy industry (ANZSIC class 0130): farms engaged mainly in dairying.

survey of the Australian dairy industry

ABARE's Australian dairy industry survey (ADIS) has been conducted annually by ABARE since 1979 and usually involves visits to approximately 300 dairy farms across Australia. For 2004-05 the sample was 290 dairy farms. The survey

covers establishments defined by ANZIC class 0130 (dairy cattle farming) – those engaged in dairy farming – with an estimated value of agricultural operations (EVAO) of $22 500 or more.

the sample

The 2004-05 estimated population and number of dairy farms sampled were:

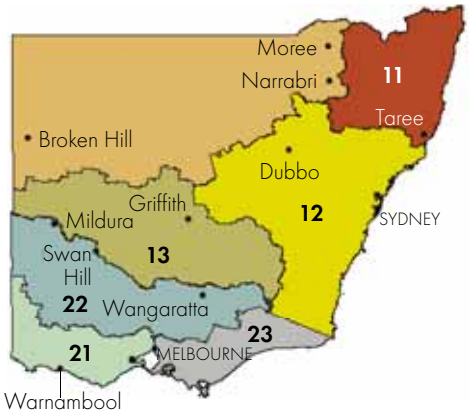
	population	**sample**
	no.	no.
New South Wales	1 397	72
Victoria	6 286	80
Queensland	1 063	38
Western Australia	321	33
South Australia	503	39
Tasmania	542	28
Australia	10 112	290

Regional level estimates are also presented for New South Wales and Victoria. Time series data for regions in Victoria are only presented for the two recent dairy technology surveys due to the changes in dairy regions in 2000. In 2004-05 the number of sample farms and the populations for each region in these two states were:

	population	**sample**
New South Wales		
Region 11 – Northern	539	18
Region 12 – Central and Southern	646	33
Region 13 – Riverina	212	21
Victoria		
Region 21 – South Western	1 685	27
Region 22 – Murray Basin	2 487	27
Region 23 – Gippsland	2 114	26

Regional boundaries for New South Wales and Victoria are shown in map 1.

map 1 **Australian dairy industry survey regions in New South Wales and Victoria**



the questionnaire

The questionnaire used to collect data on management practices and technology use on Australian dairy farms covered the following aspects:

- type of dairy, time taken to complete a milking and types of equipment and machinery used
- bulk vat type, age and capacity
- effluent disposal system
- feeding regimes and fodder conservation practices
- soil testing and drainage
- farm management
  - sources and frequency of advice
  - discussion group attendance
  - computer use
  - planning horizon
- dairy herd management
  - breeding technology
  - herd health
  - incidence of specific diseases
- farmers' intentions to change and factors limiting their ability to change.

Responses to this questionnaire were obtained by face to face interviews with dairy farmers who also provided data for the full dairy industry survey. Additional

data on items such as farm labour; milk production, costs, receipts and other financial measures were sourced from the 2005 dairy survey collection.

reliability of estimates

The reliability of the estimates of population characteristics presented in this report depends on the design of the sample and the accuracy of the measurement of characteristics for the individual sample farms.

Only a small number of farms out of the total number of farms in the dairy industry are used to produce the survey estimates. These estimates are likely to be different from those that would have been obtained if information had been collected from a census of all farms. How closely the survey results represent the population is influenced by the number of farms in the sample, the variability of farms in the population and the design of the survey and the estimation procedures used.

In the design for the dairy survey (from which this report is derived) the population is stratified according to farm size, and region to ensure wide coverage of farm types across Australia. The data collected from each sample farm are weighted to calculate population estimates. To increase the efficiency of the estimation process in generating measures of farm financial performance, the sample weights are based on milk production, which is linked to farm income and profits. Sample weights are calculated so that estimates of variables match reliable data obtained from other sources.

A consequence of this approach is that sample weights differ from farm to farm (Bardsley and Chambers 1984). Typically, larger farms have small weights and smaller farms have larger weights, reflecting the strategy of sampling a higher fraction of the larger farms than of small farms (the former having a wider range of characteristics).

Sample weights are based on populations derived from the ABS Agricultural Census and the Agricultural Commodity Survey. Milk production is benchmarked to data provided on Dairy Australia website (www.dairy.com.au/industry)

measures of reliability

As a guide to the reliability of the survey estimates, measures of sampling variation have been calculated. These measures are expressed as percentages of the

survey estimates and termed 'relative standard errors'. They are presented with each estimate in italics.

These relative standard errors 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. The first step in this calculation is to obtain what is described as the standard error by multiplying the relative standard error by the survey estimate and dividing 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. 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. There is roughly a nineteen in twenty chance that the census value is within two standard errors of the survey estimates (the 95 per cent confidence interval). Thus, in this example, there is an approximately two in three chance that the census value is between $94 000 and $106 000, and an approximately nineteen in twenty chance that the census value lies between $88 000 and $112 000.

comparing estimates

When comparing estimates between different groups of farms within the surveyed population, it is important to recognise that the differences between estimates are also subject to sampling variation. As a rough rule of thumb, a conservative estimate (an overestimate) of the standard error of the difference can be constructed by adding the squares of the estimated standard errors of the component estimates and then taking the square root of the result. An example is given below.

Suppose estimates of total cash receipts for farms in two different regions were $100 000 and $125 000 – 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

$$\sqrt{\left[\left(0.06 \times \$100000\right)^2 + \left(0.06 \times \$125000\right)^2\right]} = \$9605$$

Therefore the relative standard error of the difference is:

($9605 / $25000) x 100 = 38 per cent.

When comparing estimates of change from year to year it should be noted that there are changes in populations from one year to the next. Differences in estimates, such as farm incomes, might be caused by the changes in population covered by the survey as well as changes in incomes of farmers between years.

Initial estimates for a year are generally based on the same populations as for the previous financial year and are designated as 'provisional' estimates. When initial data on populations for the year become available the estimates for that year are recalculated and designated as 'preliminary' estimates. 'Final' estimates for a year are reported when no further changes are expected in either the survey data or the population data.

data quality

ABARE's survey system is designed to produce data of a quality suitable for research and analysis at the unit level. This involves a set of quality controls, with procedures being tailored to the specific requirements of individual surveys. The key to the success of the system is employing specialist survey officers and statisticians to guide the design and operation of the data collection and estimation process.

With voluntary surveys, the first critical control point is maximising the response rate of the selected survey sample. Having staff with appropriate people skills is essential. Problems of data quality arising from this source are reduced by the use of procedures to guide the selection of replacement farms, and the use of statistical and other modelling in the estimation process.

Data quality is also enhanced by checks against available external data sources and by internal consistency checks. The first of these checks takes place at the time of collection. With expert survey staff and training in the specific survey topic, much of the checking for internal consistency of data is done most effectively and efficiently as part of the interview. After the collection of the survey information, the data are passed through a series of automated and manual edits to check against any data collected at the unit level from other sources and as a final check for internal consistency. Extreme observations are also identified and, if necessary, checked by a second contact with the survey respondent.

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02.07

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Australian Government Department of Industry, Tourism and Resources

Australian Government Department of Prime Minister and Cabinet

Australian Government Department of Transport and Regional Services

Australian Wool Innovation Limited

CRC – Plant Biosecurity

CSIRO (Commonwealth Scientific and Industrial Research Organisation)

Dairy Australia

Department of Business, Economic and Regional Development, Northern Territory

Department of Premier and Cabinet, Western Australia

Department of Primary Industries, New South Wales

Department of Primary Industries, Victoria

East Gippsland Horticultural Group

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