The Australian Dairy Goat Industry

An assessment of the population and farm gate value

By Emma Zalcman and Brendan Cowled, Ausvet Pty Ltd
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Foreword

The Australian dairy goat sector is an important emerging industry, however, little is known about its true size. Recent estimates are limited, but it appears that the national herd is growing, and so too is the value of the industry to the rural economy.

Farmers of new animal industries are often not well connected to each other, and can have few resources that describe best production and management practices, for Australian conditions.

This report provides an estimate of the population and farm gate value of the Australian dairy goat herd in 2016, the approximate litres of dairy goat milk processed annually, and outlines a future study to estimate the total value of the dairy goat sector in Australia.

The key findings suggest the industry is growing, but remains fragmented. Most producers see value in creating a single industry group in the future. Further work is required to explore the return on investment in R & D in this sector.

This project was funded from the Rural Industries Research and Development Corporation (RIRDC) Core Funds which are provided by the Australian Government.

This report is an addition to RIRDC’s diverse range of over 2000 research publications and it forms part of our New and Emerging Animal Industries R&D program.

Most of RIRDC’s publications are available for viewing, free downloading or purchasing online at www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

John Harvey
Managing Director
Rural Industries Research and Development Corporation
About the Author

Ausvet is an independent, private company dedicated to providing high quality services to the animal and plant industries of Australia and globally. It achieves this by working with industry bodies, government agencies and other organisations and independent scientists and professionals. Ausvet was established in early 1996 to be a leader primarily in the changing spectrum of animal health service delivery through its expertise in epidemiology and program management.

Acknowledgments

Ausvet would like to acknowledge the contribution of Wendy Coutts, John Falkenhagen and Tom Dingle. These industry representatives provided guidance and feedback on the methodology and results presented in this report. In addition, Ausvet would like to thank Simon Foley for his enumeration work, the state and territory licensing boards and all the farmers who participated in the survey. Lastly, Ausvet would like to thank Professor Tom Kompas for his assistance with economic analysis.

Abbreviations

CAE  Caprine arthritis-encephalitis virus

R & D  Research and Development
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Executive Summary

What the report is about

This report presents an estimate of the population and farm gate value of the Australian dairy goat herd. Quantifying the size of the industry is important in monitoring trends and planning future research priorities.

Who is the report targeted at?

The information in this report is targeted at the Program and RIRDC management, all sectors of the Australian dairy goat industry and the wider Australian community.

Where are the relevant industries located in Australia?

The majority of Australian dairy goat farmers are found in Victoria and New South Wales, however, Queensland, South Australia, Western Australia and Tasmania also have dairy goat farms. There were 68 dairy goat farms licensed to make food products in 2016, producing 16,867,792 litres of milk annually, with a farm-gate value of $20.2-26.9 million. Products include milk, cheese and milk powder. This research will benefit the Australian dairy goat industry.

Background

The Australian dairy goat sector is a small but growing industry. In 2012, there were 63 licensed dairy goat farming producing food goods in Australia; mostly whole milk and cheese. But there has not been an estimate of the size of the industry since then. Little is known about the industry when compared to larger primary production sectors, and producers have limited contact with each other, or access to information to assist them to increase their productivity.

Aims/objectives

This project aimed to estimate the population and farm gate value of the Australian dairy goat herd in 2016, the approximate litres of dairy goat milk processed annually, and outline a future study to estimate the total value of the dairy goat sector in Australia.

Methods used

There were three approaches to the collection of information for this report.

1. A literature review of existing published and grey literature on Australian dairy goat farming from the last 20 years

2. Contact with all jurisdictional dairy licensing board to establish the number of licensee holders (census)

3. A farmer survey focused on farmer demographics, farm production and farm labour

Results/key findings

Key results include;

There were 68 dairy goat farms licensed to make food products in 2016, of which 41 participated in the survey (60%).

Of the farmers surveyed;
• Fifty-one per cent are female and 49% are male
• Eighty-six per cent are over 40 years of age
• The mean number of milking goats per farm is 449 and the mean total number of goats per farm is 679
• The mean number of litres of milk produced per goat per day is 2.5 litres
• A total production of 9.6 million litres of milk was reported from these 41 farms alone; suggesting an increase in production since 2012
• Sixty per cent of the produce is sold as cheese, 18% as fresh milk and the remaining as milk powder or other products (including unknown)
• The mean number of employees per farm in addition to the survey respondent is 2.5
• Seventy-three per cent of the respondents supported the future development of an industry group

Implications for relevant stakeholders

The Australian dairy goat industry is growing but still relatively small and fragmented. If the farmers surveyed are representative, then national commercial milking herd is approximately 30,550 milking goats and 46,152 goats in total, producing 16,867,792 litres of milk annually with a farm-gate value of $20.2-26.9 million. Producers have little contact with each other, and the daily milk production is probably lower than it is in globally leading countries such as France. The number of goats has grown significantly compared to the growth in the number of farms, suggesting that commercial dairy goat farms are getting larger. Most producers are supportive of an industry group in the future, although many have concerns about the nature of such a group.

Recommendations

Most producers would support further research and development in their industry. However, to justify additional investment, a full economic assessment of the return on such an investment is required. RIRDC should consider funding a full economic assessment of the industry.
Introduction

The Australian dairy goat industry makes a small but valuable contribution to the health and wealth of Australians but little is known about the scale of its impact. The industry is presumed to be comparatively small, but consumer demand for healthy and niche dairy products is increasing (Department of Environment and Primary Industries 2017; Agriculture Victoria 2016; Department of Food and Agriculture 2017). Two previous RIRDC projects have investigated the state of the industry, and suggested some figures on its size (Foster 2014; Stubbs and Abud 2009). However, little work has been done to confirm these numbers since 2012, track them over time, or quantify more accurately the contribution dairy goat farming makes to the Australian economy.

In 2009, Stubbs and Abud described 65 commercial dairy goat farms in operation, carrying about 12,000 goats, with one third processing their own milk and the others selling it to 15 processing factories, in their RIRDC report (Stubbs and Abud 2009). Total milk production was estimated at 6 million litres per annum in 2009 (Stubbs and Abud 2009). Sixty per cent of this was thought to go into cheese production, representing a retail value of $22 million (Stubbs and Abud 2009). Thirty-five per cent was sold as whole milk for a retail value of around $7 million and the remainder used for milk powder (Stubbs and Abud 2009). It is difficult to obtain figures on goat milk production prior to 2009, although it has been estimated that Victorian cheesemakers processed around 1.4 million litres of goat’s milk in 2005-2006 (Abud and Stubbs 2009).

By 2011-2012, Foster estimated that 63 dairy goat farms with approximately 15,750 head of goats producing food products were in operation in the second RIRDC report on the industry (Foster 2014). Foster suggested these food-producing dairy goats generated nearly 8 million litres of milk with an estimated annual value of $11 million (Foster 2014). Most produce came from Victoria and Queensland, accounting for 35% and 25% respectively (Foster 2014). South Australia and New South Wales were estimated to account for 15% of the produce each and 5 per cent from each of Tasmania and Western Australia (Foster 2014). These were slightly different state by state breakdowns than those reported in 2009 (Stubbs and Abud 2009). However roughly the same break down by products as was described in 2012 and 2009; with 60% of milk produced going to cheese, 35% to whole milk or yoghurts, and the remaining to processed powder and tablets (Foster 2014).

Despite steady growth, the industry is fragmented, and significantly less organised than other Australian agricultural primary industries (Abud and Stubbs 2009; Department of Environment and Primary Industries 2017). In general, distance and time constraints mean that producers have little contact with each other, although dairy goat breeds societies offer some opportunity for knowledge exchange (Abud and Stubbs 2009; Stubbs and Abud 2009). There is a lack of specific, evidence-based information on dairy goat production, and whilst research from the cattle dairy sector may be helpful, many producers have noted that goat farming has its own unique challenges (Stubbs and Abud 2009).

One of the greatest constraints to the productivity of dairy goat farms in Australia is providing year-round milk supply (Stubbs and Abud 2009). Exposure to long day photoperiod has been shown to increase milk yield and lactation persistence under Australian conditions (Russo et al. 2013). However, most farms are partaking in seasonal breeding (Stubbs and Abud 2009). Artificial breeding has low pregnancy rates, and there is no proven semen currently available in Australia (Stubbs and Abud 2009; Abud and Stubbs 2009).

The traditional combination of shedding and access to pasture can limit productivity, and poor shed design often leads to high labour input and suboptimal hygiene, with subsequent animal health problems (Stubbs and Abud 2009). Lack of energy is the most common problem affecting production (Department of Environment and Primary Industries 2017). Metabolic problems such as milk fever and pregnancy toxaemia tend to increase with shedding, whilst parasites are a major problem for pasture fed goats (Stubbs and Abud 2009; Department of Food and Agriculture 2017). Caprine arthritis-encephalitis virus (CAEV) is also present in Australia, although only about 10% of goats...
shows signs of the disease (Department of Food and Agriculture 2017; Greenwood 1995; Surman, Daniels, and Dixon 1987). Additional health problems likely to occur on Australian goat dairy farms include foot issues, mastitis and Johne’s disease (Windsor 2015; Abud and Stubbs 2009; Department of Food and Agriculture 2017).

In relation to human health, a large Q fever outbreak occurred recently on an Australian goat and sheep dairy farm (Bond et al. 2016; Muleme et al. 2017). Vaccination against Q fever is strongly recommended for all people occupationally exposed to animals or their products (Bond et al. 2016). Also related to human health, few veterinary drugs are registered for use in goats, and hence, many products are used off label, especially parasite drenches (Stubbs and Abud 2009). How these may result in milk residues is largely unknown (Stubbs and Abud 2009).

In the two past reports that estimated the size of the industry, it is unclear how the estimates provided were calculated. Whilst the number of farms with a commercial license to produce food products is easily obtained from jurisdictional licensing bodies, size, production and value of the national herd are more difficult to quantify; and the methodologies behind the estimates above have not been fully described in previous work. In addition, the previous reports did not explore farmer demographics, farm location, on-farm employment or farmer priorities for the future of the industry. Jurisdictional agricultural department websites also provide very little additional information on the industry than that presented in previous RIRDC reports (Department of Food and Agriculture 2017; Department of Environment and Primary Industries 2017; Agriculture Victoria 2016). There is no previous work that explores the views of farmers on future priorities for the industry, or gauges the interest of producers in developing a single industry group. However, this information is crucial for RIRDC to make future decisions on resource allocation for this industry.

This project aimed to estimate the population and farm gate value of the Australian dairy goat herd in 2016, the approximate litres of dairy goat milk processed annually, and outline a future study to estimate the total value of the dairy goat sector in Australia. In addition, this study aimed to explore the farmer demographics, farm location, on-farm employment and future industry priorities; including gauging the level of interest for a single industry group.
Objectives

The objectives of this project were to:

1. Estimate the population and farm gate value of the Australian dairy goat herd that produces food for human consumption
2. Determine the approximate litres of dairy goat milk processed in Australia annually.
3. Outline a future study to estimate the total value of the dairy goat sector in Australia.
Methodology

Literature review

Initially, the researchers completed a literature review. Two databases, ‘Web of Science’ and ‘Google scholar’ were used to capture scientific literature, applying the search terms listed in appendix one and using a date range of 1990 onwards. In ‘Web of Science’, search by topic was used in combination with specific search terms. ‘Google scholar’ does not allow for search by topic (only title or whole text). Therefore, search by title was used in ‘Google scholar’ but the search terms chosen were broader than those used for ‘Web of Science’ and included words for exclusion. Titles and abstracts were then screened for relevance and eliminated if they were focused predominately on:

- Goat populations overseas with little or no mention of Australia,
- Meat or fibre goat populations,
- Feral goat populations,
- The control of weeds using goats,
- Small laboratory reports based on a disease occurring in less than 5 goats, or
- Highly technical laboratory studies with few farm level applications (e.g. goat blood groups)

The standard Google search engine was used to capture grey literature. Applying the search term ‘Australian dairy goat industry’, titles of the first 50 hits were screened for relevance and those considered appropriate were investigated further.

To ensure no grey literature was missed, the department of agricultural in each state, and the RIRDC website, were explored for additional material. The internal search engine on these sites was used to source material including the term ‘dairy goats’. Only material referring directly to goat dairy was considered relevant. Forms and documentation for the movement of dairy goats were not considered relevant.

Jurisdictional dairy licensing boards and farmer survey

In the first instance, the dairy licensing body of each state and territory was contacted with a request for producer contact details and the number of dairy goat licensees. In most cases, the licensing bodies were unable to provide contact details but all states and territories could supply the number of license holders. A steering group of goat producers was also established to assist with survey design and gathering of contact details. Through meetings with the steering group and internet searches for dairy goat business websites, approximately 30 farmer contact details were obtained. The survey included a question on identifying any additional farmers known to the respondent, so the number of contact details grew as the surveys began. Significant effort was made to survey as many farms as possible. Numerous farms were contacted several times and attempts were made to identify and contact farms through different mediums (for example, two farms were contacted initially through business facebook pages).

The surveys were conducted by telephone (see appendix four). Questions related to the name and location of the dairy, gender and age of the farmer, size and production of the farmer’s herd, nature of the products manufactured, the farmer’s view on the future of the industry, information relating to employment on the farm and if the farmer knew the contact details for any other dairy goat farmers. The enumerator entered the responses into ‘survey monkey’ (www.surveymonkey.com) whilst conducting the interviews and kept an excel spreadsheet of farmer contact details.
Results

Literature review

After screening the titles, a total of 13 publications with relevance to the Australian dairy goat industry were identified. The titles are listed in Appendix two. An additional three relevant resources were found on state department websites and eight on the Rural Industries Research and Development Cooperation website. A further 18 websites relevant to the Australian dairy goat industry were identified from the google search. These grey literature resources are listed in Appendix three. A summary of the information from this literature relevant is provided in the introduction, however many of the websites do not provide much additional, specific information of relevance to this report.

Number of registered food producing dairy farms

In 2016, there were 68 dairy goat farms registered with jurisdictional dairy registration bodies. This figure does not include dairy goat businesses that are not producing food products (e.g. those solely producing soap). These businesses do not require registration and were not included in our terms of reference. The number of farms per state is shown in figure 1.

Farmer survey

A representative from 41 of the 68 farms (60%) participated in the survey. Five farms did not want to participate in the survey and the remaining 22 farms could not be contacted.

Distribution

The distribution of 50 located Australian goat dairy farms is shown in figure 1. These farms comprise the surveyed farms and an additional nine farms that were located but did not participate in the survey. Eighteen farms that could not be contacted are not included on the map. The points on the map represent the longitude and latitude of the postcode where the farm is located.
Respondent demographics

Twenty of the respondents were female and nineteen were male. The gender of the farmer from two farms was excluded from analysis because that one person completed the survey on behalf of three different licensed farms. The age range of respondents is shown in Figure 2.

Figure 2. Age of Australian dairy goat farmers

Milk production statistics

The number of milking goats on each farm in 2016 ranged from 16 to 5000, with a mean of 449 goats (95% CI: 160-738). The total number of milking goats across farms that responded to the survey was 18,420.

Figure 3 summarises these numbers.

The total number of goats per farm in 2016 (milking and non-milking) varied from as little as 37 to as many as 7500, with a mean of 678 goats per farm (95% CI 268-1089). The total number of goats across all 38 surveyed farms (milking and non-milking) was 27,827.
The milking goats on the farms surveyed were reported to produce 1.5-4.5 litres of milk per day, with a mean of 2.5 litres of milk per milking goat per day (95% CI: 2.2-2.8). Results are summarised in figure 4.

Thirty-seven per cent of respondents processed their own products, whilst 63% sold milk to processors.
The total milk production interpolated for each surveyed farm based on average milk production and number of goats was 9,674,175 litres (n=39).

Of these litres, 60% goes to cheese, 18% to milk and the remainder to milk powder and other products (including unknown). This breakdown is shown in table 1.

<table>
<thead>
<tr>
<th>Milk production use</th>
<th>Proportion of production of milk to each product (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese</td>
<td>60</td>
</tr>
<tr>
<td>Milk</td>
<td>18</td>
</tr>
<tr>
<td>Milk powder</td>
<td>4</td>
</tr>
<tr>
<td>Other (e.g. yoghurt)</td>
<td>19</td>
</tr>
</tbody>
</table>

**Farm labour**

Most farmer’s responding to the survey worked full time (90%) with the remaining working part time (10%).

Sixty-two per cent of farms also had one or more additional people engaged in full-time paid employment.

Of the 39 farmers that responded to the employee section of the survey, a total of 118 additional paid workers were reported (not including the farmer who responded to the survey).

In relation to part-time employees (in addition to the respondent), 23 farms reported that they did not employ any additional part-time staff, five farms employed one additional part-time worker, two farms employed two additional part-time workers, six farms employed three additional part-time workers and three farms employed more than three additional part-time workers.

In relation to full-time employees (in addition to the respondent), 14 farms reported that they did not employ any additional full-time staff, nine farms employed one additional full-time worker, six farms employed two additional full-time workers, three farms employed three additional full-time workers and five farms employed more than three additional full-time workers.

In relation to unpaid labour, four farms reported that no one in their household contributed unpaid labour, 14 farms reported that one person in their household contributed unpaid labour, 16 farms reported that two people in their household contributed unpaid labour and three farms reported that more than two people in their household contributed unpaid labour.

On average, each farm engaged 2.6 paid employees (95% CI 1.3-3.8) in addition to the survey respondent (part-time workers are assumed to represent 0.5 of a full-time employee). Eighty-eight per cent of farms utilised unpaid labour.

**The future of the industry**

Nineteen farmers indicated that they intended to increase their milk production over the next five years. Eight said they intended on producing the same amount of milk in five years. Two said they planned on producing less. The remaining respondents either did not answer the question, said they were unsure or gave figures that were inconsistent and therefore difficult to interpret.
Seventy-three per cent of respondents were supportive of an industry group in the future (with 22% specifying conditions such as ‘if it was well managed’). Responses relating to a potential industry group are summarised in figure 5.

**Figure 5. Respondents in favour of an industry group**

**Discussion**

This was an opt-in survey that utilised convenience sampling. However, 60 per cent of the total number of Australian dairy goat licensee holders were included, and the number of licensee holders is known with certainty. The inability to contact all producers demonstrates the fragmentation of the industry, as very few farms could provide contact details for other farms, and when they did, they were usually the larger farms that other farmers had already named. The authors do not know of any previous studies involving detailed surveying of Australian dairy goat producers with the aim of determining the size and value of the industry.

The number of licensed Australian dairy goat farms has grown from 63 to 68 since the last estimates in 2012 (Foster 2014). The 2012 estimates described a national herd of around 15,000 goats (Foster 2014). However, in this 2016 survey, respondents reported 18,420 milking goats and 27,827 goats in total, with only 60% of the herd surveyed. It is unclear if Foster’s 2014 estimates referred to the milking herd or the entire herd. If the sample of survey respondents is representative, we could estimate that in 2016 the Australian national dairy herd consisted of 30,550 milking goats and 46,152 goats in total. However, this assumes that the farmers surveyed are representative and hence the figures could be biased in an unknown direction (see limitations). It is likely that the national herd number has increased significantly since 2012, and/or that previous surveys have under-estimated the size of the national herd. In addition, 19 farmers indicated their intention to increase production over the next five years.

Over half the respondents to this survey were female. This is interesting given that over the entire agricultural sector, 72% of farmers in Australia are men (Australian Bureau of Statistics 2012). Most respondents to this survey were over 50. This is typical in Australian agriculture where the median age of farmers is 53 compared to 40 years for other occupations (Australian Bureau of Statistics 2012).

The average number of goats per farm (678) was relatively large, which is supported by previous work that suggested small operations may not be viable (Stubbs and Abud 2009). Over 80% of farms still utilise unpaid labour, indicating possibly that most farms remain family operated businesses.
The number of litres per day produced on the farms surveyed appears to be less than the production figures achieved in France, the country usually considered to be the world leader in dairy goat production (Abud and Stubbs 2009). France is also the only country with a national, structured herd improvement scheme (Abud and Stubbs 2009). This program describes it’s two leading dairy breeds, Saanen and Alpine as producing 3.17 and 3.01 litres of milk per day respectively, considerably more than the mean of 2.5 litres of milk per day reported in this survey. Whilst this indicates that Australian production could be enhanced, a complex suite of differences may exist between France and Australia, including feed, management and political differences, including subsidies. This indicates that increasing production may not be economically viable.

If the sample of survey respondents is representative, we could estimate that in 2016 the entire Australian national dairy herd produced 16,867,792 litres of milk. This is close to double the reported industry production in 2012 (Foster 2014). Assuming a farm-gate milk price of between $1.20 and $1.60, this represents an annual farm-gate value of $20.2-27.0 million, significantly higher than the $11 million estimated in 2012, even when consumer price index is considered (Foster 2014).

In relation to the products manufactured from the Australian dairy goat herd, results from this survey suggest that there is an increase in the number of litres going into products other than fresh milk and cheese when compared with 2012. In 2012, it was estimated that 60% of milk produced was being used to make cheese and 35% sold as whole milk, leaving only five per cent for other products (Foster 2014). In this survey, 23% of the milk was reported to be used to make products other than cheese or whole milk, with five per cent going to powder. These results may reflect the increased demand for whole-milk powder coming from Asian countries such China and Malaysia in recent years (Dong 2006).

Given the growth of the industry and the relatively little contact producers have with each other, it is not surprising that 73% of respondents were supportive of an industry group.

**Limitations of this study**

This survey was a convenience sample, so results may not be representative of the entire Australian dairy goat herd. Larger farms may have been more likely to be approached for participation in the survey, because their contact details are known by others or available through public websites. Results should therefore be interpreted with caution. However, response rate was 60%, a threshold commonly used when considering the level of response required to minimize the risk of nonresponse bias (Davern 2013; Fincham 2008). This study also draws comparison to figures described in Foster’s 2012 report (Foster 2014). However, the methodology for Foster’s figures remains unclear. It is possible that the significant changes in industry size, for example, are a product of differing methodology for estimating industry size rather than real changes.

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1 There are no official farm-gate milk price figures for goat’s milk. This estimate is based on discussions with the steering group of producers.

2 The value of $11 million in 2012 is equivalent to around $11.9 million in 2016. The figures used are derived from Australian Bureau of Statistics consumer price index calculator (available at www.abs.gov.au)
Implications

The Australian dairy goat industry is growing, but still relatively small and fragmented. If the farmers surveyed are representative, then national commercial milking herd is approximately 30,550 milking goats and 46,152 goats in total, producing 16,867,792 litres of milk annually with a farm-gate value of $20.2-26.9 million. Producers have little contact with each other, and the daily milk production is probably lower than it is in globally leading countries such as France. The number of goats has grown significantly compared to the growth in the number of farms, suggesting that commercial dairy goat farms are getting larger. Most producers are supportive of an industry group in the future, although many have concerns about the nature of such a group.

Investment in research and development (R & D) contributes significantly to productivity growth in agricultural industries (Mullen 2007). The challenge is deciding which agricultural industries will produce the greatest return on R & D investment. This decision is especially critical when public funding will be expended. This report clearly demonstrates that the industry is growing and could benefit from R & D funding but the return on this investment requires a more detailed economic analysis.
Recommendations

The Australian dairy goat industry supplies growing domestic and international niche markets. However, it is fragmented and significantly less organised than other Australian agricultural primary industries (Abud and Stubbs 2009; Department of Environment and Primary Industries 2017). Although dairy goat breed societies offer some opportunity for knowledge exchange, in general, distance and time constraints mean that producers have little contact with each other (Abud and Stubbs 2009; Stubbs and Abud 2009). There is a lack of specific, evidence-based information on dairy goat production (Stubbs and Abud 2009).

Therefore, both in terms of securing emerging markets and fulfilling gaps in R & D, investment in Australian dairy goat industry makes sense. However, an economic study into the value of the dairy goat industry, and more importantly, the rate of return for investment into the national dairy goat herd, would allow for evidence-based decision making.

Proposed methodology

The best way to plan investment is to assess the likely rate of return on that investment. This cannot be done by simply using basic cost-benefit methods, but rather methods that concentrate on estimating rates of return or the value-added of an activity or industry. In the case of R & D funding for the Australian national dairy goat herd this could be achieved by the following:

Estimate revenue generated by the industry based on survey responses

The study outlined in this report found that there are 68 licensed dairy goat farmers in Australia. Of these, 41 participated in a survey where they were asked to describe the number of milking goats on their property in 2016 and the average number of litres their goats produced daily. This figure could be used to estimate the number of goats in the national herd and the production of the national herd. The average price of milk in 2016 could then be used to calculate the revenue of the industry.

Estimate cost of industry based on survey results and previous studies on farm costs

In the survey described above, participants were asked how many people worked on their farm (paid or unpaid). These responses, along with estimates on other farming expenses sourced from previous agribusiness studies could be used to approximate the cost of the Australian dairy goat industry.

Calculate rate of return

Simply measuring the amount of revenue generated by an industry as an indicator of contribution, although useful, is severely biased against smaller industries. Likewise, a simple ratio of revenues to costs also tends to favour large industries or activities. It is thus best to look for the extra returns generated by an activity. For example, in the case of the dairy goat industry, one could look for the additional returns the industry contributes to the entire agricultural or livestock industry. In many cases, small industries can have very high returns – large extra gains relative to investment. Ideally, the best measure is value-added, or the extra returns, generated at the margin, for the extra costs of the investment, much like an interest rate or a return generated through a financial instrument. In practical terms, this rate of return can be calculated as a percentage, or as net returns (total revenues less total costs) divided by total costs. This approximation of the (marginal) rate of return gives an indication of value-added or the extra contribution that an industry or activity provides.

Analyse whether rate of return is significant enough to justify investment in R & D

Firstly, if the rate of return is greater than standard interest rates, then investment in the industry will be beneficial. This would be the usual approach – if the rate of return is larger than the bank or lending rate, it pays to invest. However, it may also be useful to compare rates of return to investments in other
areas to determine a portfolio of investments across different activities. This would entail sending funds to those activities with the highest rates of return first, based on value-added. If appropriate, provide recommendations on the activities or other steps that may be taken to further develop, disseminate or to exploit commercially the results of the project.
Appendices

Appendix 1 – Search terms

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<th>Search term</th>
<th>Search field</th>
<th>Years</th>
<th>No. of results</th>
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Table 2. Search terms

Appendix 2 – Published literature


### Appendix 3 – Grey literature

**Departments of agriculture websites**

**Table 3. Department's of agriculture websites**

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<th>Any relevant material</th>
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<tbody>
<tr>
<td>QLD</td>
<td>N/A</td>
</tr>
</tbody>
</table>
| NSW             | NSW Goat Industry Summary  
| VIC             | Dairy Goats  
| ACT             | N/A                   |
| SA              | N/A                   |
| WA              | Introduction to dairy goat farming for small landholders  
| NT              | N/A                   |
| TAS             | N/A                   |
Rural Industry Research and Development Corporation

Scoping study for genetic evaluation of Australian dairy goats 2016

Optimising genetics, reproduction and nutrition of dairy sheep and goats 2014

Emerging animal and plant industries: Their value to Australia 2014

Farming and Marketing Goat and Sheep Milk Products 2009


Dairy Goat Farming for Specialty Cheese and other Products 2003

Dairy Goat Manual 2002

Dairy Goat Products - Developing new markets 2001

Additional sites from top 50 google hits

Goat societies and industry groups

Dairy Goat Society of Australia

Dairy Goat Society of Australia Victoria Branch
http://dgsavic.weebly.com/

The Australian Association for Dairy Goats
http://www.theaustralianassociationfordairygoats.com/

Dairy Goat Society of Australia Tasmanian Branch
http://www.dgsatas.com/

Dairy Goat Society of Western Australia

The Goat Industry Council of Australia

Farm Diversity
http://www.farmdiversity.com.au/Animal/b5ffda44-2db0-4e40-8fb1-a35e00f6e316

News sites
Burke’s backyard

ABC News

Nuchev

The Australian

Newcastle Herald

Dairy farm sites
Meredith Dairy
http://meredithdairy.com/about-us.html

Jannei Dairy
https://www.jannei.com/

Main Ridge Dairy
https://www.google.com.au/?gws_rd=ssl&q=dairy+goats+australia&start=40&*

Koonac Goat Farm

Hindmarsh Valley Dairy

Bookara Goat Dairy
Appendix 4 – Farmer survey

3. Contact Information
   Name
   City/Town
   State/Province
   ZIP/Postal Code
   Email Address
   Phone Number

4. What is the name of your Dairy?

5. GPS coordinates (if known)

6. What is the gender of the participant? (DO NOT READ THIS QUESTION)
   - Male
   - Female
   - Unsure

7. How old are you?
   - 18-30
   - 31-40
   - 41-50
   - 51-60
   - Over 60
   - If specific age is given, write here

Australian Dairy Goat Producer

8. How many milking goats did you have in 2016?

9. How many goats in total did you have in 2016 (include milking and non-milking)?
3. Contact Information
Name
City/State
ZIP/Postal Code
Email Address
Phone Number

4. What is the name of your Dairy?

5. GPS coordinates (if known)

6. What is the gender of the participant? (DO NOT READ THIS QUESTION)
   - Male
   - Female
   - Unsure

7. How old are you?
   - 18-20
   - 21-30
   - 31-40
   - 41-50
   - 51-60
   - Over 60
   - If specific age is given, write here

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Australian Dairy Goat Producer
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8. How many milking goats did you have in 2016?

9. How many goats in total did you have in 2016 (include milking and non-milking)?
10. In 2016, how many litres per head did you go on produce?

11. What percentage of your milk went to the following products
   - Milk
   - Cheese
   - Milk Powder
   - Other

**Australian Dairy Goat Producers**

**Industry future**

12. How many litres of milk do you see your farm producing in five years time? (e.g. the year 2022)

13. What do you see as priorities for the Australian dairy goat industry?

14. Would you value a single group to support the industry?

15. Are you doing any R & D on your farm?
   - No
   - Yes (please specify the type of R & D)

**Australian Dairy Goat Producers**

**Further contact details**

16. Can you provide the contact details of any other goat producers that you know of?
   - Name
   - State/Province
   - ZIP/Postal Code
   - Email Address
   - Phone Number
17. FURTHER PRODUCERS
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number

18. FURTHER PRODUCERS
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number

19. FURTHER PRODUCERS
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number

20. Do you sell your milk to a processor?
☐ No
☐ Yes

21. Can you give the name and contact details of your processor or any other processor you know of?
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number
22. FURTHER PROCESSORS
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number

23. FURTHER PROCESSORS
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number

24. FURTHER PROCESSORS
Name
State/Province
ZIP/Postal Code
Email Address
Phone Number

Australian Dairy Goat Producer

Employment on the farm

We just have three more questions. Do you have an extra minute to answer these?

25. Do you work full time or part time as a dairy goat producer?
   - Full time
   - Part time
   - Other (please specify)
26. In addition to yourself, how many people are engaged in part-time paid employment on your farm?

- 0
- 1
- 2
- 3
- 4
- Other (please specify)

27. In addition to yourself, how many people are engaged in full-time paid employment on your farm?

- 0
- 1
- 2
- 3
- 4
- Other (please specify)

28. How many people in your household contribute unpaid labour to your farm?

- 0
- 1
- 2
- 3
- 4
- Other (please specify)
References


http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2384218/.

Foster, Max. 2014. Emerging Animal and Plant Industries: Their Value to Australia. RIRDC.


