

Goat meat consumption in Makassar, Sulawesi: Important for religious and cultural ceremonies, but many consider it a health risk¹

**Roy Murray-Prior,* Asmuddin Natsir,† Mawardi A. Asja,† Nasrullah,‡
Yusmasari,‡ A. Nurhayu,‡ and Peter Murray§**

*School of Management Curtin University, Muresk Campus, Northam, WA, Australia;
†Fakultas Peternakan Universitas Hasanuddin, Makassar, Indonesia; ‡BPTP Propinsi, Sulawesi Selatan, Makassar, Indonesia; and §School of Animal Studies The University of Queensland, Gatton Campus, Gatton, Qld, Australia

ABSTRACT: This paper discusses goat consumption by consumers in Makassar based on interviews with 374 households from April to May 2009 using a survey instrument including questions on attitudes to goat, goat meat purchases, usage and consumption, and demographics of the respondents. Consumers rarely bought goat for family, visitors or gifts and most commonly bought for Kurban and birth ceremonies, mostly from traditional markets and traders/butchers. Cluster analysis identified four consumer segments that were uncorrelated with demographic variables but were with purchasing patterns and the likelihood of increasing consumption. Goat meat is consumed for religious ceremonies, but many consumers consider it unhealthy.

Key words: goat, attitudes, Moslem, hypertension

INTRODUCTION

As incomes rise, Indonesian consumers are increasing their consumption of meat (Hatasuhut et al. 2001), with richer consumers tending to eat relatively more meat and less fish and seafood (Fabiosa 2005; Suryana et al. 2008). In the 15 years until 2005, beef consumption per head increased by 50%, while chicken consumption doubled (Bond et al. 2007). However, consumption of lamb and goat remained relatively stable, suggesting consumers may perceive them differently to other meats. Consumers from many countries regard goat as being nutritionally equivalent or better than other red meats (Murray et al. 1997, Webb et al. 2005, Werdi Pratiwi et al. 2007) and as having an acceptable flavour and aroma (Werdi Pratiwi et al. 2004; Orden et al. 2005; Webb et al. 2005). In Java, Budisatria et al. (2008) found that the supply, demand and price of sheep and goats peak for the religious festival of *Idul Adha*. Another key reason for purchasing sheep and goat is for the birth of a son or daughter. Consumption of sheep and goats appear to be closely linked to cultural and religious ceremonies, but there is anecdotal evidence to suggest many people in Indonesia (and Malaysia) associate consumption of goat with increases in blood pressure and heart attacks. The authors were not able to find any studies investigating the attitude of Indonesian consumers to goat meat or the reasons for the relatively stable consumption of goat meat when compared with substitute meats. The objective of this study was to investigate the consumption behaviour and attitudes of Indonesian goat meat consumers using a survey of consumers in Makassar, Sulawesi, Indonesia.

MATERIALS AND METHODS

Personal interviews were conducted by students from Hasanuddin University using a survey instrument including questions on attitudes to goat, goat meat purchases, usage and

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consumption, and demographics of the respondents. The population of interest were the purchasers and preparers of meat for household consumption in the city of Makassar. Respondents were selected from the 14 subdistricts in Makassar with a similar number in each subdistrict. Student interviewers chose households based on availability and willingness to participate until the required number of interviews was conducted. The questions on goat meat consumption were divided into four main sections: quantities of goat purchased, goat meat usage and occasions used, attitudes to goat, and demographics of the respondents. Initial questions for the survey were based on a Western Australian lamb consumer survey (Storer 1993) and a Western Australian in-store Q Lamb consumer survey (Storer 1997), with most of the questions being developed from the former. The set of 35 items developed to identify the important characteristics used by consumers when purchasing meat (see paper by Nasrullah et al. 2010 from this conference) were adapted for Indonesian conditions and used to assess attitudes to goat meat. Items were rated on a 5 point scale with 1 (strongly disagree) and 5 (strongly agree). Additional attitudinal questions asked about changes in respondents consumption and attitudes to goat meat and the likelihood of increasing their consumption if the price was the same as chicken. Questions were also asked about goat meat purchase and cooking behaviour. Interviews were conducted in April and May of 2009 at times chosen by the student surveyors, and questionnaires were checked by staff, with students asked to verify or conduct new interviews if they were incomplete. Data was entered into an Excel spreadsheet for initial cleaning and then transferred into SPSS to run initial descriptive statistics. Errors identified by this process were corrected and the descriptive statistics run again. As a result, the initial 388 questionnaires were reduced to 374 usable questionnaires; although some questionnaires did not have all questions answered and 19 (5%) of the respondents were vegetarians.

Exploratory factor analysis was undertaken (in SPSS v. 17) of the 35 meat purchase items to identify any underlying patterns or relationships in these variables and to reduce the number of variables to be used in future studies. The approach used was principal components analysis with varimax rotation. Items were excluded if they had cross-loadings greater than 0.4 or had factor loadings below 0.5, the latter based on the sample size (Hair et al. 2010). Selection of number of factors was based on an Eigen value of greater than 1.0, although Scree plots were also examined. Items contributing to each factor were tested by applying the reliability coefficient and where the Cronbach's Alpha Coefficient was below 0.5, the factor was excluded from further analysis.

Cluster analysis was conducted to see if it was possible to identify major groups of consumers based on the attitudinal items remaining after removing variables excluded by the factor analysis. A potential number of solutions were identified based on percentage increase in the agglomeration coefficient with hierarchical cluster analysis procedures (Ward's cluster method) (Hair et al. 2001). Cases from clusters with a small number of cases were removed and the analysis rerun. The number of clusters were then specified in a K-means cluster function using the iterate and classify method. An ANOVA helped identify any variables that were redundant or did not adequately differentiate between the clusters. Non-significant variables were deleted and the process repeated to assess cluster stability. The final cluster solution was saved and cluster membership was cross-tabulated with meat purchase decisions and demographic variables to see if the clusters could be differentiated further. Pearson chi-square tests were conducted and a result was regarded as significant if the probability was less than five percent. Categories were combined or deleted as appropriate and the tests re-run when: 20 percent or more of the cells for the Chi-square test had an expected value of less than five, or a cell had an expected frequency of less than one, and the result was significant or close to significant at the five percent level.

RESULTS

Goat Meat Purchases and Usage

Overall, 58% of respondents purchase goat meat. Of these 75% bought one or more whole goats in the last year, with most buying one (33%) or two (31%) goats. In the three months before the survey, a period that did not include major religious festivals, 45% bought a part of a goat, with the most common amounts for that period being 2 kg (10%) and 3 kg (17%). Goat meat is mostly purchased or obtained from traditional markets and trader/butchers, with 46% getting most or all from trader/butchers and 30% getting most or all from traditional markets. On the other hand, only 4% got most of their goat meat from supermarkets while 71% never got goat meat from supermarkets. Of the people who buy goat meat, 67% never buy it for their family and 85% never buy it for visitors. Only 9% of the respondents buy it a number of times per year or routinely for their family and 7% for visitors. Similarly, it is never bought for special occasions (71%), gifts (93%) and other occasions (96%). By way of contrast, 57% of the respondents buy it once a year for Kurban and 55% of the respondents buy it once a year and 33% buy it more than that for birth ceremonies.

Whole goat is the most common form bought for visitors (89%), Kurban (77%), other reasons (67%) and births (45%). Thigh is the other main cut bought and this is bought mainly for family (71%), special occasions (54%) and births (32%). Curry and sate are the most commonly used methods for cooking goat meat for a range of uses with the percentages of respondents using these for particular uses being: family (64%, 57%); visitors (45%, 36%); Kurban (73%, 41%); births (75%, 41%); and special occasions (41%, 39%). Other common ways of cooking are stew and soup. Most of the population rarely eat goat meat at locations outside the house with the proportion who never eat it being: 76% at restaurants, 61% on special occasions, 92% at picnics and 94% for other occasions. People are most likely to eat it for Kurban or birth ceremonies with 74% and 77% eating it on these occasions more than once a year. Apart from restaurants where sate is the most common dish (72%), curry and stew are the most common ways it is eaten outside the house.

Changes in Goat Consumption

About two thirds of the respondents say the amount of goat meat they eat changes with the time of year, but Kurban appears to be the only occasion where they eat more (55%), while at other times they say they eat less: Ramadan, Independence celebrations, rainy season and dry season. Most people (57%) say they have not changed the amount of goat meat they eat in the last 5 years, but 22% say they eat more and 21% say they eat less. The main reasons given for an increase in the quantity of goat meat consumed (in terms of percent of respondents) were: increased availability at a reasonable price (57%); attended more occasions where served (53%); and diet and nutrition is improved with more meat and variety of food (24%). Reasons given for a decrease in goat meat consumption were: increased price, more expensive than chicken (32%); negative health effects of goat meat (25%); attended fewer occasions when served (22%); and not healthy because of hypertension or cholesterol (14%).

Attitudes of Consumers to Goat Meat

Respondents were asked to rank their level of agreement or disagreement for goat meat on the same 35 items used as criteria for purchasing other types of meat using a 5 point scale with 1 being strongly disagree and 5 being strongly agree. When the mean of each items was calculated, the 7 highest ranked characteristics were: important for birth ceremony (4.53), has good colour (4.26), consistent quality (4.22), nutritional (4.19), looks good/fresh (4.17), flavoursome (4.12), and tender (4.08). Healthy was next with 4.06 in comparison to its rating for meat purchases of 4.40. The differences in ratings for other types of meat purchases and goat meat were compared using a paired samples t-test. The five greatest differences for other types

of meat over goat meat were: *low in cholesterol, low in calories, low in fat, good value for money and healthy*, all significantly different at the 0.01% level. As expected, goat meat ranked higher than other meat on *important for birth ceremony*, but was only significantly different at the 5% level, while it also ranked higher for *easy to store* and *appeals to friends* at the 10% level. It was expected that goat meat would also perform poorly on the *causes hypertension* item, but in fact it rated higher than other meat by 0.075, and was not significantly different. However, the standard deviation for this item for other meat was 1.24 compared with the average of all items of 0.93 for other meat and 1.41 for goat meat compared with the average of 0.99 for all items. It also had the highest standard deviation of any item on both occasions.

Slightly over half have not changed their attitude to goat over the last five years, while about one fifth perceived they have made a small change in their attitudes. Respondents were not asked whether the change in attitude was positive or negative, they were inferred from the reasons given for the responses, with 53 respondents giving 93 positive responses and 27 giving 30 negative responses. The most common positive reasons given for the change were learned way of preparing that is delicious and has less aroma (37 respondents) and now available in kilogram forms (26 respondents). Conversely, the most common negative reasons were change in diet because of cholesterol (10 respondents) and contaminations in meat (7 respondents).

About 60% of all respondents said they would make almost no change or no change to their consumption of goat meat even if it were the same price as chicken. About a quarter indicated they would make a small change and another quarter said they would make a large change. The main reasons given for not changing were because goat meat is less healthy than chicken (cholesterol and blood pressure) by 94 or 31%, goat meat has a less delicious smell or flavour than chicken by 71 or 24%, and normally consume chicken or fish so don't know how to prepare goat meat by 52 or 14% of respondents. The main reasons given by those who said they would increase the amount eaten were because goat meat is more nutritious and has a stronger flavour by 71 or 19%, and because the price would be cheaper and so will be on the menu more often by 36 or 10% of respondents.

Factors Associated with Goat Purchase Decisions

There were 35 items for factor analysis, however some items, such as *Free of artificial additives* and *Important for cultural occasions* had a high number of don't knows which meant they had only 235 and 256 usable responses respectively. After applying the rules for exclusion, the final solution resulted in 6 factors based on the 24 factors. These factors explained 67% of the variance. After discussion of the meanings of the items in Indonesian the factors were given the following names: Factor 1: Easy to use; Factor 2: Suits most people; Factor 3: Meat quality; Factor 4: Negative health; Factor 5: Nutritional health; and Factor 6: Religious importance.

Table 1. Mean values of clusters on factors associated with goat purchases decisions

Factor	Mean values					Mean-centred values			
	1	2	3	4	Total	1	2	3	4
1 Easy to use	3.57	3.24	4.16	4.67	3.84	-0.27	-0.60	0.32	0.83
2 Suits most people	3.24	3.28	3.43	4.84	3.56	-0.32	-0.27	-0.13	1.28
3 Meat quality	3.80	3.31	4.06	4.75	3.90	-0.10	-0.59	0.16	0.85
4 Negative health	1.44	2.82	2.75	3.51	2.52	-1.08	0.30	0.23	0.99
5 Nutritional health	3.84	3.45	4.24	4.71	4.00	-0.16	-0.55	0.24	0.71
6 Religious importance	4.20	3.51	4.22	4.71	4.11	0.09	-0.59	0.12	0.61
Number of cases	46	44	54	26	170				

1: Negative about goat meat except for religious purposes; 2: Negative about goat meat, but indifferent on hypertension effects; 3: Generally positive about goat meat; 4: Enthusiastic about goat meat

Groupings of Consumers Based on Attitudes to Goat Meat

Cluster analysis was used to group consumers based on the 24 meat purchase criteria that remained in the final factor analysis. The final K-means cluster method involved four clusters and an ANOVA of cluster membership on the clustering variables found the clusters were significantly different on all variables. The highest number of members of a cluster was 54 and the lowest number was 26. The average values of clusters for each of the meat purchase criteria were calculated and sorted into the factors identified previously. The average score for each cluster on each factor is shown in Table 1. Possible interpretations of these clusters are: Cluster 1: Negative about goat meat except for religious purposes; Cluster 2: Negative about goat meat, but indifferent on hypertension effects; Cluster 3: Generally positive about goat meat; Cluster 4: Enthusiastic about goat meat.

Association between Groupings Based on Goat Meat Purchases and Demographic and Meat Purchase Variables

While there was not a significant difference between clusters in buying goat meat when analysed using a χ^2 test, the percentages were consistent with the names given to the clusters based on the attitude variables. However, there were significant differences between the clusters based on an ANOVA test for purchases of whole goat in the previous year, kilograms of goat meat bought in the last three months, and times goat meat was cooked in a month (Table 2). Cluster 4, which was interpreted as ‘enthusiastic about goat’ had the highest averages on all these variables. A Scheffe test found it was significantly higher than all other clusters on number of goats bought and significantly higher than Cluster 2 on kilograms of goat meat bought. Cluster 2, which had the lowest scores on these variables was interpreted as being negative about goat, but indifferent on hypertension effects. It also had the lowest scores on all the factors (apart from negative health).

There were no significant differences on the demographic variables between the clusters. However, there were significant differences between clusters on some of the attitude variables (Table 3). For instance, using a χ^2 test there was a significant difference between groups ($p=0.000$) in the likelihood of changing the consumptions of goat meat eaten if its price was

Table 2. Associations between clusters and consumption of goat meat

Purchase variable	1	2	3	4	Av	p	Test
Percentage buying goat	65%	57%	67%	69%	64%	0.684	χ^2
Number of goats bought last year	0.85 ^a	0.45 ^a	0.83 ^a	1.69 ^b	0.86	0.000	F
Kilogram of goat meat bought in last 3 months	0.65	0.43 ^a	1.02	1.81 ^b	0.89	0.019	F
Times/month cooked goat meat	0.28	0.25	0.43	1.19	0.46	0.046	F

1: Negative about goat except for religious purposes; 2: Negative about goat meat, but indifferent on hypertension effects; 3: Generally positive about goat meat; 4: Enthusiastic about goat meat
 Scheffe test: Different subscripts are significantly different at $p>0.05$

Table 3. Cross tabulation and chi-square test between groupings based on goat purchase and meat purchase variables

Variable	p	Comments
Change in goat eaten last 5 years	0.000	More: 1 = 4%; 2 = 2%; 3 = 14%; 4 = 58%
Attitude to goat changed in last 5 years	0.000	No change: 1 = 73%; 2 = 48%; 3 = 56%; 4 = 8%
Consumption if price = chicken price	0.000	No change: 1 = 73%; 2 = 37%; 3 = 40%; 4 = 13%
Proportion from supermarket	0.001	Never: 1 = 63%; 2 = 32%; 3 = 58%; 4 = 100%
Proportion from market meat seller	0.146	Most: 1 = 23%; 2 = 56%; 3 = 39%; 4 = 33%
Proportion from trader	0.007	Most: 1 = 20%; 2 = 56%; 3 = 47%; 4 = 50%

1: Negative about goat meat except for religious purposes; 2: Negative about goat meat, but indifferent on hypertension effects; 3: Generally positive about goat meat; 4: Enthusiastic about goat meat

equal to chicken. Nearly 63% of cluster 4 (enthusiastic about goat meat) indicated a willingness to make more than a small change while nearly three quarters of cluster 1 indicated they would make no change. Similar differences were apparent between the two clusters in terms of the change in the amount of goat meat they had eaten in the last five years and the change in their attitude to goat meat.

DISCUSSION

Purchase and Consumption Behaviour of Makassar Goat Meat Consumers

Budisatria et al. (2008) suggested that because of the predominance of the Moslem religion in Indonesia, goats are important for religious festivities, in particular *Idul Adha* (the feast of sacrifice) and for birth ceremonies. During *Idul Adha*, which occurs once a year and coincides with pilgrims making sacrifices at Mina in Saudi Arabia, richer families are obliged to slaughter a goat (or sheep) or join with seven others in the slaughter of a cow. In Makassar because sheep are rare, Moslems slaughter goats or cattle. People also celebrate the birth of children with the slaughter of two goats for a male child or one goat for a female child. The findings of this study are consistent with this; around three-quarters of those interviewed eat goat meat on these two occasions at least once per year. For Kurban, people are most likely to buy whole goat (77% of those who bought goat in the last year), which is consistent with religious expectations. Similarly, for births people are most likely to buy whole goat (45%), but also buy thigh (32%). However, generally consumers do not buy goat for the family or visitors at other times and rarely eat it at restaurants. Possible reasons for this will be discussed later in the paper. The most common way that goat meat is cooked is curry, stew and sate. If people eat goat meat outside, they are more likely to eat sate.

Despite the trend to purchasing in supermarkets (Suryana et al. 2008), this trend has a long way to go for goat in Makassar, with most people purchasing most of their goat from traditional sources and 71% of those interviewed never purchasing goat meat from a supermarket. This is a logical outcome since people generally only purchase goat for religious festivities, where whole goat (or at the very least thigh) is what is expected and purchased, and very few people purchase goat for their families.

Consumer Attitudes to Eating Goat Meat

Consumers have similar rankings for goat and meat on the key meat purchasing criteria. However, as expected, goat ranked significantly higher on the criterion of *important for birth ceremony*. The biggest differences in rankings of other types of meat over goat meat were low in cholesterol, low in calories, low in fat, good value for money and healthy suggesting consumers have negative perceptions of goat meat in comparison to other meats. The differences of low in cholesterol, calories and fat are interesting since studies comparing nutrient composition of goat meat with other red meats generally find it compares well on these items (e.g. Webb et al. 2005; Werdi Pratiwi et al. 2006). It was expected that goat meat would be significantly higher than other types of meat on the hypertension item because many people with say that goat meat cause hypertension and heart problems. However, the standard deviation on this item was much higher at 1.41 when compared to the average of all items at 0.99. In addition, this item had a bimodal distribution with over 13% strongly disagreeing with the view that it causes hypertension and 47% strongly agreeing. The distribution for other types of meat did not show this effect, which probably mitigated against a significantly different finding. It appears that there are two different groups in the population, one that has negative perceptions that it causes hypertension and a smaller group who do not believe it causes hypertension.

Support for this split in views and the reasons comes from the questions about changes in goat meat consumption and whether respondents would change their consumption if the price of goat meat was decreased to the price of chicken; currently the price of goat meat is nearly double the price of chicken. Similar percentages have either increased or decreased their

consumption, but those who have increased have done so partly because they perceive it as improving nutrition whereas those who have decreased have done so because of perceptions of negative health effects and hypertension or cholesterol. Of greater import is the finding that 60% of respondents would make little change to their consumption of goat meat even if its price were to decrease to the same price as chicken. The two key reasons for this were they believe it to be less healthy than chicken and has a less desirable smell or flavour. In contrast, the nearly 20% who said they would said it was more nutritious and had a stronger flavour. Part of the reason for the perception of health problems could be that most people do not consume much meat and consume goat meat in large amounts at particular occasions. Consequently, their gut will be overloaded with meat, which can cause indigestion and related negative health effects. In addition, many of the goats slaughtered for religious festivals are larger entire males, more than one year old (Budisatria et al. 2008), which are likely to have a stronger smell. Goats also tend to be slaughtered under stressful conditions, which will make their meat tougher.

The authors are not aware of any research that indicates goat causes hypertension more than other red meats and it does not appear to be the view in other parts of the Moslem world (apart from Malaysia). One factor that appears to be encouraging people to consume more goat meat is that they have learned ways to prepare it and it is more readily available (perhaps in supermarkets). Ozawa et al. (2005) suggested similar remedies such as combining the sale of goat meat with recipes for cooking goat meat might increase its acceptance by Okinawa goat consumers. Obviously, this topic should be investigated further and may be an area for a public education program if the perceptions of its health problems prove to be incorrect.

Segmentation of the Makassar Goat Market

The differences in perceptions of goat discussed above were reflected in the consumer segments derived from the cluster analysis. At the two extremes were two large segments of consumers described as negative about goat meat and another segment who we described as enthusiastic about goat meat. While there were no distinguishing differences between the segments on the demographic variables, the names given to the segments were reflected in the amounts of goat meat purchased and consumed. The cluster described as enthusiastic about goat meat were also more likely to have increased their consumption of goat meat over the last five years and about two-thirds indicated a willingness to increase their consumption of goat meat if the price was the same as chicken. It appears this segment views towards goat meat are consistent with taste tests and nutrition tests for goat meat in other parts of the world (Nelson et al. 2004; Webb et al. 2005; Werdi Pratiwi 2004, 2006), but they are obviously a minority in Indonesia.

CONCLUSIONS

Makassar consumers, and perhaps Indonesian consumers, appear to have a love/hate relationship with goat meat. Many eat it and buy it for religious reasons, but many do not appear to like to eat it otherwise. Many people appear to believe it causes heart attacks, hypertension and is high in cholesterol. Others do not like its smell. Further research is required into aspects of this finding and a program of consumer education may be appropriate.

LITERATURE CITED

- Bond, R., Rodriguez, G. & Penm, J. 2007, 'Agriculture in Indonesia: A review of consumption, production, imports and import regulations', in 13th Meeting of the Australia-Indonesia Working Group on Agriculture, Food and Forestry Cooperation (WGAFFC), ABARE Conference Paper 07.6. Australian Bureau of Agriculture & Resource Economics, Canberra, ACT.
- Budisatria, I.G.S., Udo, H.M.J., van der Zijpp, A.J., Baliarti, E. & Murti, T.W. 2008, 'Religious festivities and marketing of small ruminants in Central Java - Indonesia', *Asian Journal of Agriculture and Development*, vol. 5, (2), pp. 57-73.

- Fabiosa, J.F. 2005, 'Growing demand for animal-protein-source products in Indonesia: Trade implications', Working Paper 05-WP 400, July, Center for Agricultural and Rural Development, Iowa State University, Ames, Iowa, USA.
- Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. 2010, *Multivariate Data Analysis: A Global Perspective*, 7th edn, Pearson, New Jersey, USA.
- Hutasuhut, M., Chang, H-S., Griffith, G., O'Donnell, C. & Doran, H. 2001, 'The demand for beef in Indonesia: Implications for Australian agribusiness', in Working Paper Series in Agricultural and Resource Economics, No. 2001-4. Graduate School of Agriculture and Resource Economics, University of New England, NSW, Australia, December.
- Murray, P.J., Dhanda, J.S., and Taylor, D.G. 1997, Goat meat production and its consequences for human nutrition. *Proceedings of the Nutrition Society of Australia*, Vol. 21, 28-36.
- Nasrullah, Yusmasari, Nurhayu, A., Natsir, A., Asja, M.A., Murray-Prior, R. & Murray, P. 2010, Factors involved with the purchase of meat by consumers in Makassar, Sulawesi, Paper presented to ISTAP conference, Yogyakarta, Indonesia, 19th - 22nd October.
- Nelson, M.C., Whitehead, J., Mobini, S., Brown, N.B. & Thomas, M. 2004, 'Segmenting niche goat-meat markets', *Journal of Food Distribution Research*, vol. 35, (1) pp. 146-153.
- Orden, M.E.M., Jamandre, W.E., Brown, E.O., Orden, E.A., Cruz, E.M., Alo, A.M.P. & Villar, E.C. 2005, 'Traders' preference for goat characteristics in selected markets of Pangasinan, Philippines', *Animal Science Journal*, vol. 76, (2) pp. 179-185.
- Ozawa, T., Nishitani, J., Odake, S., Lopez-Villalobos, N. & Blair, H.T. 2005, 'Goat meat acceptance in Japan: Current situation and future prospects', *Animal Science Journal*, vol. 76, no. 4, pp. 305-312.
- Storer, C.E. 1993, Factors affecting lamb meat consumption in the Perth consumer meat market, Master of Commerce Thesis, Curtin University of Technology, Perth, Western Australia.
- Storer, C.E. 1997, 'Consumers' response to Q Lamb at Action Food Barn Supermarkets', Q Lamb Management Committee, Meat Research Corporation and the Australian Meat & Livestock Corporation.
- Suryana, A., Ariani, M. & Lokollo, E.M. 2008, 'The role of modern markets in influencing lifestyles in Indonesia', *Jurnal Litbang Pertanian*, vol. 27, no. 1, pp. 10-15.
- Webb, E.C., Casey, N.H. & Simela, L. 2005, 'Goat meat quality', *Small Ruminant Research*, vol. 60, no. 1-2, pp. 153-166.
- Pratiwi, N.M.W., Murray, P.J., and Taylor, D.G. 2004, Meat quality of entire and castrated Boer bucks raised under Australian conditions and slaughtered at different weights: physical characteristics, shear force values and eating quality profiles. *Animal Science* 79, 213-219.
- Pratiwi, N.M.W., Murray, P.J., and Taylor, D.G. 2006, Total cholesterol concentrations of the muscles in castrated Boer goats. *Small Ruminant Research* 64 (1-2), 77-81.
- Wardi Pratiwi, N.M., Murray, P.J. and Taylor, D.G. 2007, Feral goats in Australia: A study on the quality and nutritive value of their meat. *Meat Science* 75, 168-177.