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Meat goat producer survey

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Abstract

A pilot study was undertaken in the form of face to face interviews with the overall goal of building an understanding of the meat goat industry in Queensland and New South Wales. Six clusters of goat producers were identified based on biogeographic factors and proximity to each other. The six clusters were then divided into two regions;

1. The pastoral regions (n = 17) inclusive of western NSW, south western Qld, and central western Qld
2. The high rainfall regions (n = 14) of eastern NSW, south eastern Queensland and north Queensland.

Producers in the pastoral regions were influenced by opportunistic harvesting practices that limited animal husbandry, management and land development. The productivity per animal was lesser in the pastoral regions than the high rainfall regions. However the contrast between the two regions highlighted the opportunity to increase productivity in the pastoral regions. Although Queensland and New South Wales produce a majority of goats for export markets, South Australia and Western Australia should also be surveyed to ascertain benchmarks for these states.

Executive summary

This survey was funded as a pilot study with the overall goal of building an understanding of the meat goat industry in Queensland (QLD) and New South Wales (NSW) and to identify problems or constraints in the meat goat industry should they arise from the survey. The survey covered 567,177 ha of land and approximately 160,010 goats. Meat goat producers (n = 31) were surveyed by face to face interviews. Six clusters of goat producers were identified based on biogeographic factors and proximity to each other. The six clusters were then divided into two regions;

1. The pastoral regions (n = 17) inclusive of western NSW, South western Qld, and central western Qld
2. The high rainfall regions (n = 14) of eastern NSW, south eastern Queensland and north Queensland.

The survey quantified goat enterprises and the markets that producers targeted. The survey was able to establish benchmarks for the meat goat industry in reproductive and production parameters for the pastoral and high rainfall regions of Queensland and New South Wales. In addition the common diseases and management of goats in the pastoral and high rainfall regions were identified and discussed. Producers also provided information on their perceptions of grazing management of goats in the pastoral regions. The preference of media by goat producers for the delivery of information on herd and property management was addressed.

The pastoral regions were dominated by opportunistic harvesting practices that have not progressed since the late 1950's when the meat goat industry began. As such animal husbandry and land development practices are minimised in these regions. In contrast the high rainfall regions were associated with seed-stock producers who utilised animal husbandry practices in the management of their herds and achieved greater productivity from their herds compared to producers in the pastoral regions. This pilot survey has shed some light into the meat goat industry of eastern Australia. The meat goat industry can benefit from this work by using the information as a starting point to benchmark their respective properties.

Table of Contents

1 Background

In Australia, goats represent a growing industry but little is known about the productivity of commercial goat operations (MLA, 2011). There is a need to develop the value chain for goat meat within Australia and internationally, to identify problems or constraints and to suggest possible strategies to improve developments and policies to the goat industry in Australia. This survey was designed to build an understanding of the goat industry in Australia, providing the first overview of the current state of the industry with regard to the size, profitability, markets and perceived limiting factors of rangeland goats and domestic farmed goats. This survey will serve to benchmark the current level of productivity.

The Australian goat industry is relatively small, it is still in its early stages of development and little is known about the productivity of commercial goat operations. Goat meat is the most widely consumed meat in the world. Consumption of goat meat is permitted by members of the major religious faiths including Christians, Jews, Muslims, Hindus and Buddhists. In Australia there are approximately 4.5 million goats (FAO 2013), comprising 4.1 million Rangeland goats and 400,000 domestic farmed goats (ABS, 2012), which means that Rangeland goats represent more than 90% of the goat meat industry in Australia. Australia is the largest exporter of goat meat worldwide, slaughtering 2.0 million goats (31,156 tonnes of meat) and exporting 62,075 live goats in 2012-13 (FAO, 2013; ABS, 2012). There is, however little data available about goat production systems, goat producers and supply-chains within Australia (Brice *et al.* 2012).

Rangeland goats in Australia are descended from goats that were originally introduced for milk and meat production but which escaped and established permanent populations within sparsely populated areas of Australia. These goats are now declared as a pest in every state or territory in Australia with the exception of the state of NSW. Inadequate management of Rangeland goats can cause environmental degradation (Brice *et al.* 2012). Thus most state governments in Australia view Rangeland goats as being detrimental to the environment and favour eradication rather than as a potential source of income (Khairo *et al.* 2013). Others view goats as an aid for the control of woody weeds (Silanikove 2000), as a potential source of supplementary income for pastoral industries, as an emerging commodity for the growing demand for organically produced products and as complementary to pasture management associated with cattle production (Boyazoglu *et al.* 2005).

In a survey of northern Australian beef industry, Bortolussi et al. (2005c) found that more than 48% of producers reported land degradation (erosion, salinity and weeds) and 68% reported woody weeds on their property. The survey focussed on beef enterprises and Bortolussi did not establish any relationship between feral goats and land degradation. In addition, between 4% to 20% of producers were using visual observation combined with some form of calculation to determine stocking rate (Bortolussi *et al.* 2005c). While stocking rates are known to have a major influence on these factors and profitability, currently there is little information on stocking rates within the goat industry, the extent of land degradation on properties on which goats are farmed and the composition of pastures that goats are grazed.

2 Project objectives

1. Determine the productive and reproductive performance of goat herds in the extensive rangelands of Australia

2. Determine the disease occurrence and management of goat herds in the extensive rangelands
3. Determine producer perceptions regarding grazing management of goats on rangelands
4. Determine the sources of information for goat producers and their effectiveness in changing producer behaviour

3 Materials and methods

Survey design and structure

An interview based questionnaire survey was conducted on goat properties located in Queensland (QLD) and New South Wales (NSW) during 2013 as a pilot study for the meat goat industry of Australia. The questions were related to the years of 2012 and 2013. The questionnaire consisted of 106 questions and was designed to take an average of 2.5 hours to be completed. The majority of the questions were in a multiple tick-a-box format which was modified from a previous beef industry survey reported by Bortolussi *et al.* (2005a). The Bortolussi et al. (2005) series of beef industry papers are used as a benchmark for researchers and extension personnel to improve productivity in the beef industry. A similar publication for the meat goat industry would be an equally valuable resource.

The survey was conducted via face to face interviews where one or two of the authors visited meat goat producers and completed the questionnaire with them. Goat producers were the owners of properties that derived a substantial portion of the enterprises income from meat goats. Face to face interviews ensured a consistent approach and interpretation of the questions and answers. The template questionnaire and methodology for this survey was approved by the Human Research Committee of James Cook University (ID H4415).

Information was collected on property, pasture management, stocking rate and goat meat markets. The survey also collected information on herd management, growth and reproductive performance and animal health in meat goat enterprises.

Survey validation

To manage the quality of data collected, most survey questions were cross-referenced where responses to a particular question could be cross-checked and/or validated by the response to a previous or subsequent question (Bortolussi *et al.* 2005b). In addition, there were some follow up calls or emails after the survey was conducted for clarification of responses. The questionnaire was tested with four producers prior to the survey and a revised questionnaire was then used with the wider survey group. On most properties, an inspection of pasture and herd management was conducted with the authorization and presence of the owner. Inspection of the pastures and herd validated some the responses provided in the questionnaire.

Survey population

The Survey was carried out in Queensland and New South Wales, and involved owners of 31 properties that derived income from goats. Meat and Livestock Australia declined to assist the authors with access to the MLA database of goat

producers due to an internal confidentiality policy. Therefore randomization and or stratification of producers to be contacted for the survey was not able to be undertaken. Instead, meat goat producers were recruited non-randomly through direct approach and local networks. This limited the ability of the authors to achieve an original objective of the study in interviewing 30 extensive meat goat producers. Interviewing intensive meat goat producers in the higher rainfall regions of Queensland and New South Wales to make up the shortfall in extensive producers surveyed was undertaken and added a valuable contrast to the industry survey.

The producers were screened to include only commercial private goat producers and corporate companies. Those willing to participate in the survey were then included. The first contact with producers was done either by telephone or email when the purpose of the survey was explained. Eleven producers (26%; 11/42) declined to participate. Thirty one goat producers (74%; 31/42) were willing to participate in the survey. Taking part in the survey was voluntary. A total of 31 goat producers in 6 regions (Fig. 1) participated in the survey. They formed 6 clusters representing goat producing areas in Queensland and New South Wales. The properties were clustered according to proximity to each other and labelled regions 1 to 6. Nine producers from eastern NSW were not asked questions relating to objective 4 (Determine the sources of information for goat producers and their effectiveness in changing producer behaviour) due to inadvertenance on behalf of the interviewer. In this objective only 22 producers were interviewed.

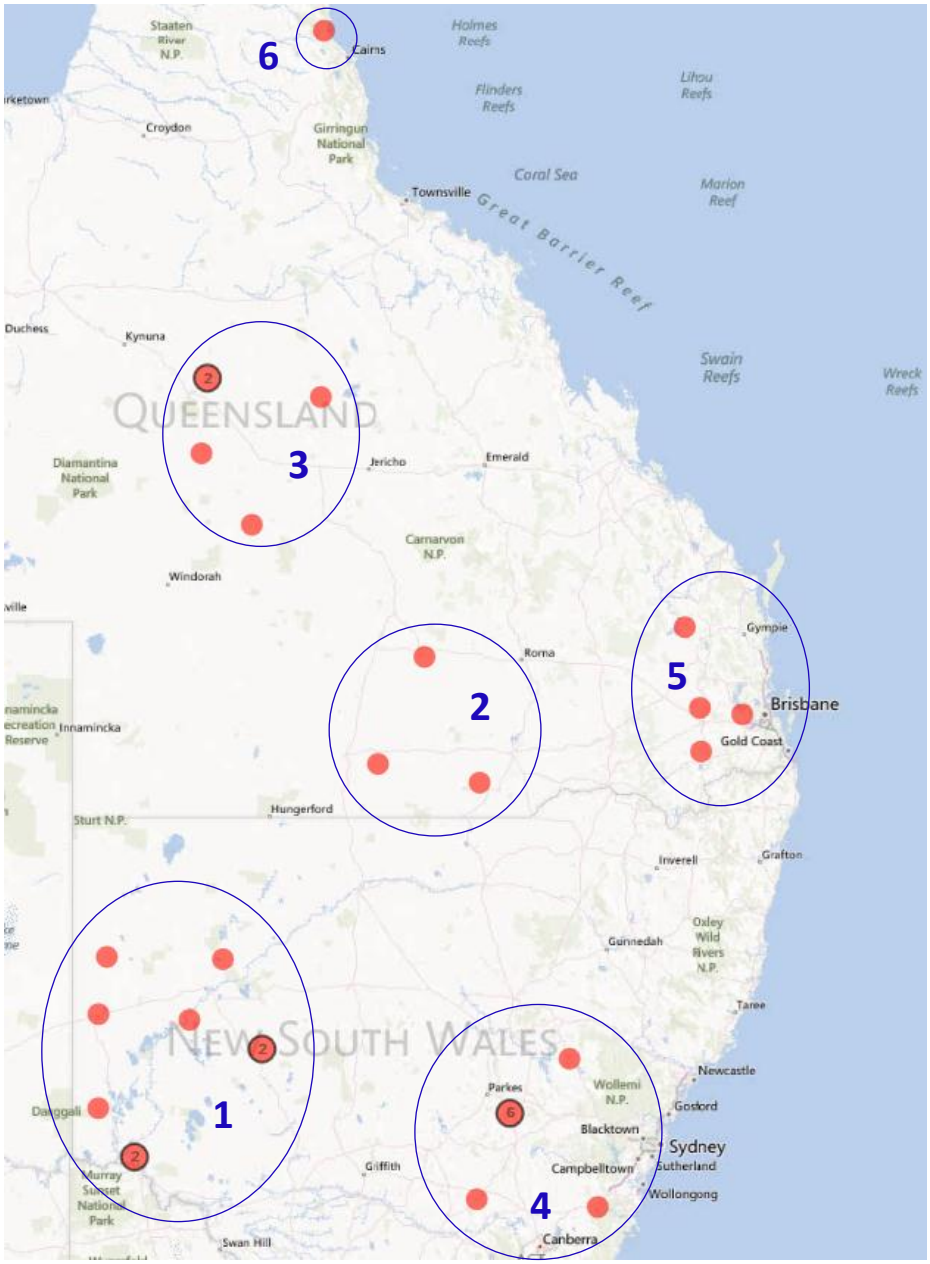

Fig. 1. Pastoral regions (1, 2 and 3) and high rainfall regions (4, 5 and 6) of New South Wales and Queensland where the survey was conducted.

Definition of terms and parameters evaluated

'Pastoral region' refers to properties located in western NSW and western QLD, characterised as an arid environment (130 mm to 500 mm rainfall). Livestock production from pasture (extensive grazing) is the main source of farm income. 'High rainfall region' refers to properties located in the eastern NSW, eastern QLD and far north QLD, presenting annual rainfall of more than 600 mm. These properties are smaller, and livestock is raised under an intensive grazing management system. 'Does' refers to female goats; 'bucks' are entire male goats; 'kids' are newborns or young goats; 'maidens' are young female goats and 'wethers' are castrated male goats. 'Pregnancy rate' was defined as the number of does that were pregnant/ total number of exposed does; 'kidding interval' was the period between two parturitions;

'prolificacy' was calculated by the number of kids born/ number of kidding does. The 'kidding rate' was calculated by (number of kids in the herd/ number of exposed does) x 100. 'Breeding season' was considered as the natural period where does regularly enter oestrus and are mated with bucks. 'Mortality rate' was the number of dead goats/ number of goats born. 'Full Blood' refers to Boer goats originated from 'fully imported bloodlines' and pedigrees can be traced back to South Africa herd books. '*KIDPLAN®' is* an Australian database developed to select animals using estimated breeding values (EBVs) and customised selection indices that help producers and breeders assess their genetic potential (Ball *et al.* 2001). 'Estimated weight gain at weaning (g/day)' was calculated by subtracting the bodyweight at birth from that at weaning and then dividing by the age at weaning (days).

Data analysis

Data were analyzed using Epi Info software (Epi Info™ 7.1.1.14, USA, 2013). Descriptive statistical procedures were used to compare surveyed regions. Data is presented as mean and standard deviation, frequencies and cross-tabulation tables. The data expressed as percentages were compared by Chi-square test (χ^2 test). Differences were considered significant when $P < 0.05$.

4 Results

Property Information and markets

Table 1. The number of properties, total land area and total goat herd size reported from surveyed regions of New South Wales and Queensland

Characteristics	Pastoral regions			Subtotal	High rainfall regions			Subtotal	Total
	West NSW	S.West QLD	C.West QLD		East NSW	S.East QLD	North QLD		
Number of properties	9	3	5	17	9	4	1	14	31
Property area (ha)									
Total area covered (ha)	391,917	96,146	74,601	562,664	3,869	482	162	4,513	567,177
Total area (%)	69.1	17.0	13.2	99%	0.7	0.1	0.03	1%	100
Mean property size (ha)	43,546	32,049	14,920	33,098	430	121	162	322	18,296
Goat herd (head)									
Total goat herd in 2013	110,100	30,500	14,300	154,900	4,320	640	150	5,110	160,010
Goat herd in 2013 (%)	68.8	19.1	8.9	97%	2.7	0.4	0.1	3%	100
Total goat sold in 2012	86,059	14,425	18,460	118,944	1,463	386	50	1,899	120,843
Mean area utilized for goats (%)	72	45	28	54	68	70	15	64	.

Goats were the most important livestock enterprise on 55% (17/31) of surveyed properties and 32% (10/31) reported that sheep production was the main enterprise. Cattle production was reported as the main enterprise by 13% (4/31) of producers. None of the properties located in central-western QLD reported that goats were the main livestock enterprise. However, 67% (6/9) of the properties located in western NSW and 78% (7/9) in eastern NSW reported that goats were the most important livestock enterprise on the surveyed properties.

Overall, there was no difference ($P > 0.05$) between numbers of producers that reported targeting the international and domestic market. However, the percentage of producers that targeted meat markets as a primary consideration for running goats was significantly greater ($P < 0.05$) than producers who used goats for weed control. The producers that considered goats as the main livestock enterprise reported the following hierarchical preference: international market (100%), domestic market (65%) and weed control (18%; $P < 0.05$; Table 2).

Table 2. Cross tabulation between main livestock enterprise and the reason for running goats on properties surveyed in NSW and QLD

Main Livestock	% (n)	Reasons for running goats %, (n)		
		International market	Domestic market	Weed control
Goats	55 (17/31)	100 (17/17) [a]	65 (11/17) [b]	18 (3/17) [c]
Sheep	32 (10/31)	50 (5/10)	50 (5/10)	50 (5/10)
Cattle	13 (4/31)	75 (3/4)	50 (2/4)	25 (1/4)
Overall %, (n)	100 (31/31)	81 (25/31) [a]	58 (18/31) [a]	29 (9/31) [c]

*Number of properties. Values with different letters in the same row are significantly different with a Chi-square test ($P < 0.05$).

All producers reported more than one goat enterprise activity on their property (Table 16). The majority of producers (68%; 21/31) reported breeding stores and replacements as the most common activity on goat properties in NSW and QLD. Overall, an average of 45% of producers reported that enterprises conducted on properties consisted of seed-stock production, opportunistic harvesting and breeding and finishing on pasture (Table 3).

Table 3. The goat enterprises carried out on the properties (mean ± SD)

	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31(100)
Number of enterprises selected									
1 enterprises	2	1	1	4 (13)	0	2	1	3 (10)	7 (23)
2 enterprises	6	1	1	8 (26)	3	1	0	4 (13)	12 (39)
3 or 4 enterprises	1	1	3	5 (16)	6	1	0	7 (23)	12 (39)
Enterprises carried out									
Breeding stores/replacements	4	2	2	8 (26)	9	3	1	13 (42)	21 (68)
Opportunistic harvesting	9	2	4	15 (48)	0	0	0	0	15 (48)
Seedstock producer	0	0	0	0	9	4	1	14 (45)	14 (45)
Breeding-finishing on pasture	3	1	5	9 (29)	4	1	0	5 (16)	14 (45)
Breeding-finishing on crop	0	1	0	1 (3)	4	1	0	5 (16)	6 (19)
Buying-finishing on pasture	2	1	2	5 (16)	0	0	0	0	5 (16)

All of the surveyed properties located in western NSW carried out opportunistic harvesting of goats and 100% of properties in central-western QLD carried out breeding-finishing of goats on native pasture. In addition, all the properties located in the high rainfall regions were Boer goat seedstock producers (Table 3).

Overall, the first three market sectors reported by producers in order of importance were: domestic market with 81% (25/31), live export with 68% (21/31), carcass export with 61% (19/31) and 13% (4/31) for restaurants (Table 4). The carcass export market was mentioned as the dominant market sector by 100% of producers located in western NSW, south-western QLD and central-western QLD (Table 4). A total of 81% (25/31) of the producers reported they had sold goats to the international market. When producers were asked to identify international markets that they supplied, Asia was identified by 52% (16/31) of producers, 29% (9/31) identified sales to the USA and 13% (4/31) to the Middle East. Exports of carcasses were reportedly sold to the USA and the live goat export trade was directed towards Asia and the Middle East. Live goat exports to Malaysia was the most cited country by the producers located in central-western QLD. The average reported export carcass weight was 17.7 ± 3.6 kg (Table 4).

Table 4. Market sectors and carcass weight for goat meat production in QLD and NSW, Australia

	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31
Number of sectors selected									
1 sector	5	0	1	6 (19)	0	2	0	2 (6)	8 (26)
2 sectors	1	1	1	3 (10)	5	2	1	8 (26)	11 (35)
3 sectors	1	2	3	6 (19)	3	0	0	3 (10)	9 (29)
4 sectors	2	0	0	2 (6)	1	0	0	1 (3)	3 (10)
Markets sectors for goat									
Domestic market	5	3	4	12 (39)	9	3	1	13 (42)	25 (81)
Live Export	3	2	3	8 (26)	9	3	1	13 (42)	21 (68)
Carcass Export	9	3	5	17 (55)	2	0	0	2 (6)	19 (61)
Restaurant	1	0	0	1 (3)	3	0	0	3 (10)	4 (13)
Carcass weight									
Observations	5	2	3	10	4	0	0	4	14
mean ± SD	16 ± 2.1	20 ± 0.5	15 ± 0.6	16 ± 2.1	23 ± 3.5	*	*	23 ± 3.5	18 ± 3.6

* Producers from south-eastern QLD and north QLD only sold breeding animals.

Overall, 84% (26/31) of producers reported a willingness to change the management of their enterprises over the next 5 years to increase profitability and 16% (5/31) of respondents said that no changes would be made (Table 9). The producers willing to increase their profitability reported adopting the following strategies: 48% (15/31) reported focusing on target markets, in particular meeting market specifications, and identifying new markets. Improving pasture management was reported by 45% (14/31) of interviewees, 35% (11/31) introducing better quality bucks and the minority were associated with herd management issues such as reducing the mortality rate, increasing weight at turn-off and increasing marking percentage (Table 5). A total of 71% (22/31) of producers of all regions reported they needed additional help from Meat and Livestock Australia to promote and advertise goat meat consumption in Australia and internationally.

Table 5. Changes over the next 5 years to increase profitability

Increase profitability	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Make no changes	2	1	2	5 (16)	0	0	0	0	5 (16)
Target markets	3	0	2	5 (16)	6	3	1	10 (32)	15 (48)
Better pasture management	1	1	2	4 (13)	8	1	1	10 (32)	14 (45)
Better quality bucks	0	0	1	1 (3)	5	4	1	10 (32)	11 (35)
Reduce turn-off age	3	0	1	4 (13)	1	0	1	2 (6)	6 (19)
Increase herd size	0	1	1	2 (6)	2	2	0	4 (13)	6 (19)
Reduce herd size	1	0	1	2 (6)	1	2	0	3 (10)	5 (16)
Reduce death rate	1	1	1	3 (10)	1	0	1	2 (6)	5 (16)
Increase turn-off weight	1	1	0	2 (6)	2	0	1	3 (10)	5 (16)
Increase marking rate	2	0	0	2 (6)	2	0	1	3 (10)	5 (16)

Objective 1. Determine the productive and reproductive performance of goat herds in the extensive rangelands of Australia

The producers in the pastoral regions reported herds consisting of Australian rangeland goats and Boer cross goats. In contrast all of the producers in the high rainfall regions reported herds of full blood Boer genotype. Producers in the rangeland regions reported introducing Boer genotypes into their rangeland herds to increase carcass weights. The pastoral region recorded lower live weights for mature breeding does and bucks compared to the high rainfall region (Table 6). Birth weights of kids were also less in the pastoral region than the birth weight of kids in the high rainfall region (Table 7). However, weaning weights were the same between regions although the age of the kids at weaning was greater for the pastoral region at 4.5 months compared to the high rainfall region of 3.2 months. The pastoral and high rainfall regions targeted weaning live weights for kids were the same at approximately 25 kg. Of note is the fact that few producers achieved their desired target weaning live weights for their kids.

Table 6. Recorded live weight (mean ± SD) of mature male and female goats

	Pastoral regions				High rainfall regions			
	West NSW	S.West QLD	C.West QLD	Subtotal	East NSW	S.East QLD	North QLD	Subtotal
Number of properties	9	3	5	17	9	4	1	14
Records observed	2	1	3	6	9	2	1	12
Liveweight for male (kg)	61 ± 41	50.0	60 ± 28	58 ± 25	104 ± 13	100 ± 28	80.0	101 ± 15
Liveweight for female (kg)	42 ± 17	40.0	50 ± 14	45 ± 12	73 ± 9	65 ± 21	60.0	71 ± 11

Table 7. Birth weight of kids, liveweight at weaning, age at weaning, daily gain to weaning, targeted weaning weights (mean ± SD) and age of castration

	Pastoral regions				High rainfall regions			
	West NSW	S.West QLD*	C.West QLD	Subtotal	East NSW	S.East QLD	North QLD	Subtotal
Number of properties	9	3	5	17	9	4	1	14
Reported to wean the kids	2	0	3	5	9	4	1	14
Records observed (n)	3	0	2	5	9	4	1	14
Birth weight (kg)	2.4± 0.2	.	2.3±0.3	2.3±0.2	3.5±0.5	3.6±0.3	3.5	3.5±0.4
Liveweight at wean (kg)	21 ± 4.9	.	18 ± 2.8	20 ± 3.2	24 ± 5.7	21 ± 6.5	17	22 ± 5.8
Age at wean (months)	4.2±1.4	.	5.1±1.4	4.5±1.3	3.3±0.2	3.4±0.2	3.0	3.2±0.2
Estimated weight gain at weaning (g/day)	144	.	105	128	204	168	150	196
Target weaning weight (kg)	21 ± 4.9	.	28 ± 5.6	24 ± 7.8	28 ± 4.1	21 ± 6.5	20.0	25 ± 6.1
Producers who castrate (n)	2	.	2	4	8	3	1	12
Castration age (month)	3.5±0.7	.	4.1±1.0	3.3±1.3	2.1±0.5	3.5±2.5	3.0	2.6±1.3

* Producers from south-western QLD could not cite known data

Age at first mating for young does was 8.5 months for the pastoral region compared to the high rainfall regions where the mean age at first mating was 15.2 months. Subsequently the pastoral regions mean age at first kidding was less than the high rainfall region. A greater percentage of young does were retained in the breeding herd in the pastoral regions compared to the high rainfall regions.

Table 8. Age that young does enter the breeding herd and age at first kidding (mean ± SD)

	Pastoral regions				High rainfall regions			
	West NSW	S.West QLD	C.West QLD	Subtotal	East NSW	S.East QLD	North QLD	Subtotal
Number of properties	9	3	5	17	9	4	1	14
Records observed	3	2	3	8	9	4	1	14
Age at first mating (month)	6±0.0	8±2.8	11.5±4.9	8.5±3.5	15±3.3	16.5±3.0	12.0	15.2±3.1
Age at first kid (month)	11±0.0	13±2.8	16.5±2.5	14.1±3.1	20.3±3.4	21.5±3.0	17.0	20.7±3.3
Retained young does (%)	33.3±15.3	50.0±3	62.5±18	50±21	42.7±33	20±4.1	20.0	34.6±28

Pregnancy rates were less in the pastoral region at 60% compared to the high rainfall region at 94%. Doe prolificacy in the pastoral region was half (0.9 kid /doe) the prolificacy reported in high rainfall herds (1.8 kids /doe). All producers had a kidding interval of 12 months. All producers indicated significant variation in kidding rates in association with seasonal conditions. However, regardless of the seasonal conditions the kidding rate was always less for the pastoral regions compared to the high rainfall regions (Table 9).

Table 9. Pregnancy and kidding rates, prolificacy and kidding interval (mean ± SD)

	Pastoral regions				High rainfall regions			
	West NSW*	S.West QLD*	C.West QLD	Subtotal	East NSW	S.East QLD	North QLD	Subtotal
Number of properties (%)	9	3	5	17	9	4	1	14
Records observed	0	0	1	1	9	4	1	14
Pregnancy rate (%)	.	.	60	60	93±4	95±4	96	94.2±3.6
Kidding rate:								
Poor season (%)	.	.	60	60	153±58	127±38	100	142±52
Average season (%)	.	.	85	85	171±66	160±34	150	166±55
Good season (%)	.	.	120	120	186±74	202±33	200	191±61
Prolificacy (kids/doe)	.	.	0.9	0.9	1.7±0.3	1.6±0.4	1.5	1.8±0.2
Kidding interval (months)	.	.	12	12	11.5±1.3	12.0	12.0	11.7±1.1

* There was no information available from producers from western NSW and south-western QLD.

Mortality rates for kids (0 to 3 months) were reported to be greater for the pastoral region at 33%/year than the high rainfall region at 12%/year. The mortality rate of the kids for western NSW and south west QLD were unknown to producers interviewed. Mortality rates were also greater in young animals (4 to 12 months) and adults (>12 months) in the pastoral region compared to the high rainfall regions (Table 10). The authors were invited to observe records from some producers in both the pastoral and high rainfall regions and where applicable the number of producers allowing access to the records is recorded. Although other producers did not give the authors access to mortality records the numbers reported corroborate data given by other producers in the cluster of properties. The producers in the pastoral and high rainfall regions reported that the most common causes of mortality in their goat herds were starvation mismothering syndrome and predators. 'Old age' was also given as a common cause of mortality in adult goats in the pastoral region. The category of old age used by producers in this region may mean simply that the animal was not seen at the next muster and an assumption of death was made.

Table 10. Average annual mortality rate (mean ± SD) for three classes of goats in the pastoral and high rainfall regions of eastern Australia

	Pastoral regions				High rainfall regions			
	West NSW*	S.West QLD*	C.West QLD	Subtotal	East NSW	S.East QLD	North QLD	Subtotal
Number of properties	9	3	5	17	9	4	1	14
Records observed	0	0	3	3	9	3	1	14
Mortality for kids (%)	.	.	33 ± 23	33 ± 23	13 ± 11	10 ± 5	5	12 ± 10
Mortality for young (%)	.	.	16 ± 17	16 ± 17	4 ± 3	9 ± 7	15	6 ± 5
Mortality for adults (%)	.	.	8 ± 3	8 ± 3	1 ± 0.4	7 ± 7	1	3 ± 4

* There was no information available on mortality in western NSW and south-western QLD

Selection of Bucks for breeding

Goat producers in the high rainfall regions selected bucks for two or more criteria. In contrast all but one goat producer in the pastoral region selected bucks for two or less criteria (Table 11). The most common criterion for buck selection was for physical conformation 80% (25/31). In the pastoral regions weight for age was selected by 24% of producers (4/17), temperament by 18% (3/17) and colour by 12% (2/17). No producers in the pastoral regions used KIDPLAN® as a selection criteria for bucks. In addition, only two producers in the high rainfall region used KIDPLAN® as a selection criterion for bucks. Of note is that most of the goat producers in the high rainfall regions were seed-stock producers. Producers in the high rainfall regions stated that KIDPLAN® was not utilised because the customers buying bucks and does did not request breeding values and the seed stock producers questioned the value of KIDPLAN® for the extra labour required to collect the data.

Table 11. Criteria for selecting the bucks in the herd

	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31(100)
Number of criteria selected									
0 criteria	4	1	0	5	0	0	0	0	5
1 type	2	2	1	5	0	0	0	0	5
2 types	3	0	3	6	3	1	1	5	11
≥ 3 types	0	0	1	1	6	3	0	9	10
Criteria for selection									
Conformation	5	2	4	11 (35)	9	4	1	14 (45)	25 (80)
Weight for age	2	0	2	4 (13)	5	1	0	6 (19)	10 (32)
Temperament	1	0	2	3 (10)	4	2	1	7 (23)	10 (32)
Colour	0	0	2	2 (6)	5	3	0	8 (26)	10 (32)
Kidplan®	0	0	0	0	1	1	0	2 (6)	2 (6)

Reasons for culling Bucks and Does

Mature does and bucks were culled when they were unproductive or over 7 years old on 58% (18/31) of surveyed properties. Bucks were most likely to be culled because of physical defects (71%), old age (58%), reproductive problems (55%) and temperament (45%). The main criteria for culling does were failure to become pregnant and deliver a kid (65%), old age (58%), mastitis (48%) and failure to rear a kid (39%, Table 12).

Table 12. Reasons for culling mature Bucks and Does

Characteristics	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Reasons for culling Bucks									
Physical defects*	5	1	3	9 (29)	9	3	1	13 (42)	22 (71)
Age (old)	5	3	4	12 (39)	4	2	0	6 (19)	18 (58)
Reproductive problems	3	0	3	6 (19)	7	3	1	11 (35)	17 (55)
Temperament	4	1	3	8 (26)	3	2	1	6 (19)	14 (45)
Increasing Fatness	3	0	2	5 (16)	0	0	1	1 (3)	6 (19)
Disease	1	0	0	1 (3)	4	0	1	5 (16)	6 (19)
Reasons for culling Does									
Failure to get pregnant/ year	3	0	4	7 (23)	9	3	1	13 (42)	20 (65)
Age (old)	5	3	4	12 (39)	4	2	0	6 (19)	18 (58)
Mastitis (Chronic)	5	0	2	7 (23)	6	2	0	8 (26)	15 (48)
Failure to rear a kid	1	0	2	3 (10)	6	2	1	9 (29)	12 (39)
Poor quality kids	0	0	1	1 (3)	5	1	0	6 (19)	7 (23)
Two teats/ udder	1	1	2	4 (13)	1	1	1	3 (10)	7 (23)
Increasing Fatness	3	0	2	5 (16)	0	0	1	1 (3)	6 (19)

* Includes all visible defects on angulation of legs, dentition (prognathism and retrognathia), etc.

Objective 2. Determine the disease occurrence and management of goat herds in the extensive rangelands

The producers interviewed had limited data on goat herd health. They rarely used any diagnostic test or any professional help to diagnose diseases. The producers who reported using feceal egg counts as a tool to monitor the incidence and severity of gastrointestinal nematodes were predominately from high rainfall regions accounting for 42% (13/31) of producers in all regions.

Producers considered gastrointestinal parasites (61%) and body lice (48%) as the main diseases associated with their goat herds (Table 8). Infections with nematodes and Caseous Lymphadenitis were reported by producers in all regions. Coccidiosis was reported by the producers in eastern NSW and south-eastern QLD as a disease within their herds. Only 6% (2/31) of producers reported testing their herds for Caprine Arthritis Encephalitis virus (CAE) and these producers existed in the pastoral region (Table 13).

Table 13. Main diseases in goat herds reported by the goat producers in QLD and NSW

Diseases	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Total n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31(100)
Gastrointestinal parasites	2	1	2	5 (16)	9	4	1	14 (45)	19 (61)
External parasites (lice)	0	1	4	5 (16)	7	3	0	10 (32)	15 (48)
Coccidiosis	0	0	0	0	7	2	0	9 (29)	9 (29)
Cheesy gland *(Caseous Lymphadenitis)*	1	1	1	3 (10)	3	1	1	5 (16)	8 (26)
Enterotoxemia (*Clostridium perfringens*)	0	0	0	0	5	0	1	6 (19)	6 (19)
Scabby mouth (*Contagious Ecthyma*)	1	0	1	2 (6)	0	0	1	1 (3)	3 (10)
Caprine Arthritis Encephalitis (CAE)	1	0	1	2 (6)	0	0	0	0	2 (6)

Producers regarded gastrointestinal parasites and body lice as the most common diseases in their herds. However, only 52% (16/31) of producers, mostly located in the high rainfall regions, reported drenching their animals with anthelmintics and 48% (15/31) were controlling lice. Producers used a large range of anthelmintics; however, producers from western NSW and south-western QLD reportedly had not used any anthelmintics in the last three years (Table 14).

Levamisole was the most commonly reported anthelmintic used to treat goats for intestinal parasites. As the commercial anthelmintic products are a combination of three or more drugs, many drugs are cited more than once. To reduce the frequency of anthelmintic administration, 22% (7/31) of producers were using the FAMACHA© system to monitor the colour of the eyelid for signs of anaemia.

Table 14. Type of anthelmintic products used in the last three years by surveyed goat producers

	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5		9	4	1		31 (100)
Number of chemical used									
0 chemical	9	3	3	15	0	0	0	0	15
1 or 2 types	0	0	1	1	0	0	0	0	1
3 or 4 types	0	0	1	1	1	2	0	3	4
5 or 6 types	0	0	0	0	3	1	0	4	4
≥ 7 types	0	0	0	0	5	1	1	7	7
Anthelmintic products used									
Levamisole	0	0	1	1 (3)	9	4	1	14 (45)	15 (48)
Closantel	0	0	0	0	8	2	1	11 (35)	11 (35)
Abamectin	0	0	1	1 (3)	8	1	1	10 (32)	11 (35)
Albendazole	0	0	0	0	9	1	1	11 (35)	11 (35)
Monepantel	0	0	0	0	5	1	1	7 (23)	7 (23)
Moxidectin	0	0	1	1 (3)	3	1	1	5 (16)	6 (19)
Ivermectin	0	0	0	0	2	3	1	6 (19)	6 (19)
Benzimidasole	0	0	0	0	3	2	1	6 (19)	6 (19)
Morantel	0	0	0	0	3	2	1	6 (19)	6 (19)
Doramectin	0	0	1	1 (3)	1	1	1	3 (10)	4 (13)
Oxifendazole	0	0	1	1 (3)	1	0	0	1 (3)	2 (6)
Fenbendazole	0	0	0	0	1	0	0	1 (3)	1 (3)
Organophosphate	0	0	0	0	0	0	1	1 (3)	1 (3)

A total of 65% (20/31) of producers reported that they isolated sick animals and 45% (14/31) had a quarantine period for new animals. The producers willing to isolate sick animals were associated with the pastoral and high rainfall regions. Seedstock producers from south-eastern QLD and northern QLD said they did not have a quarantine period because they seldom introduce new animals, but they were willing to segregate new animals before introduction to the goat herd.

The most common vaccinations used in the goat herds were targeted at clostridial diseases by 52% (16/31) of producers. A smaller sub-set of producers (13%; 4/31) also vaccinated for cheesy gland (*Caseous lymphadenitis*), included with the clostridial '5 in 1' vaccination products. All seedstock producers from the high rainfall regions vaccinated their goat herd, but only two producers from pastoral regions reported vaccinating their goats.

In all regions, the most common nutrient deficiencies reported were iodine (29%), protein/nitrogen (29%), calcium and/or magnesium (29%), selenium (23%) and phosphorus (23%) (Table 15). Some producers 26% (8/31) declined to comment on questions related to nutrient deficiencies in their herd. These producers considered the grazing resources on their properties to have adequate nutrients for goats or they did not have sufficient information to comment.

Table 15. Dietary nutrient deficiencies reported to affect goat production in surveyed goat herds from New South Wales and Queensland

Nutrient deficiencies	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
None	4	1	1	6 (19)	0	2	0	2 (6)	8 (26)
Iodine	0	0	2	2 (6)	6	1	0	7 (23)	9 (29)
Protein/nitrogen	1	1	3	5 (16)	3	0	1	4 (13)	9 (29)
Calcium and/or Magnesium	0	1	1	2 (6)	6	0	1	7 (23)	9 (29)
Selenium	0	0	1	1 (3)	6	0	0	6 (19)	7 (23)
Phosphorus	1	1	1	3 (10)	3	0	1	4 (13)	7 (23)
Energy	4	0	1	5 (16)	0	0	0	0	5 (16)
Copper	0	0	0	0	2	1	1	4 (13)	4 (13)
Sulphur	0	1	1	2 (6)	0	0	1	1 (3)	3 (10)
Salt (NaCl)	0	1	0	1 (3)	1	1	0	2 (6)	3 (10)
Cobalt	0	0	0	0	1	0	1	2 (6)	2 (6)
Potassium	0	0	1	1 (3)	0	0	0	0	1 (3)

Overall, 68% (21/31) of producers reported using supplements in their goat herds. All producers from the high rainfall regions reported using supplements. However, a majority of producers from western NSW and south-western QLD did not use any supplements (Table 16). The most commonly used supplements were mixes or formulated rations (48%; 15/31), feed blocks (45%; 14/31), grain (26%; 8/31) and crops (16%; 5/31). Only 13% (4/31) of producers reported the use of rumen modifiers for their goat herd (Table 11). The classes of goats fed with supplements in order of frequency were: does (68%; 21/31), kids (61%; 19/31) and bucks (55%; 17/31).

Table 16. Use of supplements and/or rumen modifiers associated with goat production in New South Wales and Queensland herds

	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31(100)
Producers using supplements	1	1	5	7 (23)	9	4	1	14 (45)	21 (68)
Producers using rumen modifiers	0	0	1	1 (3)	2	1	0	3 (10)	4 (13)
Type of supplements									
Mixes (formulated ration)	0	1	3	4 (13)	8	2	1	11 (35)	15 (48)
Feed blocks	1	1	3	5 (16)	6	3	0	9 (29)	14 (45)
Grain	0	0	0	0	6	2	0	8 (26)	8 (26)
Crops	0	0	0	0	3	2	0	5 (16)	5 (16)
Whole cottonseed	0	0	2	2 (6)	0	1	0	1 (3)	3 (10)
Protein meal (Copra)	0	0	0	0	2	1	0	3 (10)	3 (10)
Phosphorus (P) only	1	0	1	2 (6)	1	0	0	1 (3)	3 (10)
Molasses-urea	0	0	2	2 (6)	0	0	1	1 (3)	3 (10)
Salt-urea	0	0	0	0	0	1	0	1 (3)	1 (3)
Molasses-urea-protein meal	0	0	0	0	0	1	0	1 (3)	1 (3)
Molasses-urea-P	0	0	0	0	0	0	1	1 (3)	1 (3)
Protein meal (Soy bean)	0	0	0	0	0	0	1	1 (3)	1 (3)

Objective 3. Determine producer perceptions regarding grazing management of goats on rangelands

The mean stocking rates reported in the pastoral regions varied from 0.3 to 1.2 goats/ha (Table 17). The highest stocking rates were reported in the high rainfall regions (3.2 to 9.3 goats/ha). In general, the producer's reported stocking rates were similar and followed the same trend as the calculated stocking rates, however producers in western NSW and central-western QLD reported lower stocking rates (Table 17).

Table 17. Rainfall, property size, herd number and stocking rates of goat properties in New South Wales and Queensland

Characteristics	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31 (100)
*Rainfall (mm)**									
<250	5	0	0	5 (16)	0	0	0		5 (16)
250 to 500	4	3	4	11 (35)	0	1	0	1 (3)	12 (39)
501 to 750	0	0	1	1 (3)	9	3	0	12 (39)	13 (42)
>751	0	0	0	0	0	0	1	1 (3)	1 (3)
Property size (ha)									
<1,000	0	0	0	0	6	4	1	11 (35)	11 (35)
1,000 to 15,000	0	0	4	4 (13)	3	0	0	3 (10)	7 (23)
15,001 to 30,000	3	2	1	6 (19)	0	0	0	0	6 (19)
30,001 to 60,000	4	1	0	5 (16)	0	0	0	0	5 (16)
>60,001	2	0	0	2 (6)	0	0	0	0	2 (6)
Goat herd (head)									
< 500	0	0	0	0	5	4	1	10 (32)	10 (32)
500 to 3,000	1	2	3	6 (19)	4	0	0	4 (13)	10 (32)
3,001 to 6,000	2	0	2	4 (13)	0	0	0	0	4 (13)
6,001 to 16,000	4	0	0	4 (13)	0	0	0	0	4 (13)
>16,001	2	1	0	3 (10)	0	0	0	0	3 (10)
Stocking rate (goat/ha Mean ± SD)									
Reported (goats/ha)	0.3±0.2	0.7±0.5	0.6±0.2	0.5±0.3	5.2±3.6	3.2±2.0	5.1	4.5±3.1	
Calculated (goats/ha)	0.6±0.4	0.5±0.2	1.0±0.7	0.7±0.5	4.1±2.4	2.6±1.7	6.2	4.3±2.3	

* Average reported rainfall from the last 3 years.

Producers in the pastoral regions reported that they had the capacity to vary the number of goats on their properties to match seasonal conditions. The results showed that during a 'good season', producers could increase the number of goats up to 122% (Table 18). Goat producers in the high rainfall regions did not have the capacity to vary the number of goats carried with seasonal conditions.

Table 18. Percentage of goats carried on properties during poor, average and good seasons compared to the year of 2012* when the survey was undertaken

	Pastoral regions				High rainfall regions			
Seasonal condition	West NSW	S.West QLD	C.West QLD	Subtotal *mean±SD*	East NSW	S.East QLD	North QLD	Subtotal *mean±SD*
Poor (%)	50	34	60	51 ± 24	77	91	80	82 ± 18
Average (%)	82	72	78	79 ± 13	99	96	80	97 ± 7
Good (%)	116	115	122	117 ± 30	105	104	100	105 ± 14

*The carrying capacity of the year 2012 was considered to be a base of 100%.

Land and pasture condition

Clay soil and its derivatives were the major soil type reported by 68% (21/31) of producers. Clay soils existed in all of the surveyed properties, but mainly in eastern NSW and central-western QLD. Scrub soils were reported in western NSW, south-eastern and far north QLD. Yellow, red or black loam and sandy soils were most commonly reported in western and eastern NSW. A total of 55% (17/31) of producers reported they had very good or good land condition, although 42% (13/31) of producers reported some land erosion (Table 19). In contrast to the reported good land condition, 61% (19/31) of producers reported they had an average or poor pasture condition. This may have been perceived as a question on the current pasture status of their properties in light of the seasonal conditions at the time of the interview. Paddock spelling was practiced by 90% (28/31) of producers. The same majority of producers (90%) indicated that land management issues influenced their property management decisions.

Table 19. Land and pasture condition and major soil types in New South Wales and Queensland

	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31
Land condition									
Very good	1	1	2	4 (13)	1	1	0	2 (6)	6 (19)
Good	2	2	3	7 (13)	2	2	0	4 (13)	11 (35)
Average	4	0	0	4 (13)	6	0	1	7 (23)	11 (35)
Poor	2	0	0	2 (6)	0	1	0	1 (3)	3 (10)
Land Erosion									
Yes	4	2	2	8 (26)	3	1	1	5 (16)	13 (42)
No	5	1	3	9 (29)	6	3	0	9 (29)	18 (58)
Pasture condition									
Very good	0	0	2	2 (6)	1	1	0	2 (6)	4 (13)
Good	3	2	2	7 (23)	0	1	0	1 (3)	8 (26)
Average	4	1	1	6 (19)	4	2	1	7 (23)	13 (42)
Poor	2	0	0	2 (6)	4	0	0	4 (13)	6 (19)
Pasture spelling									
Yes	7	3	4	14 (45)	9	4	1	14 (45)	28 (90)
No	2	0	1	3 (10)	0	0	0	0	3 (10)
Major Soil types									
Clay soils (Vertosols)	4	3	4	11 (35)	8	1	1	10 (32)	21 (68)
Yellow/ Red/ Black loam	5	3	1	9 (29)	2	1	1	4 (13)	13 (42)
Sandy and Alluvial soils	4	1	1	6 (19)	4	1	0	5 (16)	11 (35)
Scrub soils	2	0	0	2 (6)	0	1	1	2 (6)	4 (13)
Rocky/ Skeletal soils	0	0	0	0	3	0	1	4 (13)	3 (10)

In all regions, the most reported browse species were Wattles (other than Mulga and Gidgee) with 42% (13/31), followed by 35% Box/Gum trees and 23% Mulga. In some cases, the presence of three or more browse species was reported on the same property. Belah, Black oak and Rosewood were recorded mainly in western NSW. Black berry, Chicory, Pine tree, Geebung, Billy bush and Teatree were reported mainly in eastern NSW (Table 20)

Table 20. Major browse species in New South Wales and Queensland

Major Browse species	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.East QLD	North QLD	Subtotal n (%)	Overall n (%)
Wattle (*Acacia* spp.)	1	0	3	4 (13)	4	4	1	9 (29)	13 (42)
Box/Gum trees (*Eucalyptus* spp.)	1	3	1	5 (16)	3	3	0	6 (19)	11 (35)
Mulga (*Acacia aneura*)	2	3	2	7 (23)	0	0	0	0	7 (23)
Blue bush (*Chenopodium* sp.)	3	1	0	4 (13)	0	0	1	1 (3)	5 (16)
Gidgee (*Acacia cambagei*)	0	2	2	4 (13)	0	1	0	1 (3)	5 (16)
Salt bush *(Atriplex* sp.)	3	1	1	5 (16)	0	0	0	0	5 (16)
Belah (*Casuarina cristata*)	4	0	0	4 (13)	0	0	0	0	4 (13)
Black oak (*Casurina* spp.)	2	0	0	2 (6)	0	0	0	0	2 (6)
Rosewood (*Heterodendrum* sp.)	2	0	0	2 (6)	0	0	0	0	2 (6)
Turkey bush (*Eremophila* spp.)	0	1	1	2 (6)	0	0	0	0	2 (6)
Prickly acacia (*Acacia nilotica*)	1	0	1	2 (6)	0	0	0	0	2 (6)
Burr medic (*Medicago* sp.)	1	0	0	1 (3)	0	1	0	1 (3)	2 (6)
Brigalow (*A. harpophyla*)	0	0	1	1 (3)	1	0	0	1 (3)	2 (6)
Black berry (*Rubus fruticosus*)	0	0	0	0	2	0	0	2 (6)	2 (6)
Chicory (*Cichorium* sp.)	0	0	0	0	2	0	0	2 (6)	2 (6)
Pines (*Pinus* sp.)	0	0	0	0	1	0	0	1 (3)	1 (3)
Geebung (*Persoonia acerosa*)	0	0	0	0	1	0	0	1 (3)	1 (3)
Tea tree (*Melaleuca* sp.)	0	0	0	0	1	0	0	1 (3)	1 (3)

Spear grass (*Stipa variabilis*) was the most important pasture community in western NSW and it was reported by 32% (10/31) of producers in all regions (Table 21). Mitchell, Buffel and Flinders grass were the most commonly utilized pastures reported by producers from the central and south-west QLD regions. The presence of Kikuyu, Rhodes and Couch grass was only reported in eastern NSW and south-eastern QLD which are regions with higher rainfall. Phalaris, annual Ryegrass, Barley grass, Cocksfoot, Redgrass, Paspalum, Tall Fescue, Bindi grass and clovers were reported exclusively by producers from eastern NSW (Table 21).

Table 21. Major pasture species reported on surveyed properties in New South Wales and Queensland

Major Pasture species	Pastoral regions				High rainfall regions				
	West NSW	S.West QLD	C.West QLD	Subtotal n (%)	East NSW	S.E. QLD	N QLD	Subtotal n (%)	Overall n (%)
Spear grass (*Stipa variabilis*)	6	0	0	6 (19)	4	0	0	4 (13)	10 (32)
Spear grass (*Heteropogon contortus*)	0	1	1	2 (6)	0	1	0	1 (3)	3 (10)
Mitchell (*Astrebla sp.*)	0	3	5	8 (26)	0	0	0	0	8 (26)
Buffel grass (*Cenchrus ciliaris*)	0	3	3	6 (19)	0	2	0	2 (6)	8 (26)
Summer grass (*Digitaria* sp.)	2	1	0	3 (10)	3	0	0	3 (10)	6 (19)
Flinders (*Iseilema macratherum*)	0	2	4	6 (19)	0	0	0	0	6 (19)
Phalaris (*Phalaris aquatica*)	0	0	0	0	6	0	0	6 (19)	6 (19)
Kikuyu (*Pennisetum clandestinum*)	0	0	0	0	3	3	0	6 (19)	6 (19)
Ryegrass (*Lolium rigidum*)	0	0	0	0	5	0	0	5 (16)	5 (16)
Wiregrass *(Aristida latifolia)*	0	2	2	4 (13)	1	0	0	1 (3)	5 (16)
Barley grass (*Hordeum leporinum*)	0	0	0	0	4	0	0	4 (13)	4 (13)
Cocksfoot (*Dactylis glomerata*)	0	0	0	0	4	0	0	4 (13)	4 (13)
Rhodes grass (*Chloris gayana*)	0	0	0	0	1	3	0	4 (13)	4 (13)
Couch grass (*Cynodon* sp.)	0	0	0	0	2	1	0	3 (10)	3 (10)
Bluegrass (*Dichanthium sericium)*	0	0	0	0	0	3	0	3 (10)	3 (10)
Copper Burr (*Bassia* spp.)	3	0	0	3 (10)	0	0	0	0	3 (10)
Clovers (*Trifolium sp.)*	0	0	0	0	2	0	0	2 (6)	2 (6)
Redgrass (*Bothriochloa macra*)	0	0	0	0	2	0	0	2 (6)	2 (6)
Paspalum (*Paspalum sp.)*	0	0	0	0	2	0	0	2 (6)	2 (6)
Spinifex (*Triodia basedowii*)	1	0	1	2 (6)	0	0	0	0	2 (6)
Panicum (*Megathyrsus* sp.)	0	0	0	0	0	1	1	2 (6)	2 (6)
Humidicola (*Urochloa* sp.)	0	0	0	0	0	1	1	2 (6)	2 (6)
Tall Fescue *(Festuca sp.)*	0	0	0	0	1	0	0	1 (3)	1 (3)
Bindi grass (*Soliva pterosperma*)	0	0	0	0	1	0	0	1 (3)	1 (3)

Weeds and toxic plants

When the producers were asked if there were any weed species occurring on their property, 81% (25/31) responded positively. Thistles (*Carduus sp.*) were the most common weeds reported by producers from eastern NSW (78%; 7/9), south-western QLD (67%; 2/3) and western NSW (11%; 1/9). Gidgee/boree (*A. cambagei* and *A. tephrina*) and other Acacia species were the second most reported weed species reported by 26% (8/31) of producers of all regions. Patterson curse (*E. plantageneum*) and Black berry (*Rubus fruticosus*) were weeds reported, respectively, by 78% (7/9) and 44% (4/9) of producers from eastern NSW

Overall, 19% (6/31) of the producers reported that toxic plants were reducing the performance of their herds. Copper burr (*Bassia convexula*) was reported by 33% (3/9) of producers from western NSW and 11% (1/9) eastern NSW. Pimelea (*Pimelea* spp.) was reported by 67% (2/3) of producers from south-western QLD and 20% (1/5) of producers from central-western QLD. Turpentine (*Eremophilia* sp.) was reported 22% (2/9) of producers from western NSW. Bracken Fern (*Pteridium aquilinum*) and Rock Fern (*Cheilanthes sieberi*) were reported equally by 22% (2/9) of producers from eastern NSW. Producers reported controlling toxic plants by using physical removal, herbicides and/or densely stocking the infested area with goats

Fencing

Ninety-seven percent (30/31) of producers in all regions carried out some fencing activity over the last 5 years (Table 22). From this total, 45% (14/31) of reported fencing activity was associated with installing new watering points and 52% (16/31) was not associated with new watering points. In western NSW, 67% (6/9) of producers conducted fencing associated with water points; however the fencing activities in eastern NSW and south-eastern QLD were not associated with water points. Overall, most of the fencing activities were undertaken with the purpose of establishing goat management paddocks (84%; 26/31) or to create a new paddock (71%; 22/31). In south-eastern QLD, 100% (4/4) of producers reported dog control as the main reason for building new fences (Table 14). In all regions, 81% (25/31) of producers reported that they were planning fencing during the next 5 years (2013 to 2018). The two most important reasons for fencing in the future were to replace old fences (55%; 17/31) and to create new holding paddocks (45%; 14/31). The most common types of fences were hinge joint (84%; 26/31) and plain wire (52%; 16/31). Producers mentioned that the hinge joint fence was normally associated with a plain wire on the top.

Table 22. Characteristics of fencing undertaken on surveyed properties.

Characteristics	Pastoral regions				High rainfall regions				
	West NSW	S.W QLD	C.W QLD	Subtotal n (%)	East NSW	S.E. QLD	Nth QLD	Subtotal n (%)	Overall n (%)
Number of properties	9	3	5	17 (55)	9	4	1	14 (45)	31 (100)
Fencing over the last 5 years									
No	0	0	1	1 (3)	0	0	0	0	1 (3)
Yes, associated with waters	6	1	3	10 (32)	2	1	1	4 (13)	14 (45)
Yes, not associated with waters	3	2	1	6 (19)	7	3	0	10 (32)	16 (52)
Reasons for the use of fence									
Goat management paddock	8	2	3	13 (42)	9	3	1	13 (42)	26 (84)
Create new paddock	6	3	2	11 (35)	7	3	1	11 (35)	22 (71)
Build a new lane	0	1	3	4 (13)	4	2	0	6 (19)	10 (32)
Fence for dog control	0	0	1	1 (3)	0	4	1	5 (16)	6 (19)
Fence out a problem area	1	0	1	2 (6)	2	2	0	4 (13)	6 (19)
Plan fencing for the future									
Yes	7	3	4	14 (45)	7	3	1	11 (35)	25 (81)
No	2	0	1	3 (10)	2	1	0	3 (10)	6 (19)
Reasons for fencing in future									
Replace old fence	5	1	4	10 (32)	5	2	0	7 (23)	17 (55)
Create new holding paddock	4	1	1	6 (19)	7	1	0	8 (26)	14 (45)
Build lane ways	0	2	2	4 (13)	3	1	1	5 (16)	9 (29)
Create a new main paddock	0	1	0	1 (3)	5	0	1	6 (19)	7 (23)
Fence out country types	1	0	0	1 (3)	2	0	0	2 (6)	3 (10)
Fence out a problem areas	1	0	0	1 (3)	1	0	0	1 (3)	2 (6)
Type of fence used									
Hinge joint	6	3	3	12 (39)	9	4	1	14 (26)	26 (84)
Plain wire	9	1	3	13 (42)	2	0	1	3 (10)	16 (52)
Electric fence	0	2	2	4 (13)	5	3	0	8 (26)	12 (39)
Barbed wire	2	1	4	7 (23)	0	1	0	1 (3)	8 (26)

Use of pasture development strategies

In all regions, 77% (24/31) of producers had undertaken some pasture development activity in the past five years and 58% (18/31) of producers had undertaken these activities in 2012 or 2013. Only 23% (7/31) of surveyed producers did not engage in pasture development in the past five years. The types of pasture development strategies employed by 78% (7/9) of producers surveyed from eastern NSW were the use of fertilizer, sowing improved grasses and sowing improved legumes. A heavy stocking rate for short time periods was the most common pasture development strategy reported by 19% (6/31) of producers. This involved putting goats in a paddock at a high stocking rate to promote the reduction of undesirable shrubs or weedy species. The pasture strategy of broadcasting seeds into grassland was

exclusively mentioned by producers from eastern NSW (22%; 2/9) and south-eastern QLD (75%; 3/4). Pulling trees/vegetation and sowing improved grasses or sowing native pasture was widely used in south-western QLD (100%; 3/3) and central-western QLD (60%; 3/5). The pasture development strategies of addition of limestone and/or diatomaceous earth (33%; 3/9), blade ploughing of woody weeds (22%; 2/9) and direct-drill disc seeders (22%; 2/9) were reported exclusively by the producers from western and eastern NSW.

Overall, 48% (15/31) of producers used fire on their properties. The reasons for using fire were for reducing fire risk (23%; 7/31), for grazing management (i.e. increasing the number of goats in certain areas, 23%; 7/31), controlling woody weeds (19%; 6/31) and to encourage growth of pasture species (16%; 5/31).

Pasture improvement with legumes and grasses

In all regions, pasture improvement with legumes was reported by 29% (9/31) of producers and the pasture improvement with grasses was reported by 32% (10/31) of producers. The two most important legumes reported by producers from eastern NSW were lucerne (*Medicago sativa*) by 67% (6/9) and clovers (*Trifolium sp.*) by 33% (3/9) of producers. Thirty-three percent (3/9) of producers from eastern NSW reported using improved grasses such as phalaris (*Phalaris aquatic*), cocks foot (*Dactylis glomerata*) and annual ryegrass (*Lolium rigidum*). Sixteen percent (5/31) of producers from both the pastoral and high rainfall regions reported using forage crops such as oats (*Avena sativa*). Very limited pasture development/sowing of improved grasses or legumes were reported from central-western QLD, south-eastern QLD and northern QLD.

Objective 4. Determine the sources of information for goat producers and their effectiveness in changing producer behaviour

A total of 86% (19/22) of meat goat producers use a personal computer with email and internet access. Personal computers were also used to keep accounting and financial records 77% (17/22) (Table 23).

Table 23. Personal computer use and activities undertaken with a computer by goat producers

Characteristics	Pastoral region				High rainfall region			
	West NSW	S. West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Personal Computer								
Yes	6	3	5	14 (64)	4	1	5 (23)	19 (86)
No	3	0	0	3 (14)	0	0	0	3 (14)
Activities with Computer								
Internet/email	6	3	5	14 (64)	4	1	5 (23)	19 (86)
Accounting/ Financial record	5	3	5	13 (59)	3	1	4 (18)	17 (77)
Education	4	3	5	12 (55)	3	1	4 (18)	16 (73)
Excel/Word processing	1	3	2	6 (27)	4	1	5 (23)	11 (50)
Planning improvements	3	3	3	9 (41)	1	0	1 (5)	10 (45)
Resource mapping	3	3	3	9 (41)	0	0	0	9 (41)
Herd recording	1	3	2	6 (27)	1	1	2 (9)	8 (36)

Table 24. Common sources for property management information sought by meat goat producers

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Field days/ Meetings	8	3	5	16 (73)	2	1	3 (14)	19 (86)
Goat on the move	3	1	3	7 (32)	4	1	5 (23)	12 (55)
Printed material	2	3	2	7 (32)	2	1	3 (14)	10 (45)
Software/ Internet	4	3	1	8 (36)	1	1	2 (9)	10 (45)
Going into goats guide	2	1	2	5 (23)	3	0	3 (14)	8 (36)
Radio/ TV/ Videos	1	2	1	4 (18)	1	0	1 (4)	5 (23)
Advisor/ Consultant	0	1	0	1 (4)	1	1	2 (9)	3 (14)

Producers regarded field days and meetings as the greatest source of property management information at present 85.7% (18/22). When asked from which group activities producers learned the most, (76.2%) of producers indicated field days as the greatest learning opportunity (Table 25). This was supported by information presented in Table 36 where 71.4% of producers preferred field days and meetings as a medium for communicating research projects. The “Goats on the Move” newsletter and other print materials were second and third respectively as sources of information for goat producers. Table 26 indicates that 80% (17/22) of producers prefer newsletters as being the most useful means to learn about new research findings in property management from available print media. Print media was also preferred as the most useful source of information about research findings and property management when given a choice of delivery from print (76.2%), radio (28.6%), television (23.8%), and video (14.3%) media (Table 28).

Table 25. Meat goat producers preferred method for the communication from research projects

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Field days/ Meetings	7	2	4	13 (59)	2	1	3 (14)	16 (73)
Software/ Internet	4	2	1	7 (32)	2	0	2 (9)	9 (41)
Printed material	2	0	3	5 (23)	2	0	2 (9)	7 (32)
Radio/ TV/ Videos	0	0	1	1 (4)	0	0	0	1 (4)
Advisor/ Consultant	0	0	0	0	1	0	1 (4)	1 (4)

Table 26. Meat goat producers preferred print media for accessing knowledge on new research findings in property management

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Newsletters	8	2	3	13 (59)	3	1	4 (18)	17 (77)
Magazines	1	0	3	4 (18)	4	1	5 (23)	9 (41)
Newspapers	3	2	2	7 (32)	1	0	1 (4)	8 (36)
Pamphlets	1	0	1	2 (9)	1	0	1 (4)	3 (14)

Table 27. In printed material, **goat producers preferred medium for disclosing research findings**

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1		22
Graphs	4	0	3	7 (32)	1	1	2 (9)	9 (41)
Diagrams	2	1	3	6 (27)	1	1	2 (9)	8 (36)
Tables	3	1	3	7 (32)	1	0	1 (4)	8 (36)
Photos	2	0	2	4 (18)	0	0	0	4 (18)

Producers preferred graphs, diagrams and tables in a similar percentage to identify interesting research outcomes.

Table 28. From which do you find the **most useful** as a source of information about **research findings and property management**?

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Print media	7	2	3	12 (55)	3	1	4 (18)	16 (73)
Radio	3	1	2	6 (27)	0	1	1 (4)	7 (32)
Television	1	0	1	2 (9)	2	1	3 (14)	5 (23)
DVD's	1	1	0	2 (9)	0	1	1 (4)	3 (14)

Table 29. From which of the group **activities** do you feel you **learn the most**?

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Field days	8	2	4	14 (64)	2	1	3 (14)	17 (77)
Group meetings	4	1	2	7 (32)	3	0	3 (14)	10 (45)
Face to face with consultants	0	0	2	2 (9)	2	0	2 (9)	4 (18)
Focus group	1	1	0	2 (9)	2	0	2 (9)	4 (18)

The records collected on farm are used by 61.9% of producers for stock number adjustments, monitoring herd size 47.6%, taxation 46.7%, and to plan property improvements 47.6%. Only 14.3% of goat producers used the records that they collected to benchmark production data.

Table 30. How records are used in the management of property by goat producers?

Characteristics	Pastoral region				High rainfall region			
	West NSW	S.West QLD	Central W. QLD	Subtotal n (%)	S.East QLD	North QLD	Subtotal n (%)	Total N (%)
Number of properties	9	3	5	17	4	1	5	22
Yes, I use my records	7	3	3	13 (59)	4	1	5 (23)	17 ()
No, I don't make records	2	0	2	4 (18)	0	0	0	4 (18)
Use of records								
Stock number adjustment	5	3	2	10 (45)	4	0	4 (18)	14 (64)
Monitoring herd size	4	3	1	8 (36)	2	0	2 (9)	10 (45)
Taxation	4	3	0	7 (32)	3	0	3 (14)	10 (45)
Plan property improvement	3	3	2	8 (36)	3	0	3 (14)	11 (50)
Seasonal trends	6	2	1	9 (41)	0	0	0	9 (41)
Plan herd improvement	2	1	3	6 (27)	3	1	4 (18)	10 (45)
Marketing	3	2	0	5 (23)	3	0	3 (14)	8 (36)
Business analysis/planning	3	2	0	5 (23)	2	0	2 (9)	7 (32)
Assessing herd performance	1	1	0	2 (9)	4	1	5 (23)	7 32()
Monitoring resources	3	1	1	5 (23)	0	0	0	5 (23)
Benchmarking	1	1	0	2 (9)	1	0	1 (4)	3 (14)

5 Discussion

Objective 1. Determine the productive and reproductive performance of goat herds in the extensive rangelands of Australia

The greater live weight of adult male and female goats in the high rainfall region compared to the pastoral regions may have a number of explanations. Boer goats are known to be heavier in weight compared to rangeland goats at maturity. The high rainfall region was dominated by seed stock producers of the Boer goat breed, in comparison the pastoral region was dominated by rangeland goats. In addition, the pastoral region relies heavily upon its natural resources as a feed base for livestock including browse and native pasture species which are inherently lower in digestibility than improved pastures and supplements consumed by goats in the high rainfall regions. Browse and pasture species of the pastoral zone limit live weight growth not only by a decreased digestibility of dry matter but also through secondary metabolites such as tannins that may have anti-nutritional effects on grazing herbivores. Furthermore, goat producers in the pastoral regions used the goat herds as biological control agents against woody weeds. To be successful in controlling woody weeds stocking rates are usually higher than average for the area and the goat herd subsequently is limited in dry matter intake by competition for feed, anti-nutritional compounds in the woody weed being grazed and digestibility of the feed base. The goats from the pastoral regions are limited in their ability to grow and fatten. However, there are opportunities to increase adult live weights of breeding does and bucks through the use of heavier genotypes, managing stocking rates, and improving the digestibility of the feed base. The mature body weight of a goat influences other productive traits such as birth weight and weaning weight of the offspring. Producers from the pastoral region reported birth weights that were 1.2 kg less than those reported by producers in the high rainfall region. Eady and Rose (1988) reported similar birth weights to those given by producers in the pastoral regions for male (2.76 kg) and female (2.54 kg) cashmere kids in south western Queensland. Weaning age was greater for the pastoral regions (5.1 months) compared to the kids weaned in the high rainfall regions (3.2 months) to achieve the same weaning live weight. It is noteworthy that the weaning live weight for the pastoral region is similar to the data reported by Eady and Rose (1988) in that weaning occurred at 3 months-of-age.

The mortality rate of kid goats from birth to weaning has been reported to be 15% in a controlled experimental herd in the pastoral region of south west Queensland (Eady and Rose 1988). The reported mortality rate in the pastoral region in this survey was 33%. It is likely that the mortality rate of kids could be greater than this as the western NSW and south western QLD producers did not know the mortality rate of their kids. Furthermore, western NSW producers rely heavily of opportunistic harvesting of goats and as such the herds would be unmanaged. Predation of kids by wild dogs, foxes, wild pigs and wedge tailed eagles were reported as a significant source of losses for young goats from all producers. However, the numbers of kids that were predated upon in a year was unknown.

Reproductive performance

The age at which maiden does are mated was reported to be less for the pastoral region (8.5 months) compared to the high rainfall region (15.2 months). This may suggest a lack of control in the mating of maiden does in the pastoral region where opportunistic harvesting operations are found. The age at first mating can also impact on reproductive wastage in the breeding herd especially if a reduced body

weight and body condition on 2nd parity does contributes to decreased pregnancy. Opportunistic harvesting operations will sell mature dry does to make up a consignment of animals that will meet a carcass weight specification. The practice of selling breeding animals and an earlier age at first mating may be why a greater percentage of young does are retained in the herds from the pastoral region compared to the high rainfall regions.

Pregnancy rates were less for the pastoral regions compared to the high rainfall regions. In addition there was a lack of information recorded by producers in the pastoral regions on reproductive parameters of their doe herds. The kidding rates were reported to vary by season. For all producers the kidding rates increased in a good season and decreased in a poor season. The pastoral region had a lesser kidding rate compared to the high rainfall regions. Prolificacy also varied between regions with the herds from the pastoral regions being half the prolificacy of the herds in the high rainfall regions. Mature body weight and digestibility of the feed base can largely explain the differences reported between both regions.

2. Determine the disease occurrence and management of goat herds in the extensive rangelands

Most producers in the pastoral regions appeared apathetic toward gastrointestinal parasite control and the disease status of their goat herds. Anaemia was evident on inspection of some of the goat herds from the pastoral regions. However, the majority of producers from the pastoral regions reported that gastrointestinal parasites were not a health problem in their goat herds. Furthermore, most producers reported to never using anthelmintic products in their goat herds. Producers in the pastoral regions rarely used any diagnostic tests such as, fecal egg counts, larval cultures or the heamonchus dipstick test nor did they seek veterinary assistance with their herds. Producers from the high rainfall regions reported using diagnostic tests in particular, faecal egg counts and the FAMACHA© system. It is ironic that all surveyed producers acknowledged the small number of anthelmintic products registered for goats in Australia as a problem for the meat goat industry. A notable difference between producers from the pastoral and high rainfall regions was that the pastoral regions producers had used less than three anthelmintic drugs but the producers from the high rainfall regions had used greater than three anthelmintic drugs. Furthermore half of the high rainfall regions producers reported using greater than seven anthelmintic drugs. If the pastoral regions producers were sourcing their bucks from the high rainfall regions seed stock producers then it is likely that the pastoral regions producers could also be sourcing anthelmintic resistant nematodes.

Coccidiosis, caseous lymphadenitis, enterotoxaemia, contagious ecthyma, and caprine arthritis encephalitis appeared to be diseases of importance in the high rainfall regions. This may be due to a higher stocking rate allowing for disease transmission. An increased human-animal contact in the high rainfall regions also allows the producer to see diseased and dead stock to a greater extent than the producers in the pastoral regions. The heavy reliance upon opportunistic harvesting operations in the pastoral regions limits animal health monitoring and interventions. However, 48% of producers spread equally between the pastoral and high rainfall regions reported culling does for mastitis. Although, mastitis was not a disease state identified by producers as a common disease in their goat herds. It is unknown if mastitis is contributing to an early exit from the breeding herd by infected does, what the percentage of infected animals is, and how this impacts on kid survival and growth.

3. Determine producer perceptions regarding grazing management of goats on rangelands

There was a large variance in reported stocking rates by producers (0.3 to 9.3 goats per hectare). Producers from western NSW and central-western QLD tended to underestimate their stocking rates. The underestimation of stocking rates has been reported previously especially when goats are run on a property with other grazing species (Ferrier and McGregor 2002). Underestimation of stocking rates can be a problem in a number of ways. Firstly underestimating stocking rates can result in increased competition for the feed base that subsequently limits digestible dry matter intake and hence productive processes such as lactation and growth. Secondly, the underestimation of stocking rates can result in overgrazing and reduced ground cover that leads to an increase in land degradation.

Producers in the pastoral regions varied their stocking rates with seasonal conditions. However, producers in the high rainfall regions reported an inability to modify stocking rates. The greater stocking rates in the high rainfall regions may be due to the demand for live Boer type does and bucks on the international market especially China and Malaysia. Although these markets have diminished at the time of writing this report. Stocking rates may also be increased purposively by producers in the pastoral regions to control invasive woody weeds. However, producers who carried out this option in managing their land also had a plan to revegetate with improved pasture species. Although producers in the pastoral regions change the amount of goats carried with seasonal conditions a third reported average or poor land condition at the time of the interview. However, half of the producers in the pastoral regions reported average or poor pasture condition. Pasture and land condition are associated and therefore should reflect the same perceived values. This may have been perceived as a question on the current pasture status of their properties in light of the seasonal conditions at the time of the interview.

4. Determine the sources of information for goat producers and their effectiveness in changing producer behaviour

Producers still prefer sources of information that can be delivered in formats that encourage discussion and debate such as field days and small groups. Producers stated that they learned more from their peers in these open forums than in one on one discussion with an advisor or consultant. Print media was preferred over electronic media as the most useful source of information from a number of mediums available. The effectiveness of changing producer behaviour lies in communicating information in the mediums that are preferred by the producer.

6 Conclusions

The survey quantified goat enterprises and the markets that producers targeted. The survey was able to establish benchmarks for the meat goat industry in reproductive and production parameters for the pastoral and high rainfall regions of Queensland and New South Wales. In addition the common diseases and management of goats in the pastoral and high rainfall regions were identified and discussed. Producers also provided information on their perceptions of grazing management of goats in the pastoral regions. The preference of media by goat producers for the delivery of information on herd and property management was addressed.

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8 Appendices

Appendix 1: Question 106

Do you have any other comments about the factors that affect the goat industry? What kind of help would you like to receive from Research, Development and Extension Agencies?

1. Promotion of goat meat. Continued marketing. More advertising. More communication through Australia about information on goats.

2. More information regarding new marketing avenues. More published documents regarding nutrition.

3. We are mainly a sheep/wool enterprise. Finding markets for small goat producers would be an advantage to our enterprise.

4. Marketing and research into markets. Support industry leaders at grassroots. Supporting the Far West to continue as a leader in the goat industry.

5. I would like to see more people have goats to make up leads for market. We need a scale to the industry so that we can fulfil contracts together. Open up the many trade to Malaysia again.

6. Where is the best place to market your goats? More market information. We need to get help on our management program… When to wean? When to breed? How to grow them faster? How do you get from a continuously mated system to a managed production system, with the least amount of problems? We need management systems for improving weight for age.

7. The biggest single factor affecting goat production is lack of markets, distance form niche markets (eg. restaurant trade) for western-northern QLD. A solution would be to have “backgrounder” or holding properties in close proximity to abattoirs. The distances to current markets mean producers need at least an 8 deck lot (approx 700-800 animals) to cut the freight cost. We need more export markets to open up for the commercial Boer cross does. We need to encourage more producers into goats. Consistency supply would be the flow on effect.

8. MLA can help open up markets to Philippines & Malaysia. More local field days with the latest research

9. Our problem Number 1 is marketing. Expand to China? Spend more money on Marketing. More research on worms in dry areas.

11. Wild dogs are our biggest problem. Goats are better in lower rainfall years.

12. More market options. Exotic diseases (FMD) are a threat to the industry.

13. Research into new markets. Not too many people will be in Boer goats in the next 5 years. The goat job is losing options to sell goats. MLA hasn't done enough.

14. Try to get into all markets (Domestic, Live export, Carcass export, Prime (restaurant) and Stores).

15. Nematodes control is our biggest problem. Find out selected animals resistant to worms. Improve chain supply to meet the export demand and to supply national restaurants. Promote and advertise more about the goat industry. Suggestions for new researches: improve nutrition to control internal parasites (worms), why animals have too much diarrhea in the rainy period.

16. More access for goat producers in high rainfall country (Over 500mm). Avoid sheep chemicals or have more drenches for goats. Chemical residues will affect the entire goat industry if producers use unregistered chemicals.

18. We need to create more markets (Domestic and International). Promote more advertisements about the goat industry. Suggestion for research projects: studies about 1) the genetic which control Bottle teats in Boer goats and about 2) the vaccine for Cheese Gland (he identified more cases after vaccination).

19. Suggestion for research projects: study about selection of resilient animals against worms (nematodes). MLA can help to promote the Domestic market,

20. We need to improve the marketing and advertise that meat goat is good and it has many benefits.

21. We need help to reduce the price of freight for animal transportation. Property is 300 km from the abattoir. Promote more goat meat advertisements.

Appendix 2. Meat Goat Survey Questions:

Interviewer: _____

Section 1: General Property Information

Owner/ Manager name: _____

Property/ Station name: _____

1) Where is your property located? Pastoral district?

   _____

   Latitude: (S) _____ Longitude: (E) _____

2) Local Government authority: _____
3) What is the area of your property (ha)? _____
   a. What % of the property is currently utilised? _____
   b. What % of the property can be potentially utilised? _____
   c. What % is utilised for goat production? ____
4) What is your main livestock enterprise (cattle, sheep, goat, horses, etc)? _____
5) What is the main purpose of running goats?
   a. Weed control
   b. National market
   c. International market
6) How many livestock are carried on the property?
   a. Goats:_____
   b. Cattle:_____
   c. Sheep:_____
   d. Horses:_____
7) How many breeding Does and Bucks does your property run today?
   a. Does: _____
   b. Bucks: ____

Extra How many full time workers? _____

8) Do you keep daily rainfall records? (yes/no)_____
9) What is the average annual rainfall record for your property (mm)? _____
10) How many paddocks do you have? _____
11) What goat enterprises are carried out on this property?

a. Opportunistic harvesting
b. Breeding stores/ replacements
c. Seedstock producer
d. Breeding-finishing on crop
e. Breeding-finishing on pasture
f. Buying-finishing on crop
g. Buying-finishing on pasture
h. Buying-finishing within feedlot
i. Goatmeat exporter
j. Live goat exporter

12) Does your property run in conjunction with another property? (yes/no)_____
    a. If yes, where is the other property? _____
13) Do you buy goats to finish on your property? (yes/no)_____
    a. If yes, what age of goat do you buy?
        i. Kids (up to 6 months old)
        ii. 6 months to 1 year old
        iii. 1 to 2 years old
        iv. > 2 years old
14) What nutrient deficiencies affect goat production on your property?
    a. Calcium
    b. Cobalt
    c. Copper
    d. Salt
    e. Sulphur
    f. Phosphorus
    g. Protein/Nitrogen
    h. Energy
    i. Fibre
    j. Other mineral deficiencies: _____
15) What are the major soil types on your property?
    a. Clay soils
    b. Brigalow soils
    c. Scrub soils
    d. Ashy Downs
    e. Yellow/ Red carths
    f. Other type: _____
16) *What is the main source of water your goats
    a. Bore well
    b. Dam
    c. Reservoir water
    d. Creek or river
    e. Municipal water
    f. Others
17) *Do you have problem with Rats, mice or other rodents in your property? (yes/no)_____
    a) If yes, do they get into feed storage areas? (yes/no)____

Section 2: Pasture Management and Development

18) What is the major browse species on these soils types?

Soil type	Major BROWSE species	% of property	Stocking rate

19) On these soils type what is the major pasture species?

Soil type	Major PASTURE species	% of property	Stocking rate

20) How do you rate the condition of your pastures?

Pasture type	Poor	Average	Good	Very Good

21) How do you rate your Land conditions? (Poor, Average, Good, Very Good)

22) What is the stocking rate for the available grazed area? _____

23) How do you determine stocking rate?

a. Set stock (eg. 1 goat to 1 ha)
b. Eye and experience
c. Calculate sufficient stocking rate at the end of growing season using a particular utilization rate
d. Carry sufficient stock to meet income requirements
e. Other way: _____

24) Have you carried out any fencing over the last 5 years?

a. No fencing
b. Yes. Not associated with new waters. If so, see below.
c. Yes. Associated with new waters. If so, see below.

This additional fencing has been used to:

i. Create new paddock
ii. Goat management paddock
iii. Build a new lane
iv. Fence out a problem area
v. Fence. Dog control

25) Have you planned any fencing for the future?
   a. No fencing for the future
   b. Yes. If yes, what have you planned to do?
      i. Create a new holding paddock
      ii. Create a new main paddock
      iii. Fence out certain country types
      iv. Fence out problem areas
      v. Replace old fence
      vi. Build lane ways
      vii. Fence to land type
      viii. Other fence reason: _____

26) What kind a fence do you use?
   a. Plain wire b. Barbed wire c. Electric fence

27) Do you have any areas on your property which are salted, eroded, infested or dominated by undesirable weeds?(yes/no)

   If yes, on which soil types are these areas?

   a. All soils types d. Scrub soils
   b. Brigalow soils e. Ashy Downs
   c. Clay soils f. None

28) Do you preferentially graze or spell different paddocks? (yes/no)
29) Do you currently manage areas to encourage pasture regeneration? (yes/no)
30) Do land management issues affect your basic management planning? (yes/no)
   a. If yes, please describe in what way? _____
   _____

31) What is your policy on the use of fire?
   a. Do not burn
   b. Control wood weeds
   c. Control undesirable pasture species
   d. Encourage improved pasture species
   e. Reduce rank pasture material
   f. Reduce fire risk
   g. For grazing management
   h. Other fire policy: _____

32) What pasture development strategies do you use?

a. Pull trees/vegetation and use native pasture
b. Pull trees/vegetation and sow improved grasses
c. Pull trees/vegetation and sow improved grasses/legumes
d. Poison trees/vegetation and use native pasture
e. Poison trees/vegetation and sow improved grasses
f. Poison trees/vegetation and sow improved grasses/legumes
g. Sow improved grasses under timber
h. Sow improved legumes under timber
i. Blade plough only
j. Blade plough and sow improved grasses
k. Blade plough and sow improved grasses and legumes
l. 'Crash graze' with goats and sow improved grasses/legumes
m. 'Crash graze' with goats and sow use native pasture
n. Broadcast seed into nature grassland
o. Use Fertiliser
p. No pasture development
q. Other strategies: _____

33) How long ago was the most recent pasture development carried out? (This year/Last year/ >2 years ago)

34) If pasture improvement has been carried out, what species have been used?

a. Legumes:

i. Stylosanthes sp.
ii. Desmanthus sp.
iii. Leucaena sp

i. Other legumes: _____

b. Grasses

i. Buffel grass
ii. Urochloa or brachiaria
iii. Rhodes grass
iv. Sabi grass
v. Mitchell
vi. Setaria
vii. Flinders
iii. Other grasses: _____

35) Are any weed species spreading naturally on your property? (yes/no) _____

If yes, which ones?

a. Native Acacia (gidgee/bone)
b. Prichly Acacia
c. Brigalow regrowth
h. Thistles
i. Brian
j. Pimelea

d. Eucalypt regrowth
e. Rubber vine
f. Mesquite (Prosopis sp.)
g. Chinee apple
l. Billy goat
m. Praxales
n. Lantana
o. Other weeds: _____

36) Do you control any following pests?

a. Feral goats
b. Feral pigs
c. Feral horses
d. Buffalo
e. Kangaroos
f. Donkyes
g. Other pests: _____

37) Are toxic plants reducing the performance of your herd? (yes/no)

If yes, list the toxic plants that you consider to be causing problems: _____

38) Do you implement any management or any strategies to control toxic plants? (yes/no)

If yes, list your strategies to control toxic plants: _____

Section 3: Herd Management and Performance

39) How many goats would you carry during the following types of season?

Class	Poor Season	Average Season	Good Season
Bucks			
Does			
Kids			

40) Is there a breeding season for goats? (yes/no). _____

If yes, which months:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec

41) During which months do a majority of kids seem to drop?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec

42) *What is the average liveweight at birth? (kg) _____ ± _____

43) Do you separate kids from their mothers (wean)? (yes/no)

If yes, during what months do you wean?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec

a. If yes, what age do you wean the kids? (months) _____

b. Do you wean your kids according to weight or age? (weight/Age)

c. What is the average liveweight at wean? (kg) _____ ± _____

d. What is your target weaning weight? (kg) _____ ± _____

** Extra** What age do you Castrate the males?

44) In poor seasons, do you wean earlier than normal? (yes/no)____

a. If yes, how old do you wean? (months)_____

45) Do you pregnancy test your females? (yes/no)____

a. What is the % of twins in your herd? _____

b. What is the % of triples in your herd? _____

c. Do you have special management for multiple pregnancies comparing with single pregnancies?(yes/no)____

46) Do you plan to change your age of turn-off in the next 5 years? (No/ Yes older/ Yes younger)

47) Are any classes of animals in the herd segregated from the rest of the herd any time? (yes/no)

a. If yes, which ones? (bucks/ does/ kids)

b. If yes, why? _____

48) Do you generally use rumen modifiers on your goats? (yes/no)____

a. If yes, in what classes of stock? (bucks/ does / both)

b. Which rumen modifiers do you use? _____

49) Do you keep stock records? (yes/no)_____

If yes, what kind?

i. Stock numbers
ii. Sales or Kill sheets
iii. Paddocks records
iv. Births
v. Deaths
vi. Pregnancy status
vii. Supplement records
viii. Other records: _____

50) Do you use any of the following supplements?

a. Phosphorus (P) only
b. Molasses-urea
c. Molasses-urea-P
d. Molasses-urea-protein meal
e. Molasses-urea-protein-P meal
f. Salt-protein-Sulphur (S) meal
g. Salt-urea ammonia
h. Salt-urea-P ammonia-P
i. Mixes (name): _____
j. Protein meal (soy bean)
l. Protein meal (copra)
m. Whole cottonseed
n. Crops
o. Feed blocks
p. Grain
q. Salt-urea-sulphate of
r. Salt-urea-sulphate of

51) What months do you feed with supplements?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec

52) What class of animals do you feed?

a. Bucks
b. Does
c. Kids
d. Sheep
e. Cattle
f. Horses

53) What are the main preferred criteria that you select your bucks in your herd?

a. Colour
b. Conformation
c. Temperament
d. Kid Plan
e. Milk production
f. Weight for age

Other criteria: _____

54) What are your reasons for culling?

a. Do not cull

Mature bucks

b. Temperament
c. Disease
d. Physical defects/ Conformation
e. Reproductive problems

Mature does

i. Failure to get pregnant
j. Out of season pregnancy
k. Mastitis
l. Failure to rear a kid

f. Age
g. Fat
h. Other: _____

m. Poor quality/performing kids
n. Age
o. Fat
p. Other:
_____

55) If a doe fails to deliver a kid, what management do you apply?
   a. Maiden? (Cull/ Rebreed)
   b. 2 years old (Cull/ Rebreed)
   c. > 2 years old (Cull/ Rebreed)

56) At what age are Does normally culled? (months) _____± _____

57) At what age are Bucks normally culled? (months) _____ ± _____

58) At what age do young does (maiden) enter the breeding season herd? (months) _____ ± _____
   a. They are always kept in the herd (Not removed)

59) At what age do your does first kid (give birth)? Months _____ ± _____

60) What is the liveweight of your does at first kidding?(kg) _____ ± _____

61) Do you body condition Score (BCS) your does? (yes/no)_____
   a. If yes, what is the BCS (range 1 to 5) for does at kidding? _____

62) At what age are young females and males culled? _____ ± _____
   a. If they don't cull, jump to q.64 (next page)

63) What % of young does is retained for the breeding herd? _____

What are the reasons for culling young males?

   a. Temperament
   b. Poor liveweight performance
   c. Physical defects/conformation

What are the reasons for culling young females?

   d. Failure to get pregnant
   e. Failure to rear a kid
   f. Disease

64) Over the next 5 years what are you going to change to increase or boost profitability? Why?
   a. Make no changes
   b. Reduce turn-off age
   c. Increase turn-off age
   d. Increase turn-off weight
   e. Reduce death rate
   f. Increase herd size
   g. Reduce herd size
   h. Target markets
   i. Improve pasture management
   j. Increase marking rate
   k. Introduce better quality bucks
   l. Introduce new breed
   m. Other change: _____

Explain why: _____

65) What are the numbers of your current breed(s) in your herd?

a. Feral goats N°:____
b. Boer N°:____
c. Anglo-Nubian N°:____
d. Savannah N°:____
e. Angora N°:____
f. Toggenburg N°:____
g. British Alpine N°:____
h. Saanen N°:____
i. Cashmere N°:____
j. Australian Rangeland N°:____
k. Kalahari/Red N°:____
l. Other breed: _____

66) What is your desired genotype for doe herd? _____

a. Why?_____

67) What breeds of bucks have you used in the past and numbers?

a. Feral goats N°:____
b. Boer N°:____
c. Anglo-Nubian N°:____
d. Savannah N°:____
e. Angora N°:____
f. Toggenburg N°:____
g. British Alpine N°:____
h. Saanen N°:____
i. Cashmere N°:____
j. Australian Rangeland N°:____
k. Kalahari /Red N°:____
l. Other breed: _____

When did you change to this breed? _____

68) What do you see as the breed(s) of the future for your herd and property? _____

a. Why do you think this breed is important in the future? _____

69) **Do you have records of annual **kidding rates** (% of does that delivered kids in the flock) and **prolificacy** (kids born to each doe)? (Yes/ No)____

a. How many does delivered kids last year? _____ ± _____
b. How many kids were born last year? _____ ± _____
c. If you know, what is the **kidding interval** (period between two parturitions in months)? ____ to ____

d. If you know, what is the average **prolificacy** for your does? _____ to _____ (kids/doe)

70) What is the average **kidding rate** (%) for the following seasons?

Class of Livestock	**Poor Season**	Average Season	**Good Season**
Young does (≤ 2 years)			
Old does (> 2 years)			

71) Indicate the type of season (Poor, Average or Good), kidding rate and annual rainfall for last three years

Year	**Type of season**	**Kidding rate (%)**	**Rainfall (mm)**
2011			
2010			
2009			

72) How many joined breeding does have you carried over the last 3 years and how many kids were marked (weaned)?

Year	**Number of joined females**	**Number of kids marked (weaned)**
2011		
2010		
2009		

73) *Do you have records of live weight and gains? (yes/no) *(refer to q.42)*

a. What in the average adult live weight (kg) for MALE: _____ ± _____

b. How long does it take to reach an adult weight for males? _____

c. What is the average adult liveweight (kg) for FEMALE: _____ ± _____

d. How long does it take to reach an adult weight for females? _____

74) What are the average liveweight gains obtained from the various country (soil) types?

Soil type	Male liveweight gain	Female liveweight gain

Section 3.1) Questions about Animal Health

75) What is your **annual mortality rate** for kids and adults?

Class of Livestock	Good season	Average season	Poor Season
Kids (0 to 3 months)			
Young (4 to 12 months)			
Adults (> 12 months)			

76) What are the possible causes of mortality in your herd?

_____

77) **How many kids died last year? _____ *(Refer to q.69)*

78) What was the mortality rate (%) from birth to weaning last year? _____

79) Is it common to find abortions? (Yes/No)

   a. What was the number of abortions last year? _____

80) What is the frequency (%) of abortion in your herd? _____

81) Do you cure the umbilical cord? (Yes/No)

82) What are the main diseases in your herd?

   a. Infections of worms (hydatids, lung worms, nodule worms, etc)
   b. Caseous lymphadenitis (Cheesy gland)
   c. Contagious ecthyma (Scabby mouth)
   d. Caprine Arthritis Encephalitis (CAE)
   e. Infection of lice

f. Clostridiosis
g. Coccidiosis
h. Leptospirosis or Kidney disease
i. Other disease: _____

83) Do you vaccinate your herd to control any of the following diseases?

a. Botulism
b. Enterotoxaemia
c. Clostridium diseases (5 in 1)
d. Contagious ecthyma (Scabby mouth)
e. Caseous lymphadenitis (Cheesy gland)
f. Leptospirosis
g. Other vaccinations:_____

84) Do you treat your flock for lice control (yes/no) ____

If yes, when? As required: (yes/no) _____

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec

85) Do you treat your herd for worms? (yes/no)____

If yes, when?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec

a. How often you treat? _____
b. As required.

86) If you treat for worms, what deworming products did you use in the last three years?

a. Albendazol
b. Oxifendazol
c. Levamisol
d. Fenbendazol
e. Closantel
f. Ivermectin
g. Abamectin + Closantel
h. Doramectin
i. Moxidectin
j. Abamectin
k. Capramec
l. Other product: _____

87) Do you use any diagnostic test? (Yes/No) ____

a. F.E.C. (Faecal Eggs Count)
b. Dipstick
c. CMT (Mastitis)

d. Blood collection for _____
e. Other test: _____

88) Do you isolate sick animals? (Yes/No) _____

89) Do you have a quarantine period for the new animals? (Yes/No) _____

Section 3.2) Questions about Market

90) For what market are you aiming to produce goats?

a. No market
b. Domestic
c. Live Export
d. Prime (restaurant)
e. Store
f. International (What?)_____

91) If Live Export, what average weight (kg) are the goats? _____ ± _____

a. What age? (months)_____
b. What sex do they prefer? (Male/Female) _____

92) Do you follow your goats through the abattoir (Yes/No)_____
If yes, why?

a. Assess/Plan breeding objectives
b. Animal selection for sale/markets
c. Monitor herd progress/performance
d. Other reason: _____

93) What is the distance of abattoir from your property (km)? _____

94) Do you value the information from the kill sheets (abattoir)? (Yes/No)____
If yes, how?

a. Assess/Plan breeding objectives
b. Animal selection for sale/markets
c. Monitor herd progress/performance
d. Other reason: _____

95) Why do you choose to target a particular market?

a. Price/Financial return
b. Neighbours do it
c. Suits country –breed mix
d. Prestige
e. Other reason: _____

96) At what age do you normally turn-off your goats and for which markets?

Market	Age of turn-off	Liveweight (kg)	Class of livestock
Asia (?)			
Meddle East (?)			

97) Over the last three years what percentages (%) of your sales have gone to the following markets?

Market	2011	2010	2009
Asia			
Meddle East			

98) Indicate the number of goats sold (or transferred) from your property in the last three years.

Year	Males	Females	Young animal
2011			
2010			
2009			

99) Indicate the average age the classes of livestock are sold. (months)

a. Does: _____ b. Bucks: _____ c. Young animals: _____

Section 4: Source of information and Feedback

100) Do you use a personal computer to assist you in property management? (yes/no)

If yes, what do you do with your computer?

a. Internet/e-mail
b. Herd recording

c. Accounting/ Financial record
d. Education
e. Resource mapping
f. Spreadsheets
g. Planning property improvements
h. Word processing

101) What are your present sources of property management information?

a. Software/ Internet
b. Field days/ Meetings
c. Advisor/ Consultant
d. Printed material (Newsletters, books, etc). **Which ones?** _____
e. Radio/ TV/ Videos
f. Goats on the move
g. Going into goats guide
h. Going into goats guide
i. Other source: _____

102) What is your preferred method for the communication of information from research projects?

a. Software/ Internet
b. Field days/ Meetings
c. Advisor/ Consultant
d. Printed material (Newsletters, books, etc)
e. Radio/ TV/ Videos Other source: _____

103) Of the printed material, which do you find the most useful to learn about new research findings in property management?

a. Newsletters
b. Newspapers
c. Pamphlets
d. Magazines
e. Other material: _____

104) Of the printed material, which do you find is the most interesting information about research findings?

a. Tables
b. Graphs
c. Diagrams
d. Other idea: _____

105) From which do you find the most useful as a source of information about research findings and property management?

a. Print media
b. Television
c. Radio
d. Videos
e. Other media: _____

106) From which of the group activities do you feel you learn the most?

a. Field days
b. Focus groups
c. Group meetings
d. Face to face with consultants
e. Other activity: _____

107) How are the records that you collect used in the management of your property?

a. I don't make records
b. No use made from my records
c. Assessing herd performance
d. Marketing
e. Brenchmarking
f. Business analysis and planning
g. Monitoring herd size
h. Monitoring resources
i. Plan herd improvement
j. Plan property improvement
k. Seasonal trends
l. Stock number adjustment
m. Taxation
n. Other: _____

108) Do you have any other comments about the factors that affect goat production? What kind of help would you like to receive from R&D&E Agencies?

_____
_____
_____
_____
_____
_____