2014 Intermountain States Sheep and Goat

Production, Marketing, and Transportation

Survey Results

Prepared for the USDA Animal Plant Health Inspection Service

by:
Dannele Peck, Christopher T. Bastian, and Amy M. Nagler
Department of Agricultural and Applied Economics, University of Wyoming

March, 2016

Descriptions and summaries were derived using data collected in cooperation with United States Department of Agriculture (USDA) and the University of Wyoming (UW), Department of Agricultural and Applied Economics. Any interpretations and conclusions derived from the data represent the authors' views and not necessarily those of the USDA or UW.

Table of Contents

Introduction

A cooperative agreement between the USDA Animal Plant Health Inspection Service (APHIS) and the University of Wyoming Department of Agricultural and Applied Economics Department, titled "Small Ruminant Movements during Production and Marketing Activities in the Intermountain West (Cooperative Agreement 14-9200-0404-CA)" was initiated in September, 2014. Survey instruments were developed to collect information from sheep and goat producers in four western states (Idaho, Montana, Utah, and Wyoming) about their livestock production, marketing, transportation, and disease management practices.

Resulting information is intended for use by USDA-APHIS to update a national model of potential disease spread during a hypothetical outbreak of Foot and Mouth Disease (FMD) or other highly contagious animal diseases. The nearly 8 million sheep and goats on US farms and ranches (USDA NASS 2016) are important to researchers modeling FMD because it can infect and be transmitted between all cloven-hoofed animals. Using survey methods to identify regional differences in production, marketing, and transportation practices will provide a more complete and accurate picture of livestock movements and resulting disease potential.

Beyond the primary purpose, the survey data can be used to paint a more nuanced picture of current sheep and goat production and marketing practices in the region. Markets for meat, fiber, dairy as well as grazing services are evolving and the information provided by producers is a valuable resource for understanding these changes in the region.

Background and Justification

Foot and mouth disease is a highly contagious viral disease. In the US, primary concern during an outbreak would be transmission between domestic cattle, pigs, sheep, and goats, although wild ungulates such as elk, deer, antelope, bighorn sheep, moose, and bison are also susceptible (CFSPH 2014). While an FMD outbreak has not occurred in North America for more than 60 years, the potential economic impacts (Paalberg et al. 2008) merit careful planning of how the disease will be detected, reported, contained, and controlled in the case of an outbreak (NIAA 2013).

Survey data collected for this research builds on related research on livestock in Colorado and Kansas (McReynolds et al. 2014), and California (Marshall et al. 2009; Bates et al. 2001). Like previous research, the current survey results contribute to a national network analysis model of livestock

movement. Network analysis of simulated livestock movements is an important tool for modelling the spread of contagious diseases through animal populations (see for example, Bajardi et al. 2011; Volkova et al. 2010; Dubé et al. 2009). Transmission patterns associated with different production types and landscapes can be critical for accurate simulation of contact patterns (Lindstrom et al. 2011; Lindstrom et al. 2009). Production practices in the intermountain region differ from other parts of the US. Sheep producers in Western states are more likely to operate range bands, with larger flocks than farm operations, grazing and sometimes lambing on unfenced public lands, and with more focus on wool production (NRC 2008; USDA APHIS 2012). Little has been published on goat production in the intermountain states. While a 2011 National Animal Health Monitoring System (NAHMS) sheep survey did include all of the intermountain west states (Montana, Idaho, Wyoming, Utah, Colorado, Arizona, and New Mexico) (USDA-APHIS 2012), regionally, only Colorado was included in a 2009 NAHMS survey of goat producers (USDA APHIS 2010). The current research helps to fill this knowledge gap.

Survey Procedures

The survey process was designed to collect relevant information from sheep and goat producers to better understand current production, marketing, transportation, and management strategies in the Intermountain West region. In separate sheep and goat producer questionnaires, respondents within each population sample were asked about their operation characteristics, production and marketing practices, transportation, and management practices. Survey design and questionnaires met all institutional human subjects requirements for ethical research and received UW Institutional Review Board (IRB) exempt status, indicating no more than minimal risk to participants in December of 2015. Survey data were collected between May and June, 2015. The UW IRB approval letter as well as complete sheep and goat questionnaires are included in Appendix A.

Data were collected in cooperation with USDA and the UW Department of Agricultural and Applied Economics. Separate censuses of all sheep producers and all goat producers listing more than 25 head across all four states were used to provide representative samples of sheep and goat producers in the region. A Dillman survey design was used to obtain the best response rates possible. No incentive was offered to participate, and the cover letter made it clear that response was voluntary—subjects contacted were able to exclude themselves by choosing not to participate. Subjects contacted who did not own sheep or goats in the previous year were asked to return the questionnaire without answering questions.

On May 4, 2015 producers selected in each population sample were sent a cover letter explaining the purpose and importance of the study being conducted, as well as the four-page questionnaire along with an addressed and stamped return envelope. A reminder postcard was then sent to all non-respondents 10 days after the initial mailing. Cover letters and reminder post cards used are included in Appendix A. Approximately three weeks after the postcard mailing, in June, 2015, those in the sample who had not yet responded (either by mailing back their questionnaire or indicating that they preferred to opt out of the survey) were sent a follow-up cover letter and a second questionnaire. Responses dropped off significantly in June, and mail data collection ceased on July 1, 2015. When mail responses stopped, 10% of the remaining non-respondents were sampled for a telephone follow-up. All phone respondents were asked to respond to the full questionnaire. Using this procedure, a total of 839 sheep and 154 goat producer usable mail surveys were returned. An additional 125 sheep and 15 goat producers' responses were obtained via telephone follow-up calls. The total usable mail and telephone responses collected represent 49.2% of sheep and 44.2% of goat producers contacted in the sample. A summary of sampling, mail and telephone responses, and usable responses and rates are reported in Table 1.

Table 1. Summary of sampling and responses.

	Sample Mailed	Usable Mail Responses	Usable Phone Responses	Total Usable Responses	Usable Response Rate
Sheep Producer Survey					
Idaho	310	142	21	163	52.6%
Montana	785	352	43	395	50.3%
Utah	497	188	38	226	45.5%
Wyoming	367	157	23	180	49.0%
Total	1959	839	125	964	49.2%
Goat Producer Survey					
Idaho	131	53	5	58	44.3%
Montana	65	27	2	29	44.6%
Utah	122	45	1	46	37.7%
Wyoming	64	29	7	36	56.3%
Total	382	154	15	169	44.2%

Survey Results

Results are presented in this section from both the sheep producer and goat producer survey. A description and table of survey responses is included for each question on each of the questionnaires. A summary and conclusion are provided for each of the surveys. Appendix B of the report includes a side-by-side comparison of the survey results for sheep and goat producer responses.

Sheep Survey Results

The following is a summary of the results from the *2014 Intermountain States Sheep Production, Marketing, and Transportation Survey*. Responses were reported from 964 sheep producers who returned usable questionnaires. For each item on the questionnaire, frequency is reported along with percent of the total 964 responders. Additionally, to account for non-response and other problematic responses (such as an individual providing multiple responses to a single-response question), we occasionally report percent of relevant responses, abbreviated in tables as "percent of responses," excluding non-response and multiple responses to single-response questions.


Shearing day outside of Kaycee, WY
Photo by Kate Harlan

Section 1: Operation Characteristics

Section 1 of the questionnaire asked respondents to describe their sheep operation characteristics, including whether they were currently involved in sheep production, other types of livestock currently on their home farm or ranch, and in which state their sheep spend the majority of their time. This section also included questions about current and peak flock size.

Current Involvement in Sheep Production

The first question asked, "Are you currently involved in sheep production?" Out of 964 respondents, 812 or 84% answered "yes," 150 (16%) reported "no" they were not currently involved in sheep production, and less than 1% chose not to respond to the question (Table S1).

Table S1. Are you currently involved in sheep production?

	Frequency	Percent of responders	Percent of responses
Yes	812	84.2%	84.4%
No	150	15.6%	15.6%
			100%
No response	2	0.2%	(n=962)
Total	964	100%	

Livestock Types

Respondents were asked to select all that applied from a list, indicating "Which type (or types) of livestock are currently on your home farm/ranch?" In addition to sheep, which were listed by 84% of all responders, the most common types of livestock listed were beef cattle (45% responses), horses (38%), poultry (19%), and llamas or alpacas (10%) (See Table S2).

Table G2. Which type (or types) of livestock are currently on your home farm/ranch? (Please choose all that apply.)

	Frequency of responses	Percent of responders
Goats	92	9.5%
Sheep	807	83.7%
Beef cattle	437	45.3%
Dairy cattle	50	5.2%
Pigs	54	5.6%
Llamas or alpacas	99	10.3%
Farmed deer or elk	1	0.1%
Farmed bison or beefalo	3	0.3%
Horses	367	38.1%
Poultry	185	19.2%
Total responses	2095	(n=964)

Of respondents who reported having sheep, a majority (64%) listed at least one other type of livestock in addition to sheep as currently on their home farm or ranch (Figure S1). For respondents reporting sheep, the average number of additional types of livestock listed was 1.6 and the maximum number of additional types of livestock reported was seven. Frequencies are illustrated in Figure S1; descriptive statistics are listed in Table S3.

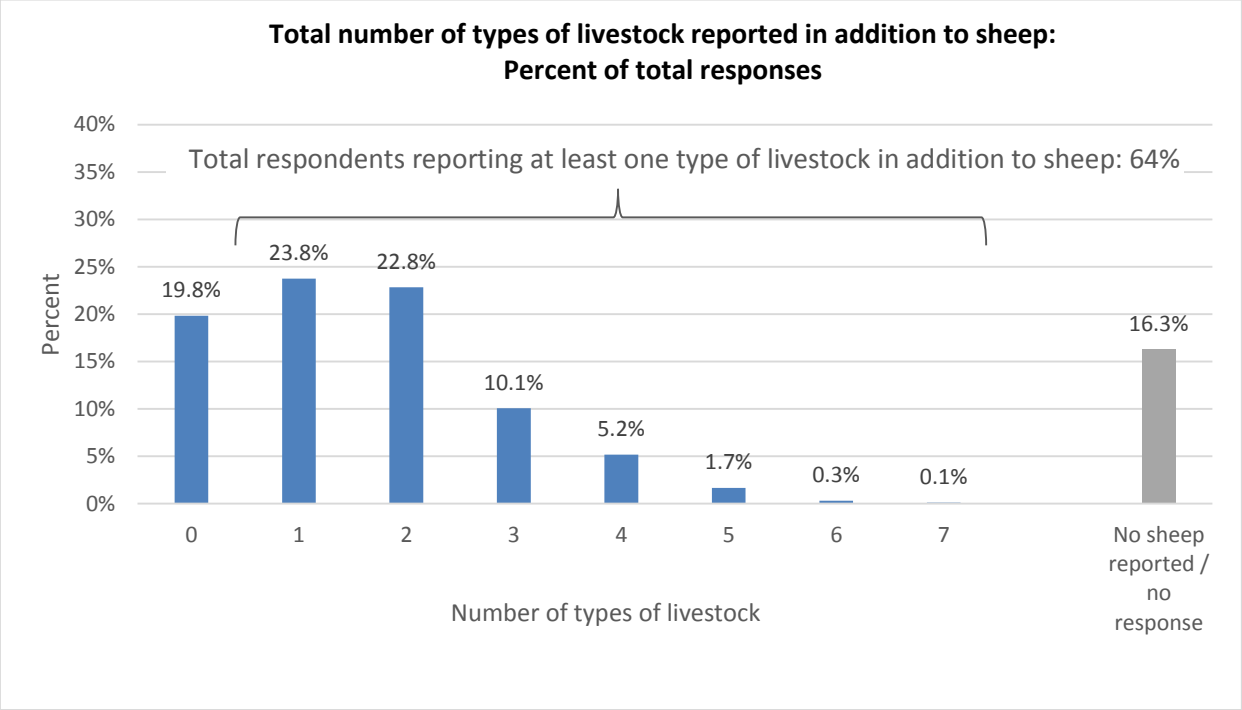


Figure S1. Types of livestock—in addition to sheep—reported as currently on the home farm or ranch.

Table S3. Total number of types of livestock reported as currently on the home farm or ranch in addition to sheep.

n (responders reporting sheep currently on their farm or ranch)	807
Mean number of livestock types reported in addition to sheep	1.57
Standard deviation	1.30
Minimum types of livestock	0
Maximum types of livestock	7

Sheep Flock State Location

Sheep survey respondents were asked to report "In which state do your sheep spend most (or all) of their time?" Thirty-three percent of responders indicated that their sheep were located in Montana, 20% in Utah, 17% in Wyoming, and 14% in Idaho; less than 1% indicated a state other than those listed and 17% chose not to respond to this question (Table S4).

Table S4. In which state do your sheep spend most (or all) of their time?

	Frequency	Percent of responders	Percent of responses
Idaho	133	13.8%	16.6%
Montana	313	32.5%	39.2%
Utah	189	19.6%	23.7%
Wyoming	162	16.8%	20.3%
Other state not listed	2	0.2%	0.3%
			100%
No response	165	17.1%	(n=799)
Total	964	100%	

Sheep Flock Size

Respondents were asked to report both the number of sheep on their home farm or ranch at the time they filled out the survey as well as their operation's peak flock size during 2014. Please note that questionnaire categories for 100 to 499 sheep, 500 to 999 sheep, and 1,000 or more sheep are reported in aggregate in order to protect respondent anonymity.

When asked how many sheep were on their farm or ranch "as of today," nearly half (45%) of respondents indicated 100 or more and 32% indicated 25 to 99 adults plus lambs. Seven percent indicated a current flock size between 1 and 24. This low percentage is expected due to our sampling protocol, which intended to exclude producers with fewer than 25 sheep. Less than 1% of respondents reported no sheep currently on their home farm or ranch and 16% of respondents chose not to answer. Results are reported in Table S5.

Table S5. How many sheep (adults + lambs) are on your home farm/ranch as of today?

	Frequency	Percent of responders	Percent of responses
0 (currently no sheep)	8	0.8%	1.0%
1 to 24 sheep as of today	68	7.1%	8.4%
25 to 99 sheep as of today	307	31.8%	37.7%
*100 or more sheep as of today	431	44.7%	52.9%
			100%
No response	150	15.6%	(n=814)
Total	964	100%	

*Aggregated category to ensure anonymity.

When asked to report peak flock size at any one time during 2014, nearly half (48%) of respondents indicated 100 or more and 32% indicated 25 to 99 adult sheep plus lambs as their peak flock size. Five percent indicated a current flock size of between 1 and 24; less than 1% reported no sheep at any time during 2014; and 15% of respondents chose not to answer the question (Table S6).

Table S6. What was the peak size your sheep flock (adults + lambs) at any one time between January 1 and December 31, 2014?

	Frequency	Percent of responders	Percent of responses
0 (no sheep in 2014)	4	0.4%	0.5%
1 to 24 sheep, peak flock size	50	5.2%	6.1%
25 to 99 sheep, peak flock size	303	31.4%	37.1%
*100 or more sheep, peak flock size	460	47.7%	56.3%
			100%
No response	147	15.2%	(n=817)
Total	964	100%	

*Aggregated category to ensure anonymity.

Section 2: Production and Marketing

Questions posed to sheep producers relating to their production and marketing activities included descriptions of their operation purpose and source of profits, and the seasonal location of animals during production and marketing activities throughout 2014. Two additional questions asked producers about pricing methods used when selling sheep operation outputs and an assessment of their bargaining skills when negotiating these prices.

Sheep Operation Purpose

A majority of respondents (76%) listed meat (lamb) production and 54% listed wool production as an operation purpose. Other common operation purposes included raising sheep for seed or breeding stock (27%); weed control (22%); and show, exhibition, or 4-H (14%) (Table S7).

Table S7. Which of the following describes the purpose (or purposes) of your sheep operation? (Please choose all that apply.)

	Frequency of responses	Percent of responders
Sheep for meat (lamb) production	733	76.0%
Sheep for fiber (wool) production	516	53.5%
Sheep for dairy (milk, cheese) production	4	0.4%
Sheep for seed or breeding stock	261	27.1%
Sheep for weed control	212	22.0%
Sheep for show, exhibition, or 4-H	137	14.2%
Sheep for pets or companion animals	33	3.4%
Other purpose	13	1.3%
Total responses	1909	(n=964)

Thirteen respondents listed purposes in addition to those named in Table S7. These other purposes, as specified by respondents, are not reported here in verbatim to protect respondent anonymity, but can be categorized as family activities, added-value products, and specific production activities for herd maintenance and lamb production.

Multiple sheep operation purposes were the norm. A majority (67%) of respondents who answered this question reported more than one purpose for their sheep operation, with 24% listing two and 23% listing three purposes. The largest number of sheep operation purposes listed was six (Figure S2).

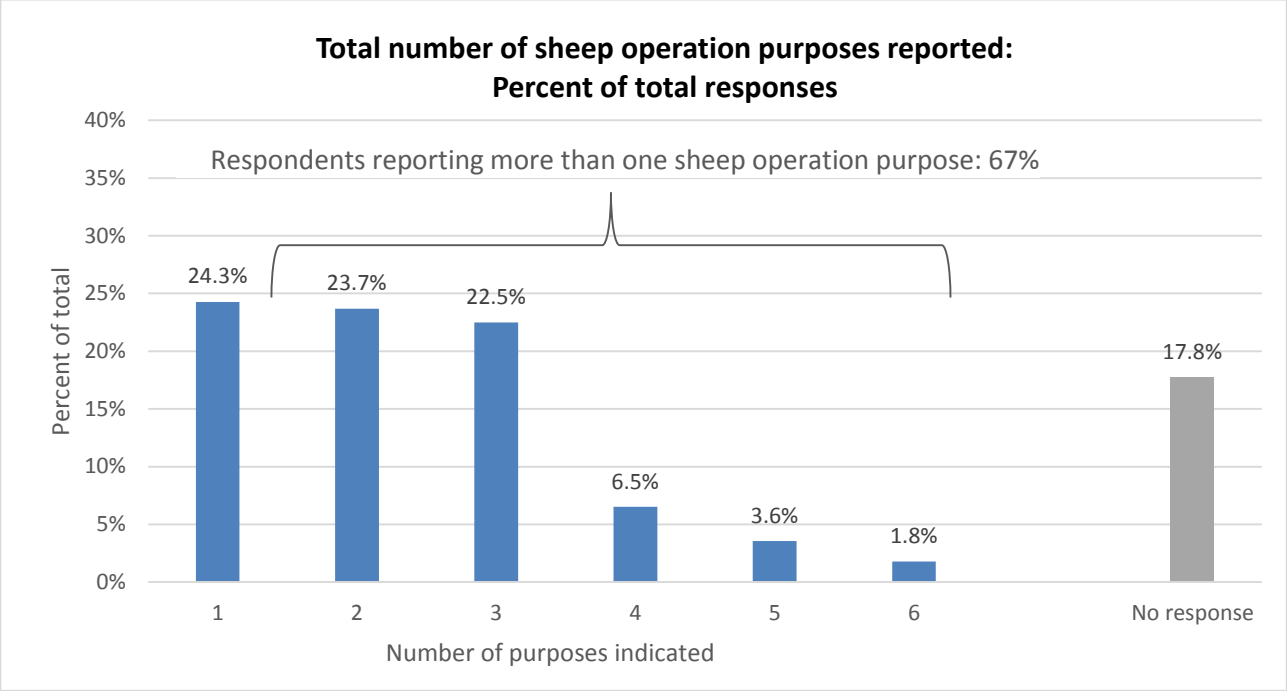


Figure S2. Number of sheep operation purposes reported.

Sheep Operation Primary Source of Profits

Although sheep producers reported a range of operation purposes, meat production dominated as a reported primary profit source. A majority (59%) listed meat (lamb) production as the primary source of profits from their sheep operation in 2014. Wool production was indicated as the primary source of profit for only 2% of responders, even though 54% indicated wool as an operation purpose. Sheep sold for seed or breeding stock was indicated as a primary source of profits by 6% of respondents. Sales for show, exhibition, or 4-H was indicated by 4% of respondents (Table S8).

Table S8. What best describes the primary source of profits (market commodity, product, or service) from your sheep operation in 2014? (Please choose only one.)

	Frequency	Percent of responders	Percent of responses
Meat (lamb) production	569	59.0%	82.1%
Fiber (wool) production	18	1.9%	2.6%
Dairy (milk, cheese) production	1	0.1%	0.1%
Sheep sold for seed or breeding stock	58	6.0%	8.4%
Sheep sold or contracted for weed control	2	0.2%	0.3%
Sheep sold for show, exhibition, or 4-H	39	4.0%	5.6%
Sheep sold or contracted for pets, or companion animals	2	0.2%	0.3%
Other product or service	4	0.4%	0.6%
			100%
More than one response	105	10.9%	(n=693)
No response	166	17.2%	
Total	964	100%	

Sheep Flock Seasonal Location, Production and Marketing Activities

Respondents were asked to think back over the previous year (January 1 through December 31, 2014), and report seasonal information about where the majority of their sheep flock was located and what production and marketing activities animals were involved in.

Seasonal Flock Locations

Respondents were asked to choose from one of four location categories to indicate seasonally (winter, spring, summer, or fall of 2014), "Where was the majority of your sheep flock located?" Location categories included: penned and fed in a drylot or feedlot at the home farm or ranch, grazing on pasture or range at the home farm or ranch, penned and fed in a drylot or feedlot away from the home farm or ranch, and grazing on pasture or range away from the home farm or ranch. Sheep location results are reported in Table S9 and further illustrated in Figure S3.

Sheep flock locations varied considerably throughout the year. Sheep were more likely to be located away from the home farm or ranch in the spring (56% of respondents) and least likely to be away in the winter (3%). A majority of sheep were located at the home farm or ranch, either fed or grazing, in the summer (64%) and fall (63%). During winter months, January through March, 41% of respondents indicated the majority of their sheep flock was penned and fed on a drylot or feedlot at home; 30% were grazing on pasture or range located at home. Only 1% of respondents indicated that their sheep flock was located away from the home farm or ranch, being penned and fed, and 4% away on pasture or range during winter months. Four percent of respondents indicated more than one winter location.

During spring months (April through June) the percentage of sheep penned and fed at home decreased substantially from a winter rate of 41% to 17% with a similar decrease for those grazing on home pasture from 30% in the winter to only 1% in the spring. This is accounted for by an increase in the number of sheep penned and fed away from home increasing from 1% in the winter to 53% in the spring. Five percent of respondents indicated more than one spring sheep flock location. Not surprisingly, survey respondents indicated the highest percentage of sheep grazing on pasture or range (as opposed to being penned and fed) during summer months. Summer months (July, August, and September) were reported with the majority of sheep flocks (59%) grazing at the home farm or ranch on pasture or range and an additional 11% grazing away from home. Only 5% were listed as penned and fed at home and 5% of respondents indicated more than one summer sheep location.

Fall responses were similar to summer. In October through December, 51% of sheep flocks were listed as grazing at home, 7% grazing away from home, and 12% penned and fed at the home farm or ranch. Four percent of respondents indicated more than one fall sheep flock location.

Table S9. For each season over the past year, where was the majority of your sheep flock located? (One season for each location, if relevant.)

January 1 through December 31, 2014	Winter (Jan-Mar)			Spring (Apr-June)			Summer (July-Sept)			Fall (Oct-Dec)		
	Freq.	%	V. %	Freq.	%	V. %	Freq.	%	V. %	Freq.	%	V. %
Where was the majority of your sheep flock located?												
Penned and fed in a drylot/feedlot at the home farm/ranch	392	40.7%	51.2%	160	16.6%	21.3%	47	4.9%	6.1%	114	11.8%	15.8%
Grazing on pasture/range at the home farm/ranch	286	29.7%	37.3%	7	0.7%	0.9%	571	59.2%	74.0%	494	51.2%	68.3%
Penned and fed in a drylot/feedlot away from the home farm/ranch	10	1.0%	1.3%	513	53.2%	68.4%	2	0.2%	0.3%	11	1.1%	1.5%
Grazing on pasture/range away from the home farm/ranch	42	4.4%	5.5%	25	2.6%	3.3%	107	11.1%	13.9%	67	7.0%	9.3%
More than one location	36	3.7%	4.7%	45	4.7%	6.0%	45	4.7%	5.8%	37	3.8%	5.1%
			100%			100%			100%			100%
No response	198	20.5%	(n=766)	214	22.2%	(n=750)	192	19.9%	(n=772)	241	25.0%	(n=723)
Total	964	100%		964	100%		964	100%		964	100%	

Freq. is the frequency, % is the percent of responders, and V. % is the percent of responses (excluding no response) within each season.

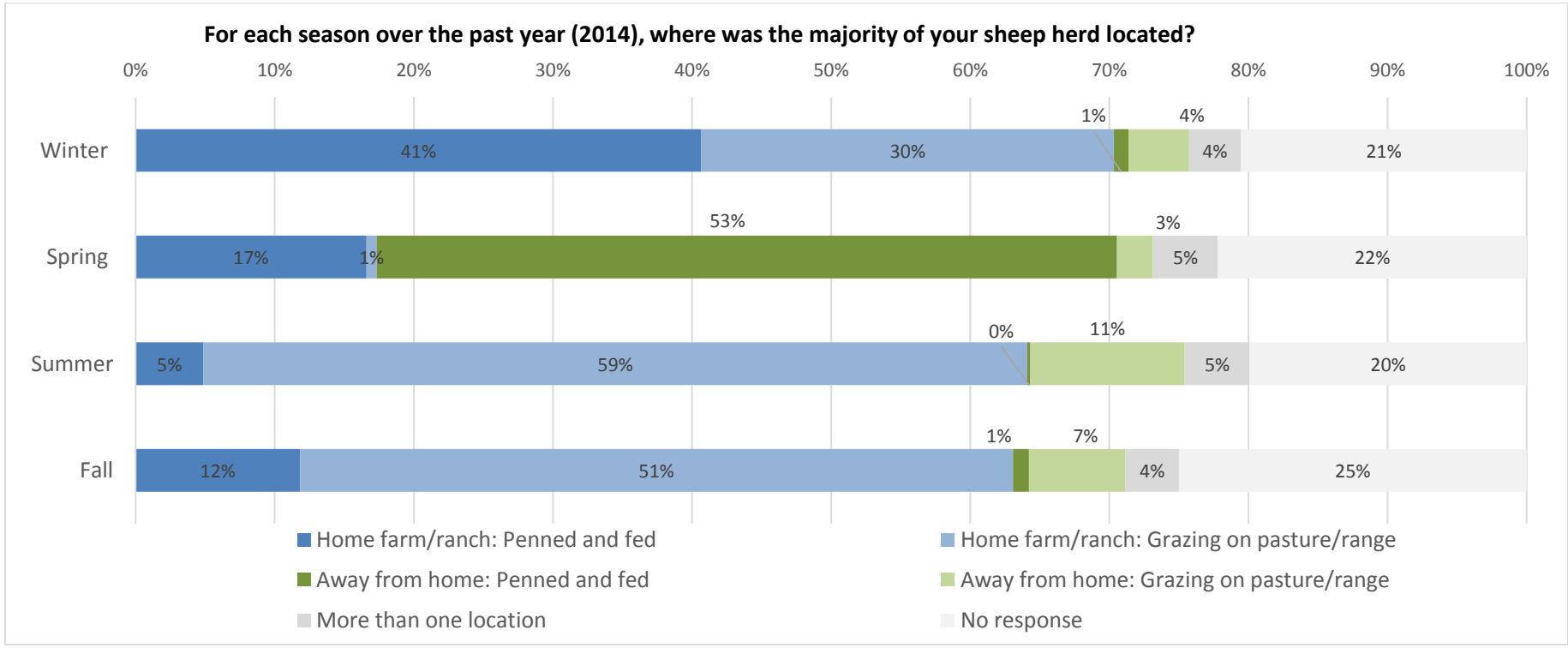


Figure S3. Seasonal location of sheep.

Production and Marketing Activities

Sheep producers were asked what seasonal production and marketing activities their sheep were involved in. Respondents were instructed to choose all seasons that applied to their sheep flock for each activity. Responses are reported in Table S10 and further illustrated in Figures S4 and S5.

Production activity categories included breeding; lambing; docking, castrating, vaccinating, de-worming, tagging/painting/branding; shearing; and milking. Seasonal responses for production activities are reported in Table S10 and illustrated in Figure S4. Seasonally, breeding was reported mainly in the fall (67% of breeding responses) and in lower frequencies in other seasons (18% in summer, 11% in winter, and 4% in spring months). Given the average gestation period for sheep of nearly 5 months (Schoenian 2014), lambing followed reported breeding times, reported most frequently in the spring (58% of lambing responses) and winter (37%). Some lambing was also reported in the fall (4%) and summer (2%).

Management tasks, including docking, castrating, vaccinating, de-worming, and identifying sheep (by tagging, painting, or branding) were most likely to be reported during spring months (62% of flock management responses) followed by winter (26%), summer (7%), and fall (6%). Sheering was most frequently reported in the spring (48% of sheering responses) and winter (43%).

Milking sheep was the least reported sheep production activity, accounting for only 2% of responses. Sheep were more likely to be milked in the spring (46%) and winter (43% of milking responses).

Marketing activity categories were listed as: "animals were purchased (for breeding, replacement, etc.) for the operation," "animals were involved in showing exhibition or 4-H activities," and "animals were sold from the operation." Seasonal responses for each marketing activity category are reported in Table S10 and illustrated in Figure S5.

Producers reported purchasing sheep more frequently in the fall (44% of purchase responses) and summer (38%). However, purchases were also recorded in the spring (11%) and winter (7%). The majority of responses for showing and exhibiting sheep placed these activities during summer months (65%) followed by spring (27%), fall (7%), and winter (2%). Selling sheep from the operation was the most frequently reported marketing activity, accounting for 64% of all marketing activity responses. Sheep were sold throughout the year, most frequently in the fall (39% of sold responses), followed by summer (37%), spring (15%), and winter (9%).

Table S10. For each season over the past year, what production and marketing activities was your sheep flock involved in? (Choose all seasons that apply for each activity, if relevant.)

January 1 through December 31, 2014	Winter (Jan-Mar)			Spring (Apr-June)			Summer (July-Sept)			Fall (Oct-Dec)			
	Freq.	% w/in winter	*% w/in activity*	Freq.	% w/in spring	*% w/in activity*	Freq.	% w/in summer	*% w/in activity*	Freq.	% w/in fall	*% w/in activity*	*Total responses within activity*
What production activities were your sheep involved in?													
Breeding	102	9.9%	*11.3%*	36	2.3%	*4.0%*	161	55.9%	*17.8%*	604	80.6%	*66.9%*	*903* *100%*
Lambing	340	32.9%	*36.6%*	535	34.1%	*57.5%*	18	6.3%	*1.9%*	37	4.9%	*4.0%*	*930* *100%*
Docking, castrating, vaccinating, de-worming, I.D.	244	23.6%	*25.5%*	594	37.8%	*62.0%*	64	22.2%	*6.7%*	56	7.5%	*5.8%*	*958* *100%*
Shearing	338	32.7%	*43.0%*	376	23.9%	*47.8%*	24	8.3%	*3.1%*	48	6.4%	*6.1%*	*786* *100%*
Milking	11	1.1%	*16.7%*	30	1.9%	*45.5%*	21	7.3%	*31.8%*	4	0.5%	*6.1%*	*66* *100%*
Total responses within season	1035	100%		1571	100%		288	100%		749	100%		**Production activities:** **3643** **Total obs.**
What marketing activities were your sheep involved in?													
Animals were purchased (for breeding, replacement, etc.)	24	20.7%	*6.6%*	41	16.9%	*11.3%*	138	21.9%	*38.0%*	160	28.6%	*44.1%*	*363* *100%*
Animals were involved in showing, exhibition, or 4-H	4	3.4%	*2.1%*	50	20.6%	*26.5%*	122	19.4%	*64.6%*	13	2.3%	*6.9%*	*189* *100%*
Animals were sold from the operation	88	75.9%	*8.8%*	152	62.6%	*15.3%*	370	58.7%	*37.1%*	386	69.1%	*38.8%*	*996* *100%*
Total responses within season	116	100%		243	100%		630	100%		559	100%		**Marketing activities:** **1548** **Total obs.**

Freq. is the frequency of responses indicated for each category.

% w/in season / winter / summer / spring / fall is the percent of responses indicating production activity within each seasonal category. For example, reading down the first two columns, 9.9% of 1035 responses for winter sheep flock activities indicated breeding.

% w/in activity is the percent of responses indicating a season within each activity category. For example, reading across the first row, 11.3% of 903 responses for breeding activities indicated breeding occurred during winter months.

Total obs. is the total responses observed for all production activity categories and all marketing activity categories.

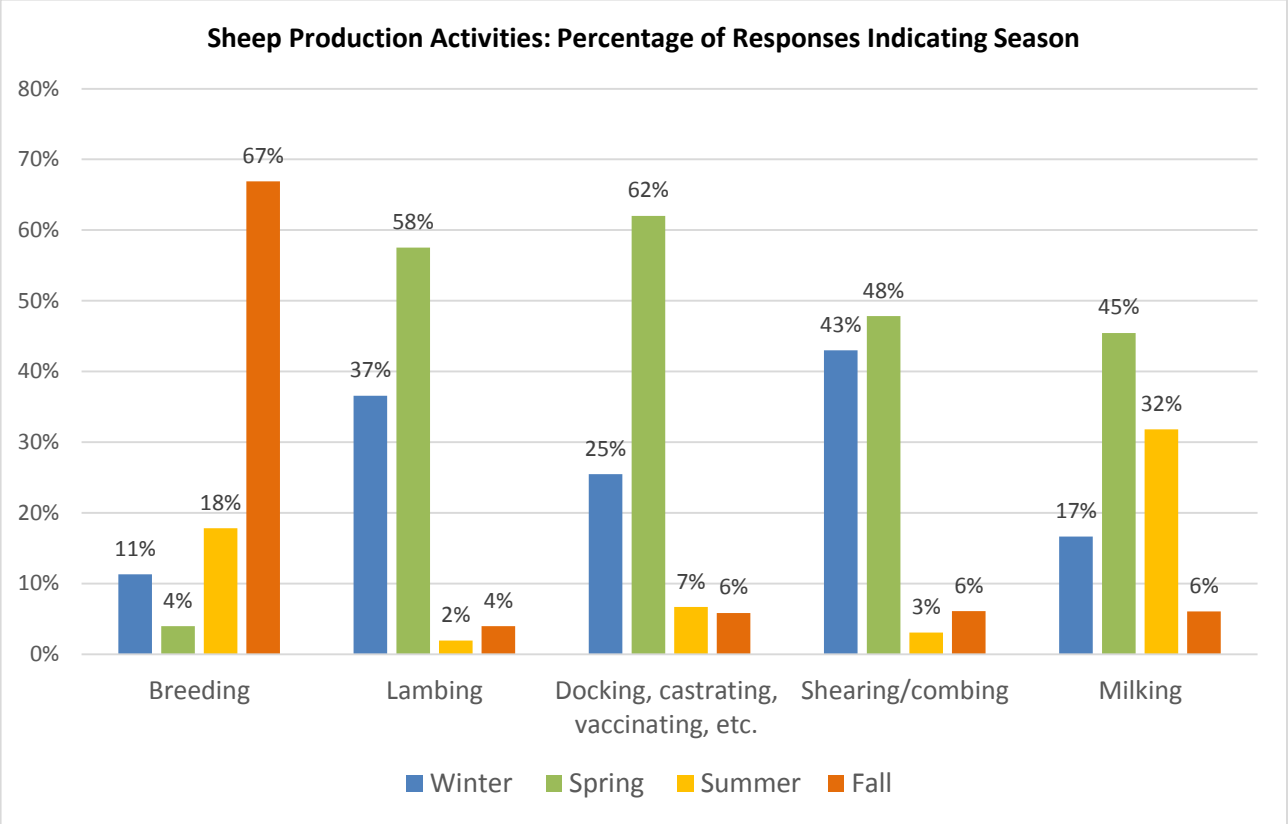


Figure S4. Seasonal sheep production activities.

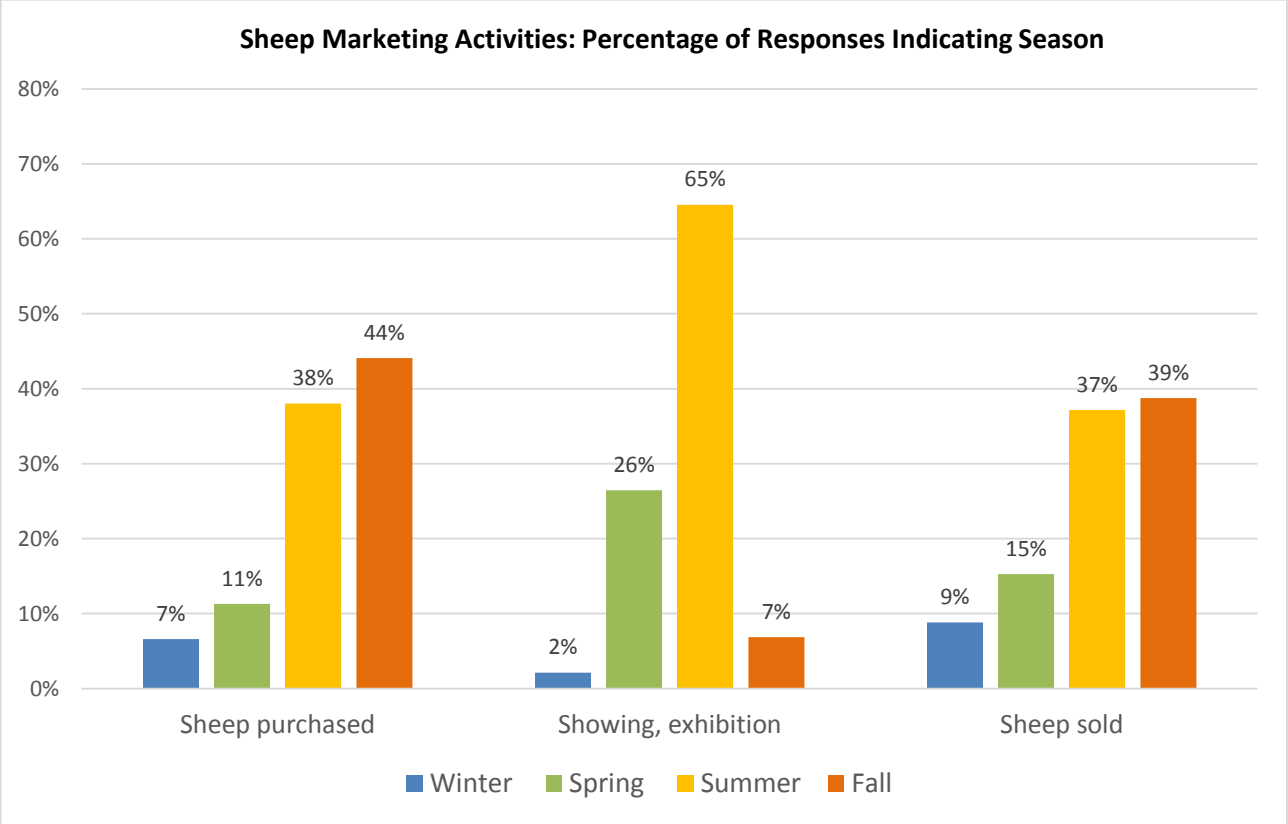


Figure S5. Seasonal sheep marketing activities.

Sheep Commodity Sales Pricing Methods

Two questions asked responders to provide information about pricing methods and bargaining skill in negotiating sales of sheep commodities. Respondents were first asked "What pricing methods did your operation use when selling commodities (lambs, fiber, dairy, etc.) during the past year?" Out of the nine categories provided, public auction was the most popular pricing method, reported by 52% of responders, followed by contract sales with a privately negotiated price (36%), and direct market sales with a negotiated price (14%). Half of the responses involved price negotiations (contract sales and direct market sales with a negotiated price sum to 50%). Other pricing methods, specified by 3% of respondents, can be categorized as cooperative or pooled marketing agreements and consignment sales. Responses are reported in Table S11.

Table S11. What pricing methods did your operation use when selling commodities (lambs, wool, etc.) during the past year? (Please choose all that apply.)

	Frequency of responses	Percent of responders
Price determined in a public auction	500	51.9%
Contract sale with privately negotiated price	342	35.5%
Contract stipulating a base price or formula price	34	3.5%
Price determined via sealed-bid auction	24	2.5%
Direct market sale with production-cost based price	69	7.2%
Direct market sale with negotiated price	136	14.1%
Other pricing method	33	3.4%
Total responses	1138	(n=964)

When asked to indicate all pricing methods used to sell sheep outputs over the previous year, sheep survey responders reported using up to five methods. Not surprisingly, a majority (53%) indicated using only one method, while just over a third (36%) indicated that they had used two or more pricing methods for sheep commodity sales in the past year (Table S12).

Table S12. Total number of pricing methods indicated.

	Frequency	Percent of responders		Percent of responses
One pricing method	513	53.2%		64.4%
Two pricing methods	230	23.9%		28.9%
Three pricing methods	48	5.0%	35.6%	6.0%
Four pricing methods	4	0.4%		0.5%
Five pricing methods	1	0.1%		100%
				(n=796)
Zero (no response)	168	17.4%		
Total	964	100%		

After indicating the pricing method(s) used over the past year when marketing commodities from their sheep operation, producers were asked to indicate their level of agreement or disagreement with the statement, "When negotiating sales during the past year, my bargaining skills resulted in the best price for my production." Thirty-six percent of survey responders either strongly agreed or agreed that their bargaining skills had resulted in the best price for their production over the past year; 11% either disagreed or strongly disagreed that their skill resulted in the best price. Thirty-two percent of responders neither agreed nor disagreed with the statement. Results and descriptive statistics are reported in Table S13; results are illustrated in Figure S6.

Table S13. Please indicate your level of agreement or disagreement with the following statement: When negotiating sales during the past year, my bargaining skills resulted in the best price for my production.

	Frequency	Percent of responders		Percent of responses
Strongly agree (1)	98	10.2%	36.2%	12.8%
Agree (2)	251	26.0%		32.9%
Neither agree nor disagree (3)	313	32.5%		41.0%
Disagree (4)	76	7.9%	10.6%	9.9%
Strongly disagree (5)	26	2.7%		3.4%
				100%
More than one response	2	0.2%		(n=764)
No response	198	20.5%		
Total	964	100%		

Likert Scale Statistics	
n (total responses)	766
Mean response	2.58
Standard deviation	0.95

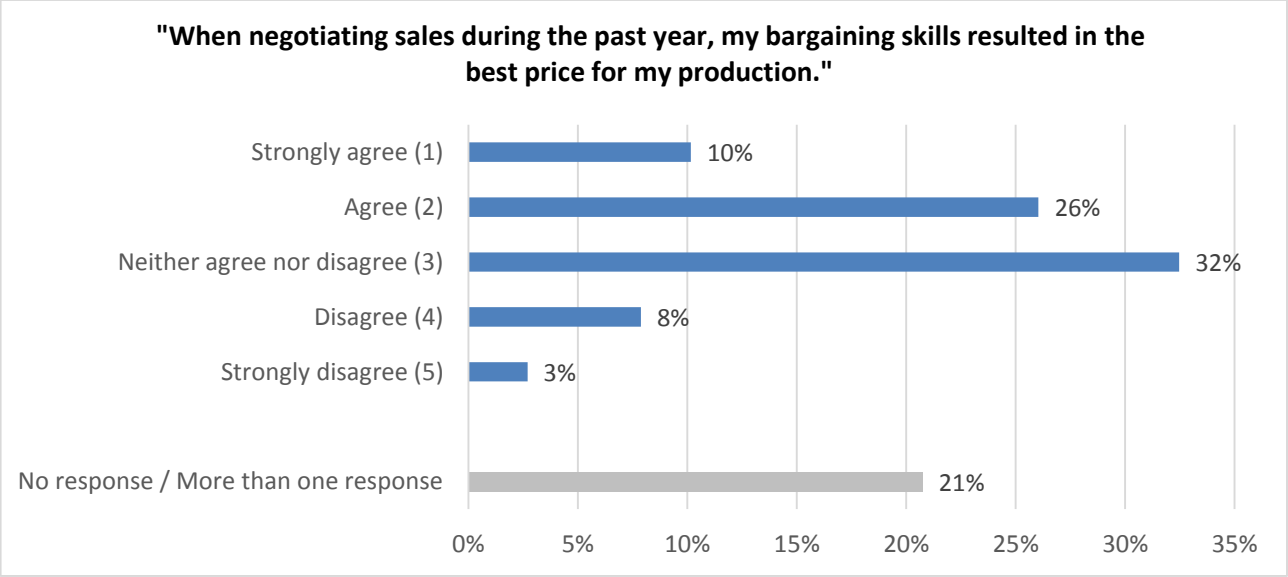


Figure S6. Level of agreement or disagreement regarding bargaining skills statement.

Section 3: Transportation

A series of questions regarding animal transport began by asking respondents, "Were sheep (adults or lambs) moved (trucked or herded) off your home farm or ranch for any reason between January 1 and December 31, 2014?" Forty-six percent of survey respondents indicated "yes," sheep had been moved off the home farm or ranch, 35% indicated "no," and 19% did not respond (Table S14).

Table S14. Were sheep (adults or lambs) moved (trucked or herded) off your home farm/ranch for any reason between January 1 and December 31, 2014?

	Frequency	Percent of responders	Percent of responses
Yes	445	46.2%	56.8%
No	339	35.2%	43.2%
			100%
More than one response	1	0.1%	(n=784)
No response	179	18.6%	
Total	964	100%	

Sheep Movements

Details regarding sheep movements related to production and marketing activities were solicited from sheep producers. A movement was defined in the instructions as "a group of sheep moving from one location to another (trucked or herded), regardless of the number of truckloads or the number of bands of sheep." For each listed activity, respondents were asked to report the typical number of sheep (adults and lambs) moved during that activity and then choose a relevant distance category, reporting the number of times this type of movement occurred in 2014. Two example movements were provided.

Responders provided 1256 valid responses about the "Typical Number of Sheep in this Type of Movement" for all movement categories. Responders provided 1433 valid responses about the number of times a type of movement occurred within particular distance categories. In several instances, responses to this complex question appeared to be mistaken or did not make sense in the intended context. The reported data have therefore been cleaned using the following criteria:

Responses listing a distance traveled without a corresponding number of sheep were eliminated from the analysis.

If the number of sheep reported was equal to the number of movements for a distance category (e.g., if 27 sheep were listed as moving 27 times) the number of movements was changed to 1.

Individual responses were also evaluated and adjusted if they were not consistent with the instructions given for this question. For example, in some instances, the sum of the number of movements listed across distance categories was equal to the typical number of animals. In other instances, the number of movements listed was equal to the number of miles in that distance category. These responses were changed on a case-by-case basis.

Responses to this question, cleaned using these criteria, are reported in Table S15.

For the typical number of sheep in by movement type, measures of skewness and kurtosis are provided to describe the distribution of responses. In general, responses were skewed to the right, with a peak indicating that a majority of smaller shipment sizes were skewed by a few relatively large shipments. This was true to a varying degree for all listed activities listed. A more detailed description of the distribution of these responses for each movement category are provided in Appendix B.

Production activities listed in the movement question included moving sheep to and between pasture and range locations as well other production activities not listed (for example, for weed control or to breeding or birthing locations). The first production-related movement was listed as "Sheep were moved from the home farm/ranch to first spring pasture/range." The mean size of a typical group moved from home to a first spring grazing location was 1332 sheep. The majority of these movements (71%) were less than 25 miles; 19% were listed as 25 to 49 miles. Movements from the home farm or ranch to the first spring grazing areas accounted for 6% of the total number of movements reported.

Movements of sheep "from their final spring pasture/range to first summer pasture/range" were reported with a mean typical group size of 2007 sheep. Shipment distances were a bit more variable than those for movements to the first spring pasture. While the majority of movements between spring and summer grazing areas (57%) were less than 25 miles, 15% were listed as 25 to 49 miles, and 23% traveled 50 to 149 miles. Only 3% of the total number of movements reported were between spring and summer grazing locations. Movements of sheep "from their final summer pasture/range to first winter pasture/range" were reported with a mean typical group size of 1544 sheep. The majority of movements between summer and winter grazing areas (65%) were less than 25 miles, but 23% traveled 50 to 149 miles. Only 4% of the total number of movements reported were between summer and winter grazing locations. The typical number of sheep moved "from their final summer pasture/range to the home farm/ranch" had a mean group size of 1175. Distances for movements from pasture to the home farm or ranch were variable, with 42% listed as 150 to 249 miles, 31% less than 25 miles, and 21% as 250 or more miles. Movements from final summer pasture to the home farm or ranch accounted for 10% of all movements reported.

Sheep moved for "Production activities not listed above (for example, weed control, movements to breeding or birthing locations)" were reported as moving in smaller groups, with a mean typical group size of 497. Common distances traveled for individual movements were relatively short, with 94% listed as traveling under 25 miles. These other production activities accounted for 4% of all reported movements.

Marketing activities listed in the movement question included moving sheep to feedlots, processors, consumers, and auctions as well as movements related to breeding, showing, and other marketing activities not included in the categories provided. When shipping sheep to a feedlot, backgrounder, or dealer, typical group sizes listed had a mean of 1226. Long distances traveled were common, with 76% of reported movements occurring over 250 miles or more. Movements to a feedlot, backgrounder, or dealer accounted for 5% of all movements listed.

Movements to a USDA-inspected processor or state-inspected slaughter facility[1] had a mean of 520 sheep in a typical shipment. Distances traveled for this category were bimodal with 60% reported as traveling less than 25 miles and 22% as 250 or more miles. Five percent of all movements reported were to a USDA or state-inspected processor. "Sheep were moved to a livestock auction barn or facility" was the most common movement category, accounting for 43% of all marketing and production related movements reported. A typical number of sheep shipped to an auction facility or sale barn was relatively small, with a mean of 85 sheep. Distances traveled to auction were variable but the most commonly reported categories were 50 to 149 miles (45%), less than 25 miles (19%), and 250 or more miles (16%).

The mean number of sheep in a typical movement to another breeding flock was 207. Distances traveled varied, with 37% reported as less than 25 miles, and 21% as 50 to 149 miles. Less than one percent of all movements reported were for sheep moved to another breeding flock.

Sheep moved directly to a consumer or restaurant was the second most common movement category, accounting for 11% of all movements reported. Typical group sizes for this type of movement were small, with a mean of 21 sheep. Distances traveled for sheep delivered directly to a consumer were most often long with 86% reported as 250 or more miles.

Typical group sizes for sheep moved for showing, exhibition, or 4-H were small with a mean of just 12 animals. Distances indicated were 50 to 149 miles (53%) and less than 25 miles (32%). Sheep moved for showing, exhibition, or 4-H accounted for 6% of all movements reported.

Sheep moved for marketing activities not listed had a mean typical group size of 163 sheep. Distances traveled were reported as mainly 150 to 249 miles (74%). Marketing activities other than those listed accounted for 2% of the total number of movements reported.

[1] Categories combined to meet disclosure requirements.

Table S15. For each production and marketing activity below, please write the typical number of animals moved during that activity. Then, under the relevant distance category, list the number of times this type of movement occurred in 2014.

	n (valid responses) % of total	Typical Number of Sheep in This Type of Movement: Mean	St. Dev	Skewness[1]	Kurtosis[2]	Distance Traveled for Each Movement (miles): >25	25-49	50-149	150-249	250+	Total % w/in category	Total # of mvmnts % of total
						Count of all movements reported / % of total within movement category						
How many sheep (adults + lambs) were moved for the following production activities? And over which distance?												
Sheep were moved from the home farm/ranch to first spring pasture/range	164	1332.9	2455.6	3.85	20.00	232	62	17	16	2		329
	13.0%					70.5%	18.8%	5.2%	4.9%	0.6%	100%	6.4%
Sheep were moved from their final spring pasture/range to first summer pasture/range	134	2007.4	3417.1	3.05	10.11	87	23	33	8			151
	10.7%					57.6%	15.2%	21.9%	5.3%		100%	2.9%
Sheep were moved from their final summer pasture/range to first winter pasture/range	127	1543.9	2311.1	2.97	12.58	143	14	50	10	4		221
	10.1%					64.7%	6.3%	22.6%	4.5%	1.8%	100%	4.3%
Sheep were moved from their final summer pasture/range to the home farm/ranch	142	1175.1	2280.2	4.44	24.73	151	18	15	207	102		493
	11.3%					30.6%	3.7%	3.0%	42.0%	20.7%	100%	9.6%
Sheep were moved for production activities not listed above	47	497.2	1174.0	3.76	14.74	199	3	6	2	1		211
	3.7%					94.3%	1.4%	2.8%	0.9%	0.5%	100%	4.1%

Table S15. (Continued.)

	n (valid responses) % of total	Typical # of Sheep in This Type of Movement: Mean	St. Dev	Skewness[1]	Kurtosis[2]	Distance Traveled for Each Movement (miles): >25	25-49	50-149	150-249	250+	Total % w/in category	Total # of mvmnts % of total
						Count of all movements reported						
						% of total within movement category						
How many sheep (adults + lambs) were moved for the following marketing activities? And over which distance?												
Sheep were moved to a feedlot, backgrounder, or dealer	104	1126.3	1863.8	2.53	6.14	19	12	11	18	192		252
	8.3%					7.5%	4.8%	4.4%	7.1%	76.2%	100%	4.9%
Sheep were moved to a USDA-inspected processor or state-inspected slaughter[3]	115	520.2	1704.3	4.56	22.14	143	22	15	5	53		238
	9.1%					60.1%	9.2%	6.3%	2.1%	22.3%	100%	4.6%
Sheep were moved to a livestock auction barn/facility	249	85.2	115.2	3.73	20.42	420	161	987	274	364		2206
	19.8%					19.0%	7.3%	44.7%	12.4%	16.5%	100%	42.8%
Sheep were moved to another breeding flock	35	206.9	670.7	4.12	18.09	16	5	9	5	8		43
	2.8%					37.2%	11.6%	20.9%	11.6%	18.6%	100%	0.8%
Sheep were moved to a consumer or restaurant	27	20.8	44.3	3.43	12.77	61	6	4	8	491		570
	2.1%					10.7%	1.1%	0.7%	1.4%	86.1%	100%	11.1%
Sheep were moved for showing, exhibition, or 4-H	79	12.2	18.2	5.83	42.36	106	18	172	12	19		327
	6.3%					32.4%	5.5%	52.6%	3.7%	5.8%	100%	6.3%
Sheep were moved for marketing activities not listed above	35	163.5	383.0	3.83	16.22	8	9	81	2	9		109
	2.8%					7.3%	8.3%	74.3%	1.8%	8.3%	100%	2.1%
Total valid responses for typical number of sheep	1258 100%											
Total number of movements reported												5150 100%

Note: Movements are listed only if a typical number of sheep in the type of movement was also indicated. Data were further cleaned to eliminate nonsensical responses.

[1] Skewness indicates asymmetry of a distribution around the mean. A positive measure of skewness indicates an asymmetric tail toward positive numbers.

[2] Kurtosis indicates the relative peaked versus flat shape of a distribution. A positive measure of kurtosis indicates a relatively peaked distribution.

[3] Categories combined to meet disclosure requirements.

Sheep Transport Modes

A series of three questions asked sheep producers responding to the survey whether sheep were transported via truck-and-trailer or trailed (herded) between the home farm or ranch and grazing locations. Instructions asked responders to choose one response from "Sheep are trucked/trailered," "Sheep are trailed (herded)," or "Not applicable." Responses are reported in Table S16.

Table S16. How is your sheep flock typically transported…

	Frequency	Percent of responders	Percent of responses
…from the home farm/ranch to first spring pasture/range?			
Sheep are trucked/trailered	174	18.0%	26.5%
Sheep are trailed (herded)	151	15.7%	23.0%
Not applicable	331	34.3%	50.5%
			100%
More than one response	16	1.7%	(n=656)
No response	292	30.3%	
Total	964	100%	
…from spring to summer pasture/range?			
Sheep are trucked/trailered	99	18.0%	19.8%
Sheep are trailed (herded)	145	15.7%	29.0%
Not applicable	256	34.3%	51.2%
			100%
More than one response	6	1.7%	(n=500)
No response	458	30.3%	
Total	964	100%	
…from summer pasture/range to where they overwinter?			
Sheep are trucked/trailered	89	10.3%	22.3%
Sheep are trailed (herded)	117	15.0%	29.3%
Not applicable	193	26.6%	48.4%
			100%
More than one response	4	0.6%	(n=399)
No response	561	47.5%	
Total	964	100%	

When asked about movements of sheep from the home farm or ranch to first spring grazing areas, 18% of respondents indicated sheep were trucked and 16% sheep were herded. Roughly two-thirds of respondents indicated that the question was not applicable, marked more than one category, or chose not to respond. Sheep were reported as transported from spring to summer grazing areas by truck and trailer by 10% and trailed by 15% of respondents. Similarly, sheep movements from summer grazing to overwinter locations were reported as 9% trucked and 12% trailed. For each of these movements, three-quarters of respondents indicated that the question was not applicable, marked more than one category, or chose not to respond. When only valid responses are considered, herding sheep as opposed to moving them in a truck and trailer was a significant mode of transport, with about a quarter of valid responses indicating sheep were trailed to, from, and between spring and summer grazing locations.

Section 4: Management Practices

Questions regarding management practices asked sheep producers to report detailed information regarding the types of people or groups visiting and coming in physical contact with their sheep, as well as which types of animals external to their operation were in contact or proximity to their sheep. Each question covered the time period of January 1 through December 31, 2014.

Visitor Contacts

A list of 16 visitor types was provided and responders were asked to relate the number of times during 2014 each of these types of people or groups visited the location of their sheep. For visitor categories that respondents indicated, respondents were further asked to report whether each type of visit typically resulted in physical contact with their sheep by indicating either "yes" or "no." Results are reported in Table S17. A more detailed description of the distribution of these responses for each visitor category are provided in Appendix B.

The most common visitor types reported were shearers and hoof trimmers (27% of responses), followed by veterinarians (13%), other livestock producers (11%), feed haulers (9%), and other visitors (8%). The average number of visits reported for each category was highest for "other visits" with a mean of 14 visits in 2014. Other visitor categories with a relatively high number of visits per year included other livestock producers (9 visits), livestock haulers and feed haulers (each with means of 8 visits), and agricultural tours (with a mean of 6 annual visits).

Several categories had relatively high reported rates of visits resulting in physical contact with sheep, including shearers and hoof trimmers (58% of responses for this category indicated "yes" to contact), veterinarians (25% of respondents indicated "yes"), livestock haulers (22% "yes"), other livestock producers (20% "yes"), and agricultural tours (10% "yes").

Table S17. How many times in the past year (January 1 and December 31, 2014) did each of the following people or groups visit the location of your sheep? Did these visits typically result in physical contact with your sheep?

	Number of Visits in 2014						Typically result in physical contact?				Total
							Yes	No	More than one response	No response	
	Number of responses (n) % of total	Mean	Median	St. Dev	Min.	Max.	n % of total	n % of total	n % of total	n % of total	Number of responses % of total
Veterinarians or other animal health professionals	255 12.8%	3.7	2.0	14.0	1	200	240 24.9%	208 21.6%		516 53.5%	964 100%
Artificial insemination technicians	12 0.6%	1.1	1.0	0.3	1	2	8 0.8%	249 25.8%		707 73.3%	964 100%
Milk truck	3 0.2%	1.0	1.0	.0	1	1	2 0.2%	246 25.5%		716 74.3%	964 100%
Wool haulers	127 6.4%	1.6	1.0	4.4	1	50	61 6.3%	270 28.0%		633 65.7%	964 100%
Livestock haulers	201 10.1%	6.8	2.0	35.2	1	400	207 21.5%	184 19.1%	1 0.1%	572 59.3%	964 100%
Manure haulers	43 2.2%	3.5	1.0	8.0	1	50	20 2.1%	242 25.1%	1 0.1%	701 72.7%	964 100%
Mobile slaughter teams	31 1.6%	2.5	2.0	2.1	1	10	30 3.1%	231 24.0%		703 72.9%	964 100%
Renderers	9 0.5%	1.6	1.0	1.7	1	6	12 1.2%	233 24.2%	2 0.2%	717 74.4%	964 100%
Shearers or hoof trimmers	534 26.7%	2.2	1.0	13.8	1	300	561 58.2%	74 7.7%	2 0.2%	327 33.9%	964 100%
Video auction representatives (videotaping, sale arrangements)	14 0.7%	1.4	1.0	0.8	1	3	8 0.8%	238 24.7%		718 74.5%	964 100%
Agricultural tours (school groups, university classes, demonstrations, etc.)	122 6.1%	6.0	2.0	20.8	1	175	99 10.3%	230 23.9%		635 65.9%	964 100%
Extension agents (not counting tours listed above)	55 2.8%	2.6	1.0	3.9	1	25	39 4.0%	235 24.4%		690 71.6%	964 100%

Table S17. (Continued.)

Nutritionists or feed company consultants	32 1.6%	2.8	2.0	2.9	1	12		19 2.0%	239 24.8%	1 0.1%	705 73.1%	964 100%
Feed (hay or grain) haulers	184 9.2%	6.7	3.0	29.6	1	400		67 7.0%	302 31.3%	1 0.1%	594 61.6%	964 100%
Other livestock producers	219 11.0%	9.3	4.0	27.9	1	300		192 19.9%	202 21.0%	3 0.3%	567 58.8%	964 100%
Other visitors (for example, package delivery or utility company personnel)	159 8.0%	14.4	10.0	19.8	1	123		50 5.2%	322 33.4%		592 61.4%	964 100%
Total	**2000** **100%**						Total	1615 10.5%	3705 24.0%	11 0.1%	10093 65.4%	**15424** **100%**

Animal Contacts and Proximity

A final question asked sheep producers about types of animals that were not part of their agricultural operation which came in contact or were in proximity to their sheep between January 1 and December 31, 2014. Respondents were further asked to estimate roughly how often contact or proximity occurred. Examples were given to define "contact" and "proximity," as follows: "Examples of 'contact' include nose-to-nose contact, sharing a pasture or pen, or comingling of herds on open range"; "Examples of 'proximity' include fence-line proximity, or animals/herds within sight of each other on pasture or range (but not comingling)." Categories to indicate the frequency of contact or proximity per year were provided: responders could choose from "never," "1-7 days," "8+ days," or "don't know." Results to this question are reported in Table S18.

When reporting on which types of animals came into contact with their sheep, "never" accounted for about half of the responses for most categories; exceptions were for beef cattle (33% "never"), and wild antelope, deer, elk, or moose (with 29% of responses indicating "never"). Combining responses indicating contact for "1-7 days" and "8+ days," sheep flocks were most likely to be reported coming into some amount of contact with beef cattle (24% of combined affirmative contact responses); wild antelope, deer, elk, or moose (16% combined contact); and domestic goats or sheep (12% combined contact). The majority of these total contact measures for each category were accounted for by "contact on 8+ days." Responders were most likely to answer they "did not know" about contact with their sheep by wild antelope, elk, or moose (17%).

Regarding proximity (as opposed to contact), a quarter to a third of respondents indicated that their sheep were "never" in proximity to nearly all of the animal types listed. "Never" was less commonly reported for beef cattle and wild antelope, deer, elk, and moose with only 16% of category responses indicating "never" in proximity for each. Combining categories for "1-7 days" and "8+ days," sheep were most likely to be reported in proximity with beef cattle (24% of category responses), wild antelope, deer, elk, or moose (16%), and domestic goats or sheep (12% of responses to this category). As with contact, combined proximity frequencies were mostly assigned to "8+ days." Responders were most likely to answer that they "did not know" about proximity with their sheep for wild antelope, deer, elk and moose (14%).

Table S18. Which of the following types of animals—not part of your operation—were in contact or proximity with your sheep between January 1 and December 31, 2014? And roughly how often?

	Contact with Sheep (frequency, %)							Proximity to Sheep (frequency, %)						
	Never	Contact on 1-7 Days	Contact on 8+ Days	Don't Know	More than one response	No response	**Total**	Never	1-7 Days of Proximity	8+ Days of Proximity	Don't Know	More than one response	No response	**Total**
Domestic goats or sheep	435	25	95	27	2	380	964	277	19	117	29	1	521	964
	45.1%	2.6%	9.9%	2.8%	0.2%	39.4%	100%	28.7%	2.0%	12.1%	3.0%	0.1%	54.0%	100%
Beef cattle	321	22	214	57	8	342	964	156	28	292	54	1	433	964
	33.3%	2.3%	22.2%	5.9%	0.8%	35.5%	100%	16.2%	2.9%	30.3%	5.6%	0.1%	44.9%	100%
Dairy cattle	516	2	22	6	3	415	964	363	1	28	9		563	964
	53.5%	0.2%	2.3%	0.6%	0.3%	43.0%	100%	37.7%	0.1%	2.9%	0.9%		58.4%	100%
Domestic pigs	527	5	13	2	1	416	964	353	5	27	7		572	964
	54.7%	0.5%	1.3%	0.2%	0.1%	43.2%	100%	36.6%	0.5%	2.8%	0.7%		59.3%	100%
Farmed bison or beefalo	539		1	2		422	964		2	8			954	964
	55.9%		0.1%	0.2%		43.8%	100%		0.2%	0.8%	0.0%		99.0%	100%
Farmed deer or elk	538	1	3	6	2	414	964	367	2	2	9		584	964
	55.8%	0.1%	0.3%	0.6%	0.2%	42.9%	100%	38.1%	0.2%	0.2%	0.9%		60.6%	100%
Wild bison	537	2		1	1	423	964	364		3	10	1	586	964
	55.7%	0.2%		0.1%	0.1%	43.9%	100%	37.8%	0.0%	0.3%	1.0%	0.1%	60.8%	100%
Wild antelope, deer, elk, or moose	281	19	133	159	3	369	964	156	25	216	133	2	432	964
	29.1%	2.0%	13.8%	16.5%	0.3%	38.3%	100%	16.2%	2.6%	22.4%	13.8%	0.2%	44.8%	100%
Feral goats, bighorn sheep, or mountain goats	537	1	2	9		415	964	365	3	5	12	1	578	964
	55.7%	0.1%	0.2%	0.9%		43.0%	100%	37.9%	0.3%	0.5%	1.2%	0.1%	60.0%	100%
Feral swine	545			2		417	964	370	2	3	7		582	964
	56.5%			0.2%		43.3%	100%	38.4%	0.2%	0.3%	0.7%	0.0%	60.4%	100%

Sheep Survey: Summary of Results

Operation Characteristics

Responders were asked to describe their sheep operation characteristics, including whether they were currently involved in sheep production, other types of livestock currently on their home farm or ranch, and in which state their sheep spend the majority of their time. This section also included questions about current and peak flock size.

Eighty-four percent of respondents indicated that they were currently involved in sheep production at the time they filled out the questionnaire. In addition to sheep, the most common types of other livestock listed as currently on the home farm or ranch were beef cattle, horses, poultry, and llamas or alpacas. In fact, a majority of respondents reported having at least one other type of livestock. The number of additional types of livestock listed ranged from zero to six types with a mean of 1.6. The reported location of sheep flocks within the intermountain region was dispersed between each of the four listed states. When asked how many sheep were on their farm or ranch "as of today," nearly half of respondents indicated 100 or more and a third indicated 25 to 99 adults plus lambs. Results for peak flock size at any one time during 2014 were similar.

Production and Marketing

Questions posed to sheep producers relating to their production and marketing activities included descriptions of their operation purpose and primary source of profits, and the seasonal location of animals during production and marketing activities throughout 2014. Two additional questions asked producers about pricing methods used when selling sheep operation outputs along with an assessment of their bargaining skills when negotiating sales prices.

Although sheep producers reported a range of operation purposes, meat production dominated as a primary profit source. Although over half of sheep respondents listed wool production as a purpose for their operation, wool production was listed by less than 2% of respondents as a primary source of profits. Sheep flock locations varied considerably throughout the year. Sheep were more likely to be located away from the home farm or ranch in the spring and least likely to be away in the winter. Respondents likewise reported a majority of their sheep located at the home farm or ranch, either fed or grazing, in the summer and fall. Seasonally, breeding was reported mainly in the fall with lower frequencies in other seasons. Lambing followed breeding times and was reported most frequently in spring and winter months. Management tasks including docking, castrating, vaccinating, de-worming,

and identifying sheep (by tagging, painting, or branding) were most likely to be reported during the spring. Producers reported purchasing sheep more often in the summer; however, purchases were recorded in all seasons. The majority of responses for showing and exhibiting sheep placed these activities during summer. Selling sheep from the operation was the most frequently reported marketing activity. Sheep were sold throughout the year, most frequently in the fall.

When asked about negotiating sales of sheep commodities, public auction was the most popular pricing method reported, followed by contract sales with a privately negotiated price, and direct market sales with a negotiated price. Half of the responses indicating sales pricing methods involved price negotiations (either in contract sales or direct market sales with a negotiated price). A majority of respondents indicated using only one method, while just over a third reported that they had used two or more pricing methods for sheep commodity sales in the past year. Just over a third of responders either strongly agreed or agreed that their bargaining skills had resulted in the best price for their production over the past year.

Transportation

Details regarding sheep movements related to production and marketing activities were solicited from sheep producers. A movement was defined as "a group of sheep moving from one location to another (trucked or herded), regardless of the number of truckloads or the number of bands of sheep." For each listed activity respondents were asked to report the typical number of sheep (adults and lambs) moved during that activity and then choose a relevant distance category, reporting the number of times this type of movement occurred in 2014.

"Sheep were moved to a livestock auction barn or facility" was the most prevalent category, accounting for nearly half of all movements reported. The next most common category was for movements directly to a consumer or restaurant. The most common production-related movement indicated was moving sheep from summer grazing locations back to the home farm or ranch. Movements reported involving the largest typical number of sheep were all production-related transport to and between grazing areas, with mean group sizes of around 1100 to 2000 animals. The most common marketing movement reported, to a livestock auction facility, had typical groups with a mean of 85 sheep. All group sizes were somewhat skewed by a few relatively large groups reported. Trailing or herding sheep as opposed to moving them in a truck and trailer was a significant mode of transport. About a quarter of valid responses indicated sheep were trailed to, from, and between spring and summer grazing locations.

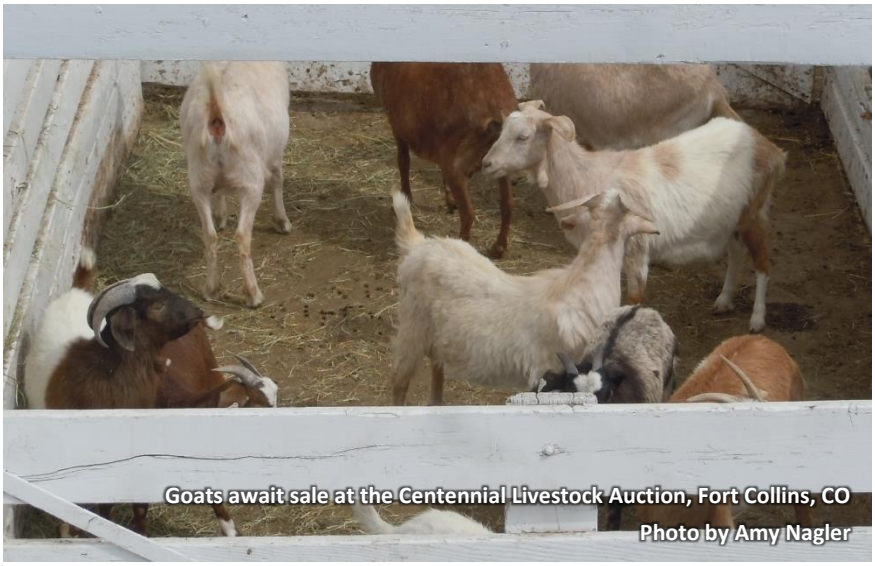
Management Practices

Questions regarding management practices asked sheep producers to report detailed information about the types of people or groups visiting their flocks and whether these visits resulted in physical contact with their sheep. Respondents were also asked about which types of outside livestock and wildlife were observed having contact or proximity to their sheep.

The most common visitor types reported were shearers and hoof trimmers followed by veterinarians, other livestock producers, and feed haulers. The average number of visits reported for each category was highest for "other visits" with a mean of 14 visits in 2014. Other relatively frequent visitor categories included other livestock producers, livestock haulers, feed haulers, and agricultural tours. Several categories had relatively high reported rates of visits resulting in physical contact with sheep, including shearers and hoof trimmers, veterinarians, livestock haulers, and other livestock producers. Sheep flocks were most likely to be reported coming into some contact or observed proximity with beef cattle; wild antelope, deer, elk, or moose; and domestic goats or sheep.

Goat Survey Results

The following is a summary of results from the *2014 Intermountain States Goat Production, Marketing, and Transportation Survey*. Data were reported from 169 responders who returned usable questionnaires. For each item on the questionnaire, frequency is reported along with percent of the total 169 responders. Additionally, to account for non-response and other problematic responses (such as an individual providing multiple responses to a single-response question), we occasionally report a percentage of relevant responses, abbreviated as "percentage of responses," which includes all recorded responses excluding non-response and multiple responses to single-response questions.


Goats await sale at the Centennial Livestock Auction, Fort Collins, CO
Photo by Amy Nagler

Section 1: Operation Characteristics

Section 1 of the questionnaire asked respondents to describe their goat operation characteristics, including whether they were currently involved in goat production, other types of livestock currently on their home farm or ranch, and in which state their goats spend the majority of their time. This section also included questions about current and peak herd size.

Question 1 asked "Are you currently involved in goat production?" Out of 169 respondents, 135 or 80% answered "Yes," 31 (18%) reported that they were not currently involved in goat production, and 3 (2%) did not respond to the question (Table G1).

Table G1. Are you currently involved in goat production?

	Frequency	Percent of responders	Percent of responses
Yes	135	79.9%	81.3%
No	31	18.3%	18.7%
			100%
No response	3	1.8%	(n=166)
Total	169	100%	

Livestock Types

Respondents were asked to select all that applied from a list, indicating "Which type (or types) of livestock are currently on your home farm/ranch?" In addition to goats, which were listed by 79% of all responders, the most common types of livestock listed were horses (40%), poultry (28%), beef cattle (27%), and sheep (25%) (Table G2).

Table G2. Which type (or types) of livestock are currently on your home farm/ranch? (Please choose all that apply.)

	Frequency of responses	Percent of responders
Goats	133	78.7%
Sheep	42	24.9%
Beef cattle	45	26.6%
Dairy cattle	10	5.9%
Pigs	12	7.1%
Llamas or alpacas	21	12.4%
Farmed deer or elk	0	0.0%
Farmed bison or beefalo	0	0.0%
Horses	67	39.6%
Poultry	47	27.8%
Total responses	377	(n=169)

Of respondents who reported having goats, a majority (59%) listed at least one other type of livestock currently on their home farm or ranch. For respondents reporting goats, the average number of additional types of livestock listed was 1.7 and the maximum number of additional types of livestock reported was six. Frequencies are illustrated in Figure G1; descriptive statistics are listed in Table G3.

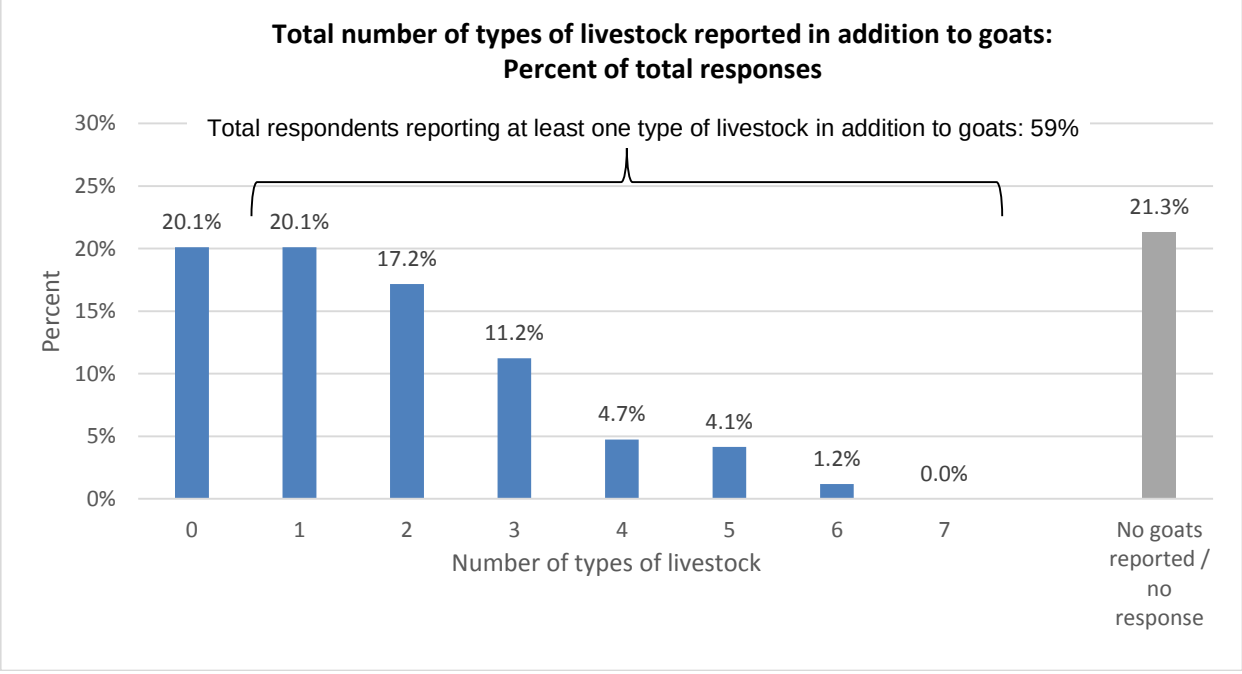


Figure G1. Number of types of livestock—in addition to goats—currently on the home farm/ranch.

Table G3. Total number of types of livestock reported as currently on the home farm/ranch in addition to goats.

n (responders reporting goats currently on their farm or ranch)	133
Mean	1.71
Standard deviation	1.52
Minimum	0
Maximum	6

Goat Herd State Location

Goat survey respondents were asked to report "In which state do your goats spend most (or all) of their time?" Roughly a fifth of respondents reported goats in each of the four states included in the sampling population; 19% chose not to respond to this question (Table G4).

Table G4. In which state do your goats spend most (or all) of their time?

	Frequency	Percent of responders	Percent of responses
Idaho	35	20.7%	25.5%
Montana	30	17.8%	21.9%
Utah	36	21.3%	26.3%
Wyoming	35	20.7%	25.5%
Other state not listed	1	0.6%	0.7%
			100%
No response	32	18.9%	(n=137)
Total	169	100%	

Goat Herd Size

Respondents were asked to report both the number of goats on their home farm or ranch at the time they filled out the survey as well as their operation's peak herd size during 2014. Please note that questionnaire categories for 100 to 499 goats, 500 to 999 goats, and 1,000 or more goats are reported in aggregate in order to protect respondent anonymity.

When asked how many goats were on their farm or ranch "as of today," half (50%) of respondents indicated between 25 and 99 adults plus kids. Sixteen percent indicated a current herd size between 1 and 24 goats. A low percentage for this category is expected due to the sampling protocol, which intended to exclude producers listing fewer than 25 goats. Fifteen percent of respondents indicated that their current herd consisted of 100 or more goats. Results are reported in Table G5.

Table G5. How many goats (adults + kids) are on your home farm/ranch as of today?

	Frequency	Percent of responders	Percent of responses
0 (currently no goats)	3	1.8%	2.1%
1 to 24 goats as of today	27	16.0%	19.3%
25 to 99 goats as of today	85	50.3%	60.7%
*100 or more goats as of today	25	14.8%	17.9%
			100%
No response	29	17.2%	(n=140)
Total	169	100%	

*Aggregated category to ensure anonymity.

When asked to report peak herd size at any one time during 2014, a majority of respondents (57%) indicated that their largest herd size was between 25 and 99 adult and kid goats. Seven percent indicated between 1 and 24, and 18% indicated a peak herd of over 100 adult goats plus kids at any one point during 2014. Results are reported in Table G6.

Table G6. What was the peak size your goat herd (adults + kids) at any one time between January 1 and December 31, 2014?

	Frequency	Percent of responders	Percent of responses
0 (no goats in 2014)	1	0.6%	0.7%
1 to 24 goats, peak herd size	11	6.5%	7.9%
25 to 99 goats, peak herd size	97	57.4%	69.3%
*100 or more goats, peak herd size	31	18.3%	22.1%
			100%
No response	29	17.2%	(n=140)
Total	169	100%	

*Aggregated category to ensure anonymity.

Section 2: Production and Marketing

Questions posed to goat producers relating to their production and marketing activities included descriptions of their operation purpose and source of profits, and the seasonal location of animals during production and marketing activities throughout 2014. Two additional questions asked producers about pricing methods used when selling goat operation outputs, and an assessment of their bargaining skills when negotiating these prices.

Goat Operation Purpose

A majority of respondents (67%) listed meat production as the goat operation's purpose. Other common operation purposes included raising goats for seed or breeding stock (33%); weed control (29%); dairy (23%); and show, exhibition, or 4-H (23%) (Table G7). Other purposes specified for goat production can be categorized as family activities, added-value products, and specific production activities linked to lamb production.

Table G7. Which of the following describes the purpose (or purposes) of your goat operation? (Please choose all that apply.)

	Frequency of responses	Percent of responders
Goats for meat (kid) production	113	66.9%
Goats for fiber (mohair, cashmere) production	10	5.9%
Goats for dairy (milk, cheese) production	38	22.5%
Goats for seed or breeding stock	56	33.1%
Goats for weed control	49	29.0%
Goats for show, exhibition, or 4-H	38	22.5%
Goats for pack animals, pets, or companion animals	18	10.7%
Other purpose	5	3.0%
Total responses	327	(n=169)

Multiple goat operation purposes was the norm. Over half (58%) of all respondents who answered this question reported more than one purpose for their goat operation, with 24% listing two and 22% listing three purposes (Figure G2).

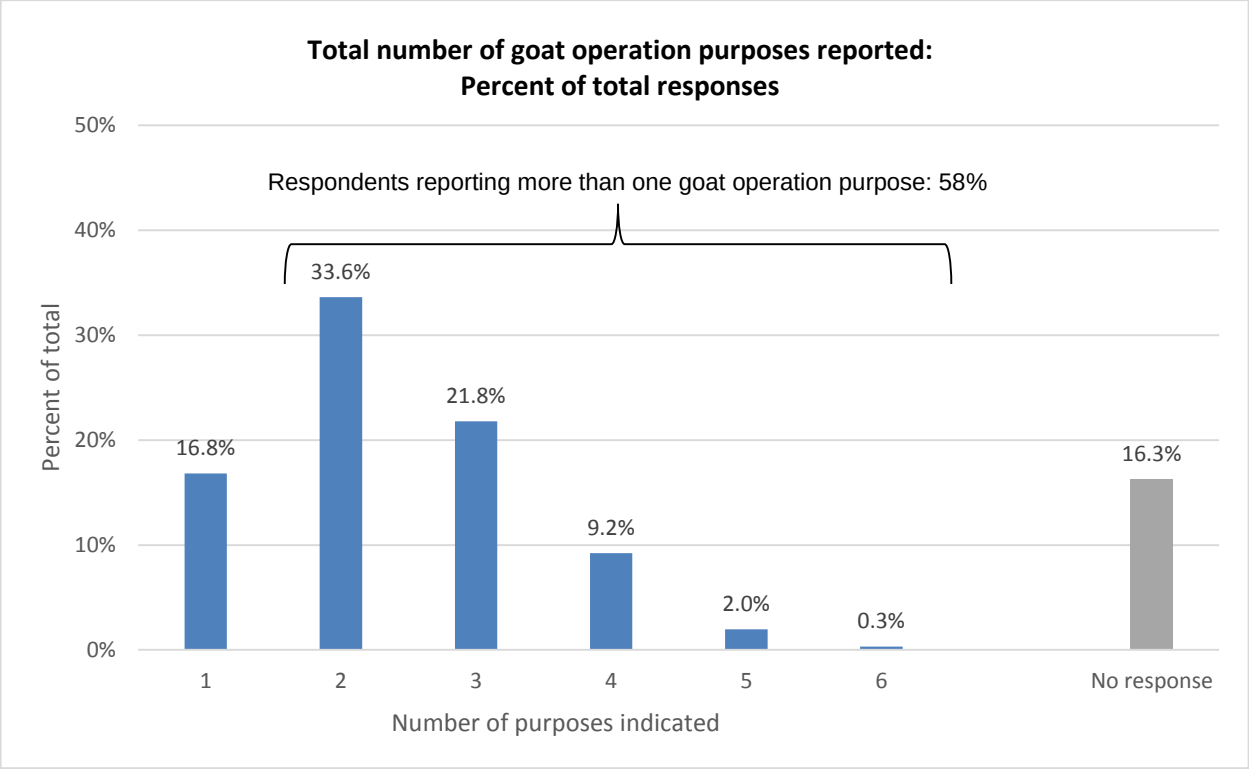


Figure G2. Number of goat operation purposes reported.

Goat Operation Primary Source of Profits

Although goat producers reported a range of goat operation purposes, meat production dominated as a reported primary profit source. A majority (59%) listed meat production as their primary source of profits from their goat operation in 2014 followed by dairy (milk, cheese) (9%); goats sold for show, exhibition, or 4-H (7%); and fiber (mohair, cashmere) sales (5%) (Table G8).

Table G8. What best describes the primary source of profits (market commodity, product, or service) from your goat operation in 2014? (Please choose only one.)

	Frequency	Percent of responders	Percent of responses (n=138)
Meat (kid) production	100	59.2%	72.5%
Fiber (mohair, cashmere) production	7	4.1%	5.1%
Dairy (milk, cheese) production	12	7.1%	8.7%
Goats sold for seed or breeding stock	2	1.2%	1.4%
Goats sold or contracted for weed control	2	1.2%	1.4%
Goats sold for show, exhibition, or 4-H	10	5.9%	7.2%
Goats sold or contracted for pack animal use, pets, or companions	1	0.6%	0.7%
Other product or service	4	2.4%	2.9%
			100%
No response	31	18.3%	
Total	169	100%	

Goat Herd Seasonal Location, Production and Marketing Activities

Respondents were asked to think back over the previous year (January 1 through December 31, 2014), and report seasonal information about where the majority of their goat herd was located and what production and marketing activities animals were involved in. Responses from this multi-part question are reported in Tables G9 and G10 and Figures G3 and G4 below.

Seasonal Herd Locations

Respondents were asked to choose from one of four location categories to indicate seasonally (winter, spring, summer, or fall of 2014), "Where was the majority of your goat herd located?" Location categories included: penned and fed in a drylot or feedlot at the home farm or ranch, grazing on pasture or range at the home farm or ranch, penned and fed in a drylot or feedlot away from the home farm or ranch, and grazing on pasture or range away from the home farm or ranch. Herd location results are reported in Table G9 and further illustrated in Figure G3.

Reported goat herd locations did vary seasonally; however, the majority of herds remained on the home farm or ranch throughout the year, ranging from 71% of respondents in winter months to 62% in

fall months. Goat herds were more likely to be located away from the home farm or ranch in the summer (7% of respondents) and least likely to be away in the winter (only 2% of respondents).

During winter months, from January through March, 52% of respondents indicated that the majority of their goat herd was penned and fed on a drylot or feedlot located on the home farm or ranch; 19% were grazing on pasture or range located at home. Only 2% of respondents indicated that their goat herd was located away from the home farm or ranch, either being fed or on pasture, during winter months. Seven percent of respondents indicated more than one winter goat herd location.

During spring months (April through June) the percentage of goats reported as located at home grazing on pasture or range increased from a winter rate of 19% to 45%. An additional 19% were reported as penned and fed at home in the spring. Likewise, the number of goats grazing away from home increased from less than 1% in winter to 3% in spring months. Five percent of respondents indicated more than one spring goat herd location.

Not surprisingly, survey respondents indicated the highest percentage of goats grazing on pasture or range (as opposed to being penned and fed) during summer months (July, August, and September). Fifty-five percent of responses indicated herds were grazing at home, and 6% were grazing away from home, while only 11% were reported penned and fed at home, and 1% penned and fed away from home. Five percent of respondents indicated more than one summer goat herd location.

In the fall (October through December), a shift back to goat herds penned and fed was reported with 25% of herds penned and fed at home, 37% grazing on pasture or range at home, 1% fed away and 4% grazing away from the home farm or ranch. Four percent of respondents indicated more than one fall goat herd location.

Table G9. For each season over the past year, where was the majority of your goat herd located? (One season for each location, if relevant.)

January 1 through December 31, 2014	Winter (Jan-Mar)			Spring (Apr-June)			Summer (July-Sept)			Fall (Oct-Dec)		
	Freq.	%	V. %	Freq.	%	V. %	Freq.	%	V. %	Freq.	%	V. %
Where was the majority of your goat herd located?												
Penned and fed in a drylot/feedlot at the home farm/ranch	88	52.1%	66.2%	32	18.9%	25.8%	19	11.2%	14.5%	42	24.9%	35.0%
Grazing on pasture/range at the home farm/ranch	32	18.9%	24.1%	76	45.0%	61.3%	93	55.0%	71.0%	63	37.3%	52.5%
Penned and fed in a drylot/feedlot away from the home farm/ranch	1	0.6%	0.8%	2	1.2%	1.6%	1	0.6%	0.8%	2	1.2%	1.7%
Grazing on pasture/range away from the home farm/ranch	1	0.6%	0.8%	5	3.0%	4.0%	10	5.9%	7.6%	6	3.6%	5.0%
More than one location	11	6.5%	8.3%	9	5.3%	7.3%	8	4.7%	6.1%	7	4.1%	5.8%
			100%			100%			100%			100%
No response	36	21.3%	(n=133)	45	26.6%	(n=124)	38	22.5%	(n=131)	49	29.0%	(n=120)
Total	169	100%		169	100%		169	100%		169	100%	

Freq. is the frequency, % is the percent of responders, and V. % is the percent of responses (excluding no response) within each season.

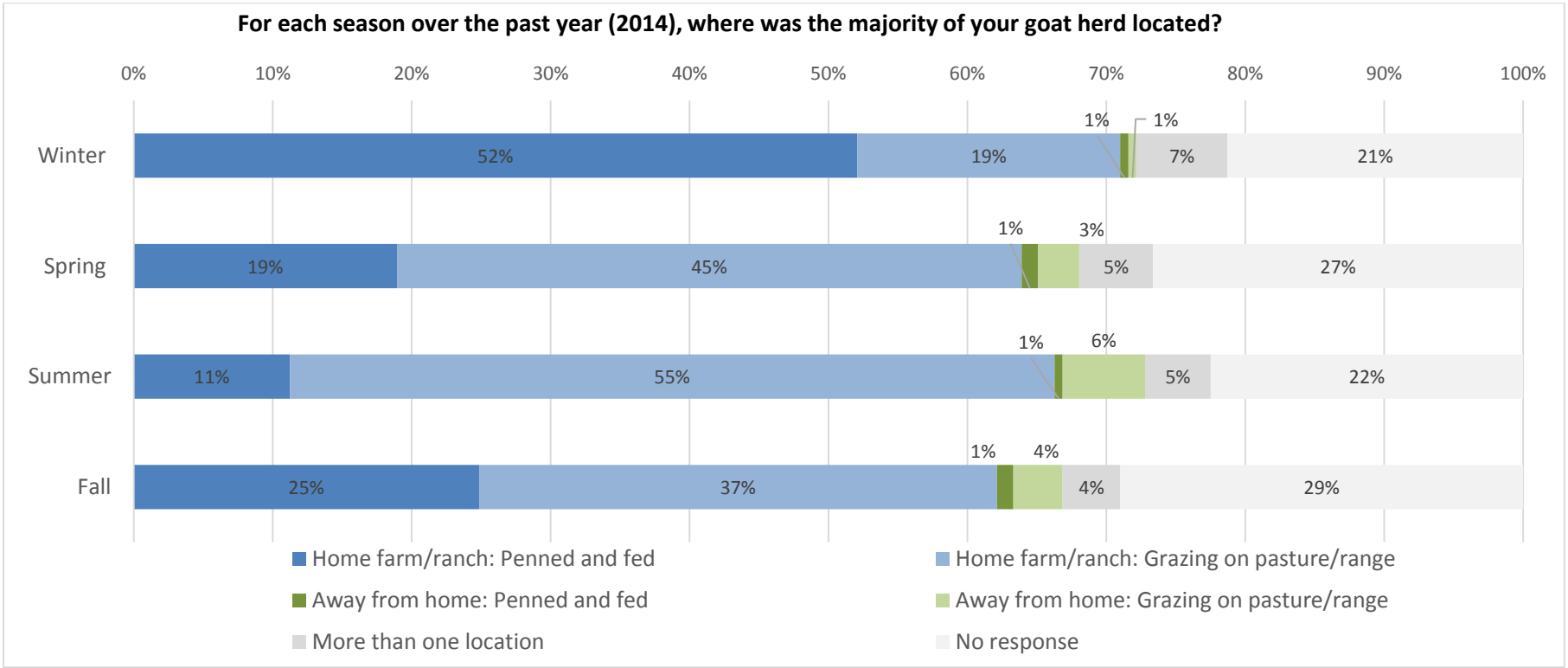


Figure G3. Seasonal location of goats.

Production and Marketing Activities

Goat producers were asked what seasonal production and marketing activities their goats were involved in. Respondents were instructed to choose all seasons that applied to their goat herd for each activity. Responses are reported in Table G10 and further illustrated in Figures G4 and G5.

Production activity categories included breeding; kidding; castrating, vaccinating, de-worming, tagging/painting/branding; shearing/combing; and milking. Seasonal responses for production activities are illustrated in Figure G4. Seasonally, breeding was reported mainly in the fall (51% of breeding responses) and in lower frequencies in other seasons (19% in summer, 19% in winter, and 11% in spring months). Given the average 5-month gestation period for goats (eXtension 2015), kidding followed reported breeding times, occurring most frequently in the spring (48% of kidding responses) and winter (37%). Some kidding was also reported in the fall (9%) and summer (6%).

Herd management tasks, including castrating, vaccinating, de-worming, and identifying goats (by tagging, painting, or branding), were most likely to be reported during summer months (50% of herd management responses) followed by winter (18%), summer (17%), and fall (15%).

Sheering and combing was the least-reported production activity, accounting for only 3% of all production activity responses. Of these, sheering and combing was most frequently reported in the spring (48% of sheering responses) and fall (24%).

Milking goats was reported as a production activity throughout the year; however, herds were more likely to be milked in the spring (33% of milking responses) and summer (31%), than in the winter (19%) or fall (18%). Eighteen percent of all production responses were for milking activities.

Marketing activity categories were listed as: "animals were purchased (for breeding, replacement, etc.) for the operation," "animals were involved in showing exhibition or 4-H activities," and "animals were sold from the operation." Seasonal frequencies for marketing activities are illustrated in Figure G5.

Producers reported purchasing goats more frequently during the summer (36% of purchase responses) and fall (30%). However, purchases were also recorded in the spring (22%) and winter (12%). The majority of responses (54%) for showing and exhibiting goats placed these activities during summer months followed by spring (24%), fall (13%), and winter (9%). Selling goats from the operation was the most frequently reported marketing activity, accounting for 63% of all marketing activity responses. Goats were sold throughout the year, most frequently in the fall (32% of sold responses), followed by summer (27%), spring (26%), and winter (15%).

Table G10. For each season over the past year, what production and marketing activities was your goat herd involved in? (All seasons that apply for each activity, if relevant.)

January 1 through December 31, 2014	Winter (Jan-Mar)			Spring (Apr-June)			Summer (July-Sept)			Fall (Oct-Dec)				
	Freq.	% w/in winter	*% w/in activity*	Freq.	% w/in spring	*% w/in activity*	Freq.	% w/in summer	*% w/in activity*	Freq.	% w/in fall	*% w/in activity*	*Total responses within activity*	
What production activities were your goats involved in?														
Breeding	31	20.0%	*18.5%*	19	7.8%	*11.3%*	32	28.6%	*19.0%*	86	55.1%	*51.2%*	*168*	*100%*
Kidding	67	43.2%	*37.4%*	86	35.1%	*48.0%*	10	8.9%	*5.6%*	16	10.3%	*8.9%*	*179*	*100%*
Castrating, vaccinating, de-worming, I.D.	32	20.6%	*17.6%*	91	37.1%	*50.0%*	31	27.7%	*17.0%*	28	17.9%	*15.4%*	*182*	*100%*
Shearing/combing	3	1.9%	*14.3%*	10	4.1%	*47.6%*	3	2.7%	*14.3%*	5	3.2%	*23.8%*	*21*	*100%*
Milking	22	14.2%	*18.6%*	39	15.9%	*33.1%*	36	32.1%	*30.5%*	21	13.5%	*17.8%*	*118*	*100%*
Total responses within season	155	100%		245	100%		112	100%		156	100%		**Production activities: 668**	**Total obs.**
What marketing activities were your goats involved in?														
Animals were purchased (for breeding, replacement, etc.)	9	20.0%	*12.3%*	16	19.0%	*21.9%*	26	23.4%	*35.6%*	22	22.4%	*30.1%*	*73*	*100%*
Animals were involved in showing, exhibition, or 4-H	5	11.1%	*9.3%*	13	15.5%	*24.1%*	29	26.1%	*53.7%*	7	7.1%	*13.0%*	*54*	*100%*
Animals were sold from the operation	31	68.9%	*14.7%*	55	65.5%	*26.1%*	56	50.5%	*26.5%*	69	70.4%	*32.7%*	*211*	*100%*
Total responses within season	45	100%		84	100%		111	100%		98	100%		**Marketing activities: 338**	**Total obs.**

Freq. is the frequency of responses indicated for each category.

% w/in season / winter / summer / spring / fall is the percent of responses indicating production activity within each seasonal category. For example, reading down the first two columns, 20.0% of 155 responses for winter goat herd activities indicated breeding.

% w/in activity is the percent of responses indicating a season within each activity category. For example, reading across the first row, 18.5% of 168 responses for breeding activities indicated breeding occurred during winter months.

Total obs. is the total responses observed for all production activity categories and all marketing activity categories.

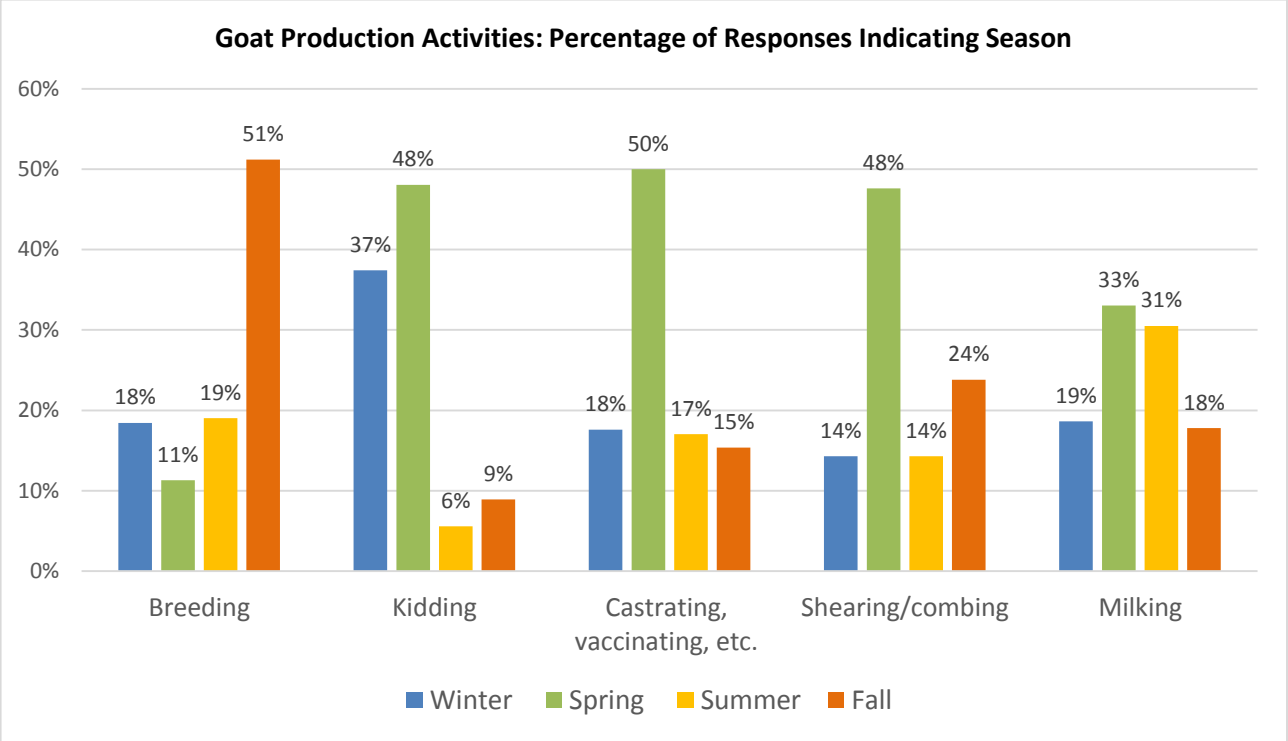


Figure G4. Seasonal goat production activities.

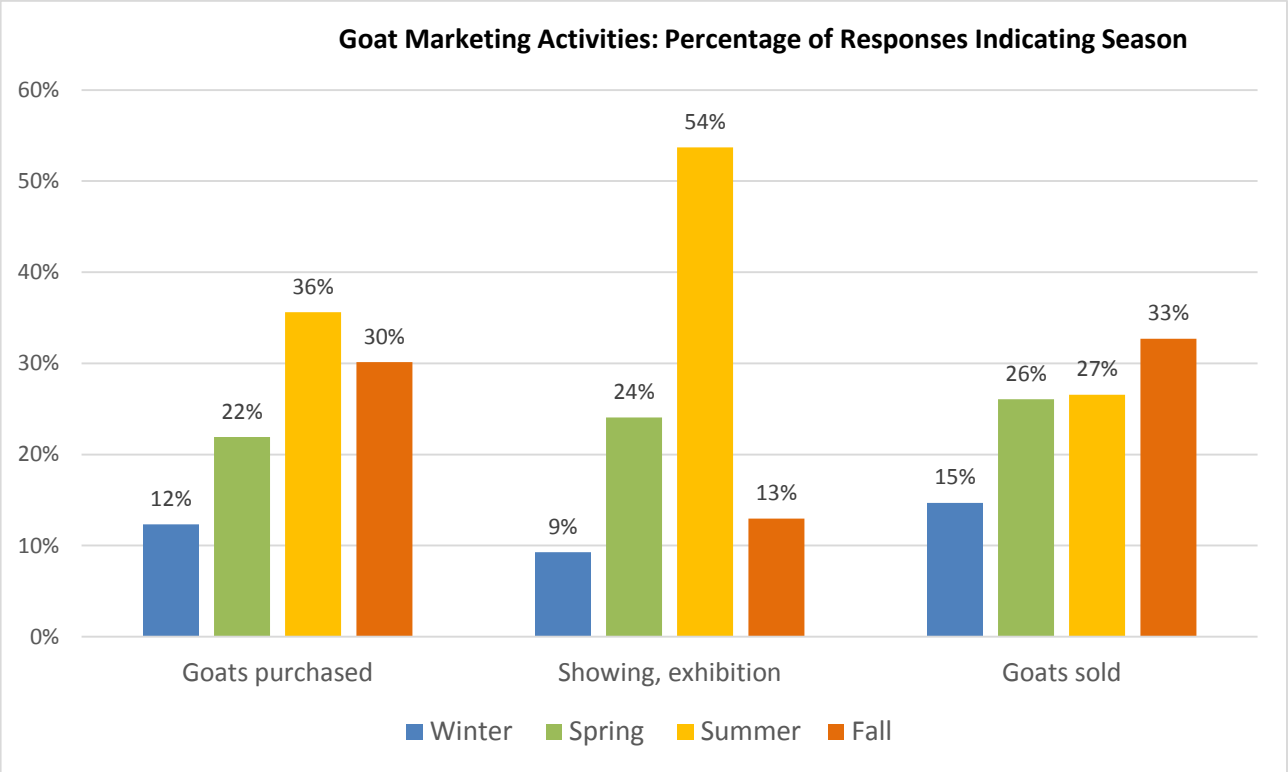


Figure G5. Seasonal goat marketing activities.

Goat Commodity Sales Pricing Methods

Two questions asked responders to provide information about pricing methods and bargaining skill in negotiating sales of goat commodities. Respondents were first asked "What pricing methods did your operation use when selling commodities (kids, fiber, dairy, etc.) during the past year?" Out of the nine categories provided, public auction was the most popular pricing method, reported by 37% of responders, followed by contract sales with a privately negotiated price (35%), and direct market sales with a negotiated price (16%). Over half of the responses involved price negotiations (contract sales and direct market sales with a negotiated price sum to 59%). Other pricing methods not listed were indicated by 3% of respondents. Responses are reported in Table G11.

Table G11. What pricing methods did your operation use when selling commodities (kids, fiber, dairy, etc.) during the past year? (Please choose all that apply.)

	Frequency of responses	Percent of responders
Price determined in a public auction	74	37.4%
Contract sale with privately negotiated price	69	34.8%
Contract stipulating a base price or formula price	1	0.5%
Price determined via sealed-bid auction	3	1.5%
Direct market sale with production-cost based price	15	7.6%
Direct market sale with negotiated price	31	15.7%
Other pricing method	5	2.5%
Total responses	198	(n=169)

When asked to indicate all pricing methods used to sell goat outputs over the previous year, goat survey responders reported using up to four different methods. Not surprisingly, the largest group (48%) indicated one method, while just over a third (37%) indicated that they had used two or more pricing methods for goat commodity sales in the past year (Table G12).

Table G12. Total number of pricing methods indicated.

	Frequency	Percent of responders		Percent of responses
One pricing method	82	48.5%		62.6%
Two pricing methods	34	20.1%		26.0%
Three pricing methods	12	7.1%	37.4%	9.2%
Four pricing methods	3	1.8%		2.3%
				100%
Zero (no response)	38	29.0%		(n=131)
Total	169	100%		

After indicating the pricing method(s) used over the past year in marketing commodities from their goat operation, producers were asked to indicate their level of agreement or disagreement with the statement, "When negotiating sales during the past year, my bargaining skills resulted in the best price for my production." Forty percent of survey responders either strongly agreed or agreed that their

bargaining skills had resulted in the best price for their production over the past year; 8% either disagreed or strongly disagreed that their skill resulted in the best price. Twenty-seven percent of responders neither agreed nor disagreed with the statement. Results are reported in Table G13 and illustrated in Figure G6.

Table G13. Please indicate your level of agreement or disagreement with the following statement: When negotiating sales during the past year, my bargaining skills resulted in the best price for my production.

	Frequency	Percent of responders		Percent of responses
Strongly agree (1)	25	14.8%	39.6%	19.7%
Agree (2)	42	24.9%		33.1%
Neither agree nor disagree (3)	46	27.2%		36.2%
Disagree (4)	6	3.6%	8.3%	4.7%
Strongly disagree (5)	8	4.7%		6.3%
				100%
More than one response	1	0.6%		(n=127)
No response	41	24.3%		
Total	169	100%		

Likert Scale Statistics	
n (total responses)	128
Mean response	2.45
Standard deviation	1.06

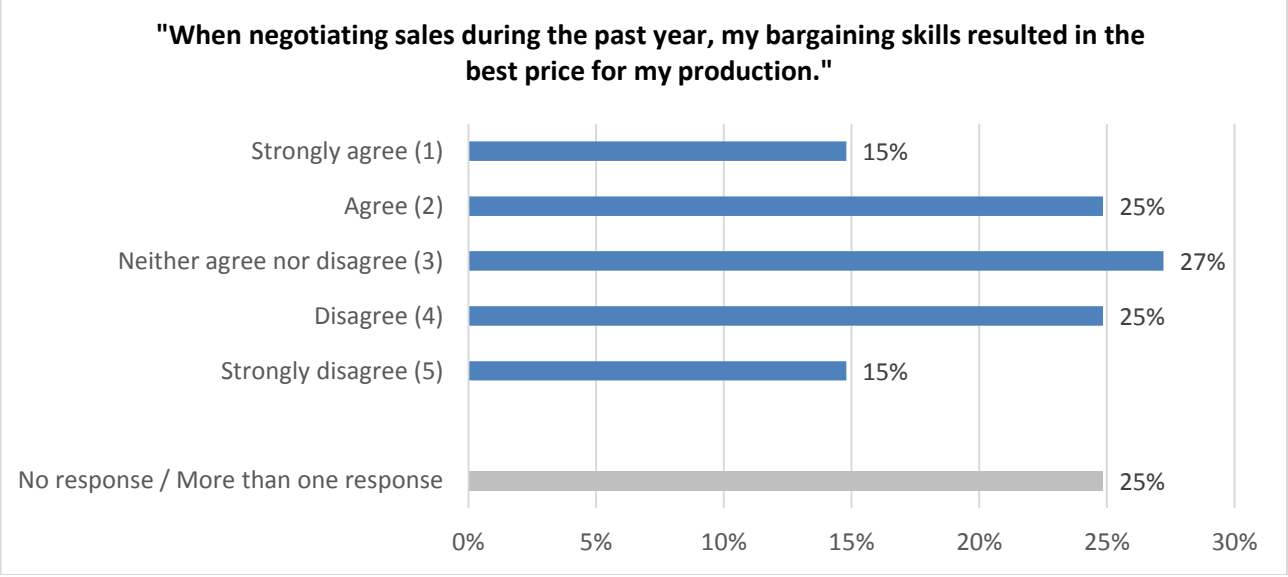


Figure G6. Level of agreement or disagreement regarding bargaining skills statement.

Section 3: Transportation

A series of questions regarding animal transport began by asking respondents, "Were goats (adults or kids) moved (trucked or herded) off your home farm or ranch for any reason between January 1 and December 31, 2014?" Forty-eight percent of survey respondents indicated "yes," goats had been moved off the home farm or ranch; 33% indicated "no," and 20% did not respond (Table G14).

Table G14. Were goats (adults or kids) moved (trucked or herded) off your home farm/ranch for any reason between January 1 and December 31, 2014?

	Frequency	Percent of responders	Percent of responses
Yes	81	47.9%	59.6%
No	55	32.5%	40.4%
			100%
No response	33	19.5%	(n=136)
Total	169	100%	

Goat Movements

Details regarding goat movements related to production and marketing activities were solicited from goat producers. A movement was defined in the instructions as "a group of goats moving from one location to another (trucked or herded), regardless of the number of truckloads or the number of bands of goats." For each listed activity, respondents were asked to report the typical number of goats (adults and kids) moved during that activity and then choose a relevant distance category, reporting the number of times this type of movement occurred in 2014. Two example movements were provided.

One-hundred and forty two valid responses were recorded for the "Typical Number of Goats in this Type of Movement" for all movement categories, with 881 individual responses reporting the number of times a type of movement occurred within particular distance categories. In several instances, responses to this lengthy question appeared to be mistaken or did not make sense within the intended context. The reported data have therefore been cleaned using the following criteria:

Responses listing a distance traveled without a corresponding number of goats were eliminated from the analysis.

If the number of goats reported was equal to the number of movements for a distance category (e.g., if 27 goats were listed as moving 27 times) the number of movements was changed to 1.

Individual responses were also evaluated and adjusted if they were not consistent with the instructions given for this question. For example, in some instances the sum of the number of movements listed across distance categories was equal to the typical number of animals. In other instances, the number of movements listed was equal to the number of miles in that distance category. These responses were changed on a case-by-case basis.

Responses to this question, cleaned using these criteria, are reported in Table G15.

For the typical number of goats in each type of movement, measures of skewness and kurtosis are provided to describe the distribution of responses. In general, responses were skewed to the right, with a peak indicating that a majority of shipments are smaller sizes, yet skewed by a few relatively large shipments. This was true to a varying degree for all activities listed. A more detailed description of the distribution of these responses for each movement category are provided in Appendix B.

Production activities listed in the movement question included moving goats to and between pasture and range locations, moving goats for weed control, and other production activities not listed. The first production-related movement was listed as "Goats were moved between the home farm/ranch to pasture/range." The mean size of a typical group moved from home to a grazing location away from home was 69 goats. The majority of these movements (81%) were less than 25 miles. Movements from the home farm or ranch to grazing areas accounted for 3% of the total number of production and marketing activity movements reported.

Movements of goats between pasture and range locations away from the home farm or ranch tended to be smaller and less variable that those between home and grazing areas, with a mean shipment size of 39 goats. As with shipments from home to grazing areas, the majority of movements between grazing areas (80%) were less than 25 miles. Only 2% of the total number of movements reported were between grazing locations away from the home farm or ranch. The typical number of goats moved between locations for weed control is not reportable due to disclosure requirements. The majority (56%) of these movements were less than 25 miles; 13% were reported in each of the distance categories up to 249 miles, and 6% were reported as 250 or more miles. Movements related to weed control accounted for 3% of all movements reported.

Goats moved for "Production activities not listed above (for example, movements to breeding or birthing locations)" had a mean typical group size of 37 goats. Common distances traveled for individual movements were short with 65% traveling 25 to 49 miles and 32% less than 25 miles. Other production activities accounted for 13% of all reported movements.

Marketing activities listed in the movement question included moving goats to feedlots, processors, consumers, and auctions as well as movements related to breeding, showing, and other marketing activities not included in the categories provided. When shipping goats to a feedlot, backgrounder, or dealer, typical group sizes listed had a mean of 44 goats per shipment. Long distances traveled were common with 41% of reported movements occurring over 250 miles or more; however, 29% reported

traveling 25 to 49 miles and 18% reported traveling less than 25 miles. Movements to a feedlot, backgrounder, or dealer accounted for 3% of all movements listed.

Typical group size for movements to a USDA-inspected processor is not reportable due to disclosure requirements. Distances traveled for this category varied with 67% of reported distances 50 to 149 miles and 17% in categories for less than 25 miles and more than 250 miles traveled. One percent of movements reported were to a USDA-inspected processor. A typical number of goats shipped to an auction facility or sale barn had a mean of 60 goats. Distances traveled to auction were variable: 66% of movements were reported as 150 to 249 miles and 23% less than 25 miles. “Goats were moved to a livestock auction barn or facility” was the most common category, accounting for over half, 58%, of all movements reported.

The mean number of goats in a typical movement to another breeding herd was 9. Distances traveled varied with 47% reported as 50 to 149 miles, 20% less than 25 miles, and 20% 150 to 249 miles. Three percent of movement reports were for goats moved to another breeding herd.

Goats moved directly to a consumer or restaurant had typical group sizes with a mean of 23 goats. Distances traveled for goats delivered directly to a consumer varied with the most common categories 50 to 149 miles (50%) This category accounted for 1% of all movements reported.

Shipment size for goats to state-inspected slaughter or butcher facilities is not reportable due to disclosure requirements. Distances traveled for state-inspected slaughter varied with most reported to be 50 to 149 miles (44%) and 25 to 49 miles or 150 to 249 miles (22% each). Movements to state-inspected processors accounted for 2% of those reported.

Typical group sizes for goats moved for showing, exhibition, or 4-H were small with a mean of 13 animals. Distances traveled tended to be short but varied, with 49% reported traveling less than 25 miles, 18% 250 or more miles, 15% 50 to 149 miles,10% 150 to 249 miles, and 8% 25 to 49 miles. Goats moved for showing, exhibition, or 4-H was the second-most common marketing related movement reported, accounting for 11% of all movements reported.

Typical number of goats moved for marketing activities not listed is not reportable due to disclosure requirements. Distances traveled were reported as mainly 25 to 49 miles (71%) and either less than 25 miles or 250 miles or more (14% each). Marketing activities other than those listed accounted for 1% of total movements reported.

Table G15. For each production and marketing activity below, please write the typical number of animals moved during that activity. Then, under the relevant distance category, list the number of times this type of movement occurred in 2014.

	n (valid responses) % of total	Typical Number of Goats in This Type of Movement				Distance Traveled for Each Movement (miles)					Total % w/in category	Total number of movements % of total
						>25	25-49	50-149	150-249	250+		
		Mean	St. Dev.	Skewness	Kurtosis	Count of all movements reported % of total within movement category						
How many goats (adults + kids) were moved for the following production activities? And over which distance?												
Goats were moved from the home farm/ranch to pasture/range	13 8.0%	68.5	98.2	2.46	5.91	13 81.3%	3 18.8%				100%	16 2.7%
Goats were moved between pasture/range locations away from the home farm/ranch	7 4.3%	38.7	33.4	1.35	0.67	8 80.0%		2 20.0%			100%	10 1.7%
Goats were moved to or between locations for weed control [3]	13 8.0%	--	--	--	--	9 56.3%	2 12.5%	2 12.5%	2 12.5%	1 6.3%	100%	16 2.7%
Goats were moved for production activities not listed above	10 6.2%	36.5	49.2	1.83	2.58	25 31.6%	51 64.6%	1 1.3%	1 1.3%	1 1.3%	100%	79 13.2%

Table G15. (continued)

	n (valid responses) % of total	Typical # of Goats in This Type of Movement: Mean	St. Dev.	Skewness	Kurtosis	Distance Traveled for Each Movement (miles): >25	25-49	50-149	150-249	250+	Total % w/in category	Total 3 of movements % of total
						Count of all movements reported % of total within movement category						
How many goats (adults + kids) were moved for the following marketing activities? And over which distance?												
Goats were moved to a feedlot, backgrounder, or dealer	13 8.0%	43.9	54.5	2.27	5.65	3 17.6%	5 29.4%		2 11.8%	7 41.2%	100%	17 2.8%
Goats were moved to a USDA-inspected processor[3]	3 1.9%	--	--	--	--	1 16.7%		4 66.7%		1 16.7%	100%	6 1.0%
Goats were moved to a livestock auction barn/facility	48 29.6%	60.4	199.7	6.70	45.77	80 22.9%	17 4.9%	14 4.0%	230 65.9%	8 2.3%	100%	349 58.3%
Goats were moved to another breeding herd	13 8.0%	9.1	8.1	0.54	-1.36	7 46.7%	3 20.0%	3 20.0%	1 6.7%	1 6.7%	100%	15 2.5%
Goats were moved directly to a consumer or restaurant	6 3.7%	23.2	17.2	0.38	-0.03	2 25.0%	1 12.5%	4 50.0%	1 12.5%		100%	8 1.3%
Goats were moved to a state-inspected slaughter/butcher facility [3]	7 4.3%	--	--	--	--	1 11.1%	2 22.2%	4 44.4%		2 22.2%	100%	9 1.5%
Goats were moved for showing, exhibition, or 4-H	23 14.2%	12.6	10.1	1.58	3.48	33 49.3%	5 7.5%	10 14.9%	7 10.4%	12 17.9%	100%	67 11.2%
Goats were moved for marketing activities not listed above [3]	6 3.7%	--	--	--	--	1 14.3%	5 71.4%			1 14.3%	100%	7 1.2%
Total valid responses for typical number of goats	162 100%										Total number of movements	599 100%

Note: Movements are listed only if a typical number of sheep in the type of movement was also indicated. Data were further cleaned to eliminate nonsensical responses.

[1] Skewness indicates asymmetry of a distribution around the mean. A positive measure of skewness indicates an asymmetric tail toward positive numbers.

[2] Kurtosis indicates the relative peaked versus flat shape of a distribution. A positive measure of kurtosis indicates a relatively peaked distribution.

[3] Category does not meet disclosure requirements; typical group size statistics are not reported.

Goat producers responding that they had moved goats to a processing facility were asked whether it was kosher or halal certified. Results are reported in Table G16. Three responders indicated that they moved goats to a USDA-inspected processor, however, five responded to this question. Of these, one indicated that the facility was kosher/halal certified, one that it was not, and three did not know. Seven responders indicated that they moved goats to a state-inspected slaughter or butcher facility and nine responded to this question. Of these, three indicated that the facility was kosher/halal certified, one that it was not, and five did not know.

Table G16. Were processors receiving goats from your operation kosher/halal certified?

	Frequency	Percent of responders	Percent of responses
If you moved goats to a USDA-inspected processor was it kosher/halal certified?			
Yes	1	0.6%	20.0%
No	1	0.6%	20.0%
Don't Know	3	1.8%	60.0%
			100%
No response	164	97.0%	(n=5)
Total	169	100%	
If you moved goats to a state-inspected slaughter/butcher facility was it kosher/halal certified?			
Yes	3	1.8%	33.3%
No	1	0.6%	11.1%
Don't Know	5	3.0%	55.6%
			100%
No response	160	94.7%	(n=9)
Total	169	100%	

Section 4: Management Practices

Questions regarding management practices asked goat producers to report detailed information regarding the types of people or groups visiting and coming in physical contact with their goats as well as which types of animals external to their operation were in contact or proximity to their goat herds. Each question covered the time period of January 1 through December 31, 2014.

Visitor Contacts

A list of 16 visitor types was provided and responders were asked to relate the number of times during 2014 each of these types of people or groups visited the location of their goats. For visitor categories that respondents indicated, respondents were further asked to report on whether each type of visit typically resulted in physical contact with their goats by indicating either "yes" or "no." Results are reported in Table G17. A more detailed description of the distribution of these responses for each visitor category are provided in Appendix B.

The most common visitor types reported were veterinarians (19% of responses), other livestock producers (18%), other visitors (13%), and agricultural tours (10%). The average number of visits reported for each category was highest for the milk truck with a mean of 51 visits in 2014. Other relatively frequent visitor categories indicated included agricultural tours and "other visitors" (each with a mean of 12 annual visits), and feed haulers and other livestock producers (each with means of 8 visits).

Several categories reported relatively high rates of visits resulting in physical contact with goats, including veterinarians (24% of responses to this category indicated "yes"), agricultural tours (13% "yes"), livestock haulers (10% "yes"), other visitors (10% Yes), shearers and hoof trimmers (8% "yes"), and feed haulers (5% "yes" to "typically result in physical contact").

Table G17. How many times in the past year (January 1 and December 31, 2014) did each of the following people or groups visit the location of your goats? Did these visits typically result in physical contact with your goats?

	Number of Visits in 2014						Typically result in physical contact?				
							Yes	No	More than one response	No response	Total
	Number of responses % of total	Mean	Median	St. Dev	Min.	Max.	n % of total	n % of total	n % of total	n % of total	Number of responses % of total
Veterinarians or other animal health professionals	43 19.1%	2.6	2.0	2.5	1	12	40 23.7%	35 20.7%	1 0.6%	93 55.0%	169 100%
Artificial insemination technicians	3 1.3%	1.7	1.0	1.2	1	3	3 1.8%	40 23.7%	0 0.0%	126 74.6%	169 100%
Milk truck	2 0.9%	51.5	51.5	68.6	3	100	0 0.0%	41 24.3%	0 0.0%	128 75.7%	169 100%
Wool haulers	1 0.4%	1.0	1.0		1	1	3 1.8%	35 20.7%	0 0.0%	131 77.5%	169 100%
Livestock haulers	19 8.4%	2.2	1.0	2.2	1	10	17 10.1%	35 20.7%	0 0.0%	117 69.2%	169 100%
Manure haulers	10 4.4%	3.4	2.5	2.8	1	10	4 2.4%	43 25.4%	0 0.0%	122 72.2%	169 100%
Mobile slaughter teams	4 1.8%	1.5	1.5	0.6	1	2	2 1.2%	39 23.1%	0 0.0%	128 75.7%	169 100%
Renderers	0 0.0%						0 0.0%	38 22.5%	0 0.0%	131 77.5%	169 100%
Shearers or hoof trimmers	18 8.0%	1.9	1.0	2.6	1	12	14 8.3%	36 21.3%	0 0.0%	119 70.4%	169 100%
Video auction representatives (videotaping, sale arrangements)	1 0.4%	1.0	1.0		1	1	1 0.6%	38 22.5%	0 0.0%	130 76.9%	169 100%
Agricultural tours (school groups, university classes, demonstrations, etc.)	23 10.2%	11.7	2.0	31.3	1	150	22 13.0%	33 19.5%	0 0.0%	114 67.5%	169 100%
Extension agents (not counting tours listed above)	3 1.3%	1.0	1.0	0.0	1	1	0 0.0%	0 0.0%	0 0.0%	169 100%	169 100%

Table G17. (Continued.)

Nutritionists or feed company consultants	1 0.4%	1.0	1.0		1	1		1 0.6%	36 21.3%	0 0.0%	132 78.1%	169 100%
Feed (hay or grain) haulers	27 12.0%	8.0	3.0	14.3	1	60		9 5.3%	53 31.4%	0 0.0%	107 63.3%	169 100%
Other livestock producers	41 18.2%	8.1	4.0	11.6	1	50		0 0.0%	0 0.0%	0 0.0%	169 100%	169 100%
Other visitors (for example, package delivery or utility company personnel)	29 12.9%	11.5	10.0	10.5	1	50		16 9.5%	44 26.0%	0 0.0%	109 64.5%	169 100%
Total	**225** **100%**							132 4.9%	546 20.2%	1 0.0%	2025 74.9%	**2704** **100%**

Animal Contacts and Proximity

A final question asked goat producers about types of animals that were not part of their agricultural operation which came in contact or were in proximity to their goats between January 1 and December 31, 2014. Respondents were further asked to estimate roughly how often contact or proximity occurred. Examples were given to define "contact" and "proximity," as follows: "Examples of 'contact' include nose-to-nose contact, sharing a pasture or pen, or comingling of herds on open range"; "Examples of 'proximity' include fence-line proximity, or animals/herds within sight of each other on pasture or range (but not comingling)." Categories to indicate the frequency per year were provided: responders could choose from "never," "1-7 days," "8+ days," or "don't know." Results to this question are reported in Table G18.

When reporting on which types of animals came into contact with their goats, "never" accounted for about half of the responses for most categories; exceptions were for dairy cattle (6% "never"), and wild antelope, deer, elk, or moose (with 39% of responses indicating "never"). Combining categories for "1-7 days" and "8+ days," goat herds were most likely to be reported coming into contact with outside domestic goats or sheep (14% of responses to this category); beef cattle (8% of category responses); and wild antelope, deer, elk, or moose (also 8%). The majority of these total contact measures for each category were reported as "contact on 8+ days." Responders were most likely to answer that they did not know about contact with their goats with dairy cattle (51% of responses for this category) and wild antelope, elk, or moose (14% of category responses).

A quarter to a third of respondents indicated that their goats were "never" in proximity to nearly all of the animal types listed. "Never" was less commonly reported for proximity of wild antelope, deer, elk, and moose with 15% of category responses. Combining categories for "1-7 days" and "8+ days," goat herds were most likely to be reported in proximity with beef cattle (18% of category responses), wild antelope, deer, elk, or moose (17%), and domestic goats or sheep (10% of responses to this category). As with contact, proximity frequencies were mostly assigned to "8+ days." Responders were most likely to answer that they did not know about proximity with their goats for wild antelope, deer, elk and moose (12%); all other categories had 3% or fewer responses in the "don't know" column.

Table G18. Which of the following types of animals—not part of your operation—were in contact or proximity with your goats between January 1 and December 31, 2014? And roughly how often?

	Contact with Goats (frequency, %)						Proximity to Goats (frequency, %)						
	Never	Contact on 1-7 Days	Contact on 8+ Days	Don't Know	No response	Total	Never	1-7 Days of Proximity	8+ Days of Proximity	Don't Know	More than one response	No response	Total
Domestic goats or sheep	72	6	17	2	72	169	40	5	12	4		108	169
	42.6%	3.6%	10.1%	1.2%	42.6%	100%	23.7%	3.0%	7.1%	2.4%	0.0%	63.9%	100%
Beef cattle	76	4	10	4	75	169	33	4	27	5		100	169
	45.0%	2.4%	5.9%	2.4%	44.4%	100%	19.5%	2.4%	16.0%	3.0%	0.0%	59.2%	100%
Dairy cattle	1	2	2	87	77	169	49		4	1		115	169
	0.6%	1.2%	1.2%	51.5%	45.6%	100%	29.0%	0.0%	2.4%	0.6%	0.0%	68.0%	100%
Domestic pigs	85		4	1	79	169	50		7	1		111	169
	50.3%	0.0%	2.4%	0.6%	46.7%	100%	29.6%	0.0%	4.1%	0.6%	0.0%	65.7%	100%
Farmed bison or beefalo	90			2	77	169	53			2		114	169
	53.3%	0.0%	0.0%	1.2%	45.6%	100%	31.4%	0.0%	0.0%	1.2%	0.0%	67.5%	100%
Farmed deer or elk	90			1	78	169	54			1		114	169
	53.3%	0.0%	0.0%	0.6%	46.2%	100%	32.0%	0.0%	0.0%	0.6%	0.0%	67.5%	100%
Wild bison	91			1	77	169	52			1		116	169
	53.8%	0.0%	0.0%	0.6%	45.6%	100%	30.8%	0.0%	0.0%	0.6%	0.0%	68.6%	100%
Wild antelope, deer, elk, or moose	66	1	13	24	65	169	26	1	27	21	1	93	169
	39.1%	0.6%	7.7%	14.2%	38.5%	100%	15.4%	0.6%	16.0%	12.4%	0.6%	55.0%	100%
Feral goats, bighorn sheep, or mountain goats	90	1		1	77	169	53			3		113	169
	53.3%	0.6%	0.0%	0.6%	45.6%	100%	31.4%	0.0%	0.0%	1.8%	0.0%	66.9%	100%
Feral swine	91	1		1	76	169	54	1		1		113	169
	53.8%	0.6%	0.0%	0.6%	45.0%	100%	32.0%	0.6%	0.0%	0.6%	0.0%	66.9%	100%

Goat Survey: Summary of Results

Operation Characteristics

Responders were asked to describe their goat operation characteristics, including whether they were currently involved in goat production, other types of livestock currently on their home farm or ranch, and in which state their goats spend the majority of their time. This section also included questions about current and peak herd size.

Eighty percent of respondents indicated that they were currently involved in goat production at the time they filled out the questionnaire. In addition to goats, the most common types of other livestock listed as currently on the home farm or ranch were the most common types of livestock listed were horses, poultry, beef cattle, and sheep. A majority of respondents reported at least one other type of livestock on their home farm or ranch. The number of additional types of livestock listed ranged from zero to seven types with a mean of 1.7. The reported location of goat herds within the intermountain region was dispersed between each of the four listed states. When asked how many goats were on their farm or ranch "as of today," half of respondents indicated 25 to 99 adult goats plus kids. Sixteen percent indicated 1 to 24 and 15% 100 or more goats. Results for peak herd size at any one time during 2014 were similar.

Production and Marketing

Questions posed to goat producers relating to their production and marketing activities included descriptions of their operation purpose and primary source of profits, and the seasonal location of animals during production and marketing activities throughout 2014. Two additional questions asked producers about pricing methods used when selling goat operation outputs along with an assessment of their bargaining skills when negotiating sales prices.

A majority of respondents listed meat production as a goat operation purpose. Other common operation purposes included raising goats for seed or breeding stock; weed control; dairy; and show, exhibition, or 4-H. Multiple goat operation purposes were the norm with over half indicating more between two and six purposes for their goat operation. Although goat producers reported a range of operation purposes, meat production dominated as a primary profit source. In order of importance, other primary profit sources included dairy; goats sold for show, exhibition, or 4-H; and fiber sales.

Reported goat herd locations did vary seasonally; however, the majority of herds remained on the home farm or ranch throughout the year. Goat herds were more likely to be located away from the

home farm or ranch in the summer and least likely to be away in the winter. Not surprisingly, survey respondents indicated the highest percentage of goats grazing on pasture or range as opposed to being penned and fed during summer months.

Seasonally, breeding was reported mainly in the fall and in lower frequencies in other seasons. Kidding followed reported breeding times, reported most frequently in the spring and winter. Herd management tasks including castrating, vaccinating, de-worming, and identifying goats (by tagging, painting, or branding) were most likely to be reported during summer months; sheering and combing was the least-reported production activity, accounting for only 3% of all production activity responses. Milking goats was reported as a production activity throughout the year, however, herds were more likely to be milked in the spring and summer. Producers reported purchasing goats more often during summer months; however, purchases were recorded in all seasons. The majority of responses for showing and exhibiting goats indicated these activities occurred most often during the summer. Selling goats from the operation was the most frequently reported marketing activity. Goats were sold throughout the year, most frequently in the fall.

When asked about negotiating sales of goat commodities, public auction was the most popular pricing method reported, followed by contract sales with a privately negotiated price and direct market sales with a negotiated price. Over half of the responses indicating sales pricing methods for goat commodities involved price negotiations (either in contract sales or direct market sales with a negotiated price). A majority of respondents indicated using only one method, while just over a third reported that they had used two or more pricing methods for sales in the past year. Over a third of responders either strongly agreed or agreed that their bargaining skills had resulted in the best price for their production over the past year.

Transportation

Details regarding goat movements related to production and marketing activities were solicited. A movement was defined as "a group of goats moving from one location to another (trucked or herded), regardless of the number of truckloads or the number of bands of goats." For each listed activity respondents were asked to report the typical number of goats (adults and kids) moved during that activity and then choose a relevant distance category, reporting the number of times this type of movement occurred in 2014.

Half of all movements reported were for moving goats to a livestock auction barn or facility. The most common production-related movement indicated was moving goats for unlisted production activities. Movements reported involving the largest typical number of goats were to locations for weed control, with mean group sizes of 659 animals. The most common marketing movement reported, to a livestock auction facility, had typical groups with a mean of 60 goats. All group sizes were somewhat skewed by a few relatively large groups reported.

Management Practices

Questions regarding management practices asked goat producers to report detailed information about the types of people or groups visiting their goats and whether these visits resulted in physical contact. Respondents were also asked about which types of outside livestock and wildlife were observed having contact or proximity to their goats.

The most common visitor types reported were veterinarians, other livestock producers, other visitor types not listed, and agricultural tours. The average number of visits reported for each category was highest for the milk truck with a mean of 51 visits in 2014. Other relatively frequent visitor categories included agricultural tours and feed haulers. Goat herds were most likely to be reported coming into some contact or observed proximity with outside domestic goats or sheep; beef cattle; and wild antelope, deer, elk, or moose.

References

Bajardi, P., A. Harrat, F. Natale, L. Savini, and V. Colizza. 2011. "Dynamical patterns of cattle trade movements." *PLoS one* 6(5):e19869.

Bates, T.W., M.C. Thurmond, and T.E. Carpenter. July 2001. "Direct and indirect contact rates among beef, dairy, goat, sheep, and swine herds in three California counties, with reference to control of potential foot-and-mouth disease transmission." *American Journal of Veterinary Research* 62(7):1121-1129.

Dubé, C., C. Ribble, D. Kelton, and B. McNab. 2009. "A review of network analysis terminology and its application to foot-and-mouth disease modelling and policy development." *Transboundary and Emerging Diseases* 56:73–85.

eXtension. 2013. Goat reproduction gestation. http://articles.extension.org/pages/19316/goat-reproduction-gestation

Lindström, T., S.A. Sisson, S.S. Lewerin, and U. Wennergrena. 2009. "Estimating animal movement contacts between holdings of different production types." *Preventative Veterinary Medicine* 95:23-31.

Lindström, T., S.A. Sisson, S.S. Lewerin, and U. Wennergrena. 2011. "Bayesian analysis of animal movements related to factors at herd and between herd levels: Implications for disease spread modeling." *Preventative Veterinary Medicine* 98:230-242.

Marshall E.S., T.E. Carpenter, and C. Thunes. 2009. "Results of a survey to estimate cattle movements and contact rates among beef herds in California, with reference to the potential spread and control of foot-and-mouth disease." *Journal of the American Veterinary Medicine Association* 235:573–579.

McReynolds, S.W., M.W. Sanderson, A. Reeves, M. Sinclair, A.E. Hill, and M.D. Salman. May 2014. "Direct and indirect contact rates among livestock operations in Colorado and Kansas." *Journal of the American Veterinary Medical Association* 244(9):1066-1074.

National Institute for Animal Agriculture (NIAA). 2013. "Foot-and-mouth disease – Fostering a new preparedness paradigm: Facilitating a conversation among public and private sector stakeholders. Information synthesized from Foot-and-Mouth Disease Symposium in Louisville, KY, April 17-18, 2013.

National Research Council (NRC). 2008. *Changes in the Sheep Industry in the United States: Making the Transition from Tradition*. Washington, DC: National Academies Press.

Paalberg, P.L., A.H. Seitziner, A., J.G. Lee, and K. Mathews. 2008. "Economic Impacts of Foreign Animal Disease." USDA ERS Economic Research Report No. (ERR-57).

Schoenian, S. 2012. Sheep 210: A beginner's guide to raising sheep. Reproduction in the ewe. http://www.sheep101.info/201/ewerepro.html

The Center for Food Security and Public Health (CFSPH). April 2014. Foot and Mouth Disease Factsheet. Iowa State University, Ames IA.

United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS). 2010. Goat 2009 Part I: Reference of Goat Management Practices in the US, 2009.

United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS). 2012. Sheep 2011 Part I: Reference of Sheep Management Practices in the US, 2011.

United States Department of Agriculture National Agricultural Statistics Service (USDA NASS). 2016. Sheep and Goats. http://usda.mannlib.cornell.edu/usda/current/SheeGoat/SheeGoat-01-29-2016.pdf

United States Department of Agriculture National Agricultural Statistics Service (USDA NASS). 2007. 2007 Census of Agriculture Sheep and Goat Farming.

Volkova, V.V., R.H., N.J. Savill, M.E.J. Woolhouse. 2010. "Sheep Movement Networks and the Transmission of Infectious Diseases." *PLoS one* 5(6):e11185

APPENDIX A: Protocol, Questionnaires, and Survey Correspondence

UW Institutional Review Board Approval

UNIVERSITY
OF WYOMING

Vice President for Research & Economic Development
1000 E. University Avenue, Department 3355 • Room 305/308, Old Main • Laramie, WY 82071
(307) 766-5353 • (307) 766-5320 • fax (307) 766-2608 • www.uwyo.edu/research

December 5, 2014

Dr. Danelle Peck
Associate Professor
Agricultural and Applied Economics
University of Wyoming

Dr. Chris Bastian
Associate Professor
Agricultural and Applied Economics
University of Wyoming

Amy Nagler
Research Assistant
Agricultural and Applied Economics
University of Wyoming

Protocol # 20141205DP00599

Re: IRB Proposal *"Small Ruminant Movement During Production and Marketing Activities in the Intermountain West"*

Dear Drs. Peck and Bastian:

The proposal referenced above (proposal received November 20, 2014) qualifies for exempt review and is approved as one that would not involve more than minimal risk to participants. Our exempt review and approval will be reported to the IRB at their next convened meeting December 18, 2014.

Any significant change(s) in the research/project protocol(s) from what was approved should be submitted to the IRB (Protocol Update Form) for review and approval prior to initiating any change. Per recent policy and compliance requirements, any investigator with an active research protocol may be contacted by the recently convened Data Safety Monitoring Board (DSMB) for periodic review. The DSMB's charge (sections 7.3 and 7.4 of the IRB Policy and Procedures Manual) is to review active human subject(s) projects to assure that the procedures, data management, and protection of human participants follow approved protocols. Further information and the forms referenced above may be accessed at the "Human Subjects" link on the Office of Research and Economic Development website: http://www.uwyo.edu/research/human-subjects/index.html.

You may proceed with the project/research and we wish you luck in the endeavor. Please feel free to call me if you have any questions.

Sincerely,

Colette Kuhfuss
Colette Kuhfuss
IRB Coordinator
On behalf of the Chairman,
Institutional Review Board

Sheep Producer Questionnaire

2014 Intermountain States Sheep Production, Marketing, and Transportation Survey

Conducted by the University of Wyoming Department of Agricultural and Applied Economics in cooperation with the USDA

University of Wyoming
Department of Agricultural and Applied Economics
1000 E. University Ave., Laramie, WY 82071-3354
Dr. Chris Bastian (307) 766-4377 • bastian@uwyo.edu

Thank you for participating in this important research. Information you share will help us understand production, marketing, transportation, and management strategies for sheep producers in four intermountain states.

Participation is entirely voluntary and your responses are completely confidential. You will not be individually identified in our results. After data from the survey have been recorded and verified, this printed survey will be destroyed.

The survey should take 10 to15 minutes to complete.

A postage-paid envelope is included for you to return the survey to us. A summary of our findings will be available to you on the future on the UW Dept. of Ag and Applied Economics website (www.uwyo.edu/agecon).

Instructions

For the purposes of this survey, if you own or manage multiple flocks, "your sheep flock" refers to the group of sheep you spend the most time managing—such as your main breeding flock. The "home farm/ranch" refers to the location where this sheep flock overwinters.

For each question, please fill in the circle next to your choice ○ → ● or write in your response if directed.
To change an answer please erase your pencil mark or cross out the incorrect response ✖ and fill in the correct one ●

Operation Characteristics

Q1. Are you currently involved in sheep production?

- ○ No → *Please place this blank questionnaire in the postage-paid envelope and drop it in the mail at your earliest convenience.*
- ○ Yes *We want to hear from you! Please continue.*

Q2. Which type (or types) of livestock are currently on your home farm/ranch? (Please choose **all that apply**.)

- ○ Sheep
- ○ Goats
- ○ Beef cattle
- ○ Dairy cattle
- ○ Pigs
- ○ Llamas or alpacas
- ○ Farmed deer or elk
- ○ Farmed bison or beefalo
- ○ Horses
- ○ Poultry

Q3. In which state do your sheep spend most (or all) of their time? (Please choose **one** state.)

- ○ Idaho
- ○ Montana
- ○ Utah
- ○ Wyoming
- ○ Other state not listed (Please specify: 0308)

Q4. How many sheep (adults + lambs) are on your home farm/ranch as of today?

- ○ 0 (currently no sheep)
- ○ 1 to 24 sheep as of today
- ○ 25 to 99 sheep as of today
- ○ 100 to 499 sheep as of today
- ○ 500 to 999 sheep as of today
- ○ 1,000 or more sheep as of today

Q5. What was the peak size of your sheep flock (adults + lambs) at any one time between January 1 and December 31, 2014?

- ○ 0 (no sheep in 2014)
- ○ 1 to 24 sheep, peak flock size
- ○ 25 to 99 sheep, peak flock size
- ○ 100 to 499 sheep, peak flock size
- ○ 500 to 999 sheep, peak flock size
- ○ 1,000 or more sheep, peak flock size

Production and Marketing

Q6. Which of the following describes the purpose (or purposes) of your sheep operation? (Please choose **all that apply**.)

- ○ Sheep for meat (lamb) production
- ○ Sheep for fiber (wool) production
- ○ Sheep for dairy (milk, cheese) production
- ○ Sheep for seed or breeding stock
- ○ Sheep for weed control
- ○ Sheep for show, exhibition, or 4-H
- ○ Sheep for pets or companion animals
- ○ Other purpose (Please specify: _____)

Q7. What best describes the **primary** source of profits (market commodity, product, or service) from your sheep operation in 2014? (Please choose only **one**.)

- ○ Meat (lamb) production
- ○ Fiber (wool) production
- ○ Dairy (milk, cheese) production
- ○ Sheep sold for seed or breeding stock
- ○ Sheep sold or contracted for weed control
- ○ Sheep sold for show, exhibition, or 4-H
- ○ Sheep sold or contracted for pets or companion animals
- ○ Other product or service (Please specify:_____)

Q8. For each season over the past year (January 1 through December 31, 2014), where was majority of your sheep flock located? What production and marketing activities were your animals involved in during each season of 2014?

	Winter (Jan-Mar)	Spring (Apr-June)	Summer (July-Sept)	Fall (Oct-Dec)
Where was the majority of your sheep flock located? (Choose **one season** for each location, if relevant.)				
Penned and fed in a drylot/feedlot at the home farm/ranch	○	○	○	○
Grazing on pasture/range at the home farm/ranch	○	○	○	○
Penned and fed in a drylot/feedlot away from the home farm/ranch	○	○	○	○
Grazing on pasture/range away from the home farm/ranch	○	○	○	○
What production activities were your sheep involved in? (Chose **all seasons that apply** for each activity, if relevant.)				
Breeding	○	○	○	○
Lambing	○	○	○	○
Docking, castrating, vaccinating, de-worming, tagging/painting/branding	○	○	○	○
Shearing	○	○	○	○
Milking	○	○	○	○
What marketing activities were your sheep involved in? (Chose **all seasons that apply** for each activity, if relevant.)				
Animals were purchased (for breeding, replacement, etc.) for the operation	○	○	○	○
Animals were involved in showing, exhibition, or 4-H activities	○	○	○	○
Animals were sold from the operation	○	○	○	○

Q9. What pricing methods did your operation use when selling commodities (lambs, wool, etc.) during the past year? (Please choose **all that apply**.)

- ○ Price determined in a public auction
- ○ Contract sale with privately negotiated price
- ○ Contract stipulating a base price or formula price
- ○ Price determined via sealed-bid auction
- ○ Direct market sale with production-cost based price
- ○ Direct market sale with negotiated price
- ○ Other pricing method (Please specify:_____)

Q10. Please indicate your level of agreement or disagreement with the following statement:

When negotiating sales during the past year, my bargaining skills resulted in the best price for my production.

- ○ Strongly agree
- ○ Agree
- ○ Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

Transportation

Q11. Were sheep (adults or lambs) moved (trucked or herded) off your home farm/ranch for any reason between January 1 and December 31, 2014?

- ○ No Please skip to question 13 below.
- ○ Yes Please continue.

Q12. We are interested in any movements of your sheep (adults + lambs) between January 1 and December 31, 2014.

For each production and marketing activity below, please write the typical number of animals moved during that activity. Then, under the relevant distance category, list the number of times this type of movement occurred in 2014.

A movement is defined as a group of sheep moving from one location to another (trucked or herded), regardless of the number of truckloads or the number of bands of sheep.

In example 1 below, 700 sheep were moved once to spring range in a convoy of two trucks; the range was 50 to 149 miles away.

In example 2 below, 10 sheep were moved twice in 2014 to shows, once less than 25 miles and once over 250 miles.

	Typical Number of Sheep in this Type of Movement	Distance Traveled for each Movement				
Examples:		<25 miles	25-49 miles	50-149 miles	150-249 miles	250+ miles
1) Sheep were moved from the home farm/ranch to first spring pasture/range	***700***			***1***		
2) Sheep were moved for showing, exhibition, or 4-H	***10***	***1***				***1***
How many sheep (adults + lambs) were moved for the following production activities? And over which distance?						
Sheep were moved from the home farm/ranch to first spring pasture/range						
Sheep were moved from their final spring pasture/range to first summer pasture/range						
Sheep were moved from their final summer pasture/range to first winter pasture/range						
Sheep were moved from their final summer pasture/range to the home farm/ranch						
Sheep were moved for production activities not listed above (for example, weed control, breeding or birthing locations)						
How many sheep (adults + lambs) were moved for the following marketing activities? And over which distance?						
Sheep were moved to a feedlot, backgrounder, or dealer						
Sheep were moved to a USDA-inspected processor						
Sheep were moved to a livestock auction barn/facility						
Sheep were moved to another breeding flock						
Sheep were moved to a consumer or restaurant						
Sheep were moved to a state-inspected slaughter/butcher facility						
Sheep were moved for showing, exhibition, or 4-H						
Sheep were moved for marketing activities not listed above						

Q13. How is your sheep flock typically transported from the home farm/ranch to first spring pasture/range? (Please choose one.)

○ Sheep are trucked/trailered ○ Sheep are trailed (herded) ○ Not applicable

Q14. How are your sheep typically transported from spring to summer pasture/range? (Please choose one.)

○ Sheep are trucked/trailered ○ Sheep are trailed (herded) ○ Not applicable

Q15. How are your sheep typically transported from summer pasture/range to where they overwinter? (Please choose one.)

○ Sheep are trucked/trailered ○ Sheep are trailed (herded) ○ Not applicable

Management Practices

Q16. How many times in the past year (January 1 and December 31, 2014) did each of the following people or groups visit the location of your sheep? Did these visits typically result in physical contact with your sheep?

Type of Visitor	Number of Visits in 2014	Typically result in physical contact with your sheep?
Veterinarians or other animal health professionals		◯ Yes ◯ No
Artificial insemination technicians		◯ Yes ◯ No
Milk truck		◯ Yes ◯ No
Wool haulers		◯ Yes ◯ No
Livestock haulers		◯ Yes ◯ No
Manure haulers		◯ Yes ◯ No
Mobile slaughter teams		◯ Yes ◯ No
Renderers		◯ Yes ◯ No
Shearers or hoof trimmers		◯ Yes ◯ No
Video auction representatives (videotaping, sale arrangements)		◯ Yes ◯ No
Agricultural tours (school groups, university classes, demonstrations, etc.)		◯ Yes ◯ No
Extension agents (not counting tours listed above)		◯ Yes ◯ No
Nutritionists or feed company consultants		◯ Yes ◯ No
Feed (hay or grain) haulers		◯ Yes ◯ No
Other livestock producers		◯ Yes ◯ No
Other visitors (for example, package delivery or utility company personnel)		◯ Yes ◯ No

Q17. Which of the following types of animals—not part of your operation—were in contact or proximity with your sheep between January 1 and December 31, 2014? And roughly how often?

Examples of "contact" include nose-to-nose contact, sharing a pasture or pen, or comingling of herds on open range.
Examples of "proximity" include fence-line proximity, or animals/herds within sight of each other on pasture or range (but not comingling).

	Contacts with your Sheep in 2014				Proximity to your Sheep in 2014			
Type of Animal (not part of your operation)	Never	Contact on 1-7 Days	Contact on 8+ Days	Don't Know	Never	1-7 Days of Proximity	8+ Days of Proximity	Don't Know
Domestic goats or sheep	◯	◯	◯	◯	◯	◯	◯	◯
Beef cattle	◯	◯	◯	◯	◯	◯	◯	◯
Dairy cattle	◯	◯	◯	◯	◯	◯	◯	◯
Domestic pigs	◯	◯	◯	◯	◯	◯	◯	◯
Farmed bison or beefalo	◯	◯	◯	◯	◯	◯	◯	◯
Farmed deer or elk	◯	◯	◯	◯	◯	◯	◯	◯
Wild bison	◯	◯	◯	◯	◯	◯	◯	◯
Wild antelope, deer, elk, or moose	◯	◯	◯	◯	◯	◯	◯	◯
Feral goats, bighorn sheep, or mountain goats	◯	◯	◯	◯	◯	◯	◯	◯
Feral swine	◯	◯	◯	◯	◯	◯	◯	◯

Goat Producer Questionnaire

2014 Intermountain States Goat Production, Marketing, and Transportation Survey

Conducted by the University of Wyoming Department of Agricultural and Applied Economics in cooperation with the USDA

University of Wyoming
Department of Agricultural and Applied Economics
1000 E. University Ave., Laramie, WY 82071-3354
Dr. Chris Bastian (307) 766-4377 • bastian@uwyo.edu

Thank you for participating in this important research. Information you share will help us understand production, marketing, transportation, and management strategies for goat producers in four intermountain states.

Participation is entirely voluntary and your responses are completely confidential. You will not be individually identified in our results. After data from the survey have been recorded and verified, this printed survey will be destroyed.

The survey should take 10 to15 minutes to complete.

A postage-paid envelope is included for you to return the survey to us. A summary of our findings will be available to you on the future on the UW Dept. of Ag and Applied Economics website (www.uwyo.edu/agecon).

Instructions

For the purposes of this survey, if you own or manage multiple herds, "your goat herd" refers to the group of goats you spend the most time managing—such as your main breeding herd. The "home farm/ranch" refers to the location where this goat herd overwinters.

For each question, please fill in the circle next to your choice ○ → ● or write in your response if directed.

To change an answer please erase your pencil mark or cross out the incorrect response ✖ and fill in the correct one ●

Operation Characteristics

Q1. Are you currently involved in goat production?

- ○ No → *Please place this blank questionnaire in the postage-paid envelope and drop it in the mail at your earliest convenience.*
- ○ Yes *We want to hear from you! Please continue.*

Q2. Which type (or types) of livestock are currently on your home farm/ranch? (Please choose **all that apply**.)

- ○ Goats
- ○ Sheep
- ○ Beef cattle
- ○ Dairy cattle
- ○ Pigs
- ○ Llamas or alpacas
- ○ Farmed deer or elk
- ○ Farmed bison or beefalo
- ○ Horses
- ○ Poultry

Q3. In which state do your goats spend most (or all) of their time? (Please choose **one** state.)

- ○ Idaho
- ○ Montana
- ○ Utah
- ○ Wyoming
- ○ Other state not listed (Please specify: _____)

Q4. How many goats (adults + kids) are on your home farm/ranch as of today?

- ○ 0 (currently no goats)
- ○ 1 to 24 goats as of today
- ○ 25 to 99 goats as of today
- ○ 100 to 499 goats as of today
- ○ 500 to 999 goats as of today
- ○ 1,000 or more goats as of today

Q5. What was the peak size your goat herd (adults + kids) at any one time between January 1 and December 31, 2014?

- ○ 0 (no goats in 2014)
- ○ 1 to 24 goats, peak herd size
- ○ 25 to 99 goats, peak herd size
- ○ 100 to 499 goats, peak herd size
- ○ 500 to 999 goats, peak herd size
- ○ 1,000 or more goats, peak herd size

Production and Marketing

Q6. Which of the following describes the purpose (or purposes) of your goat operation? (Please choose **all that apply**.)

- ○ Goats for meat (kid) production
- ○ Goats for fiber (mohair, cashmere) production
- ○ Goats for dairy (milk, cheese) production
- ○ Goats for seed or breeding stock
- ○ Goats for weed control
- ○ Goats for show, exhibition, or 4-H
- ○ Goats for pack animals, pets, or companion animals
- ○ Other purpose (Please specify:_____)

Q7. What best describes the **primary** source of profits (market commodity, product, or service) from your goat operation in 2014? (Please choose only **one.**)

- ○ Meat (kid) production
- ○ Fiber (mohair, cashmere) production
- ○ Dairy (milk, cheese) production
- ○ Goats sold for seed or breeding stock
- ○ Goats sold or contracted for weed control
- ○ Goats sold for show, exhibition, or 4-H
- ○ Goats sold or contracted for pack animal use, pets, or companions
- ○ Other product or service (Please specify: _____)

Q8. For each season over the past year (January 1 through December 31, 2014), where was the majority of your goat herd located? What production and marketing activities were your animals involved in during each season of 2014?

	Winter (Jan-Mar)	Spring (Apr-June)	Summer (July-Sept)	Fall (Oct-Dec)
Where was the majority of your goat herd located? (Choose **one season** for each location, if relevant.)				
Penned and fed in a drylot/feedlot at the home farm/ranch	○	○	○	○
Grazing on pasture/range at the home farm/ranch	○	○	○	○
Penned and fed in a drylot/feedlot away from the home farm/ranch	○	○	○	○
Grazing on pasture/range away from the home farm/ranch	○	○	○	○
What production activities were your goats involved in? (Chose **all seasons that apply** for each activity, if relevant.)				
Breeding	○	○	○	○
Kidding	○	○	○	○
Castrating, vaccinating, de-worming, tagging/painting/branding	○	○	○	○
Shearing/combing	○	○	○	○
Milking	○	○	○	○
What marketing activities were your goats involved in? (Choose **all seasons that apply** for each activity, if relevant.)				
Animals were purchased (for breeding, replacement, etc.) for the operation	○	○	○	○
Animals were involved in showing, exhibition, or 4-H activities	○	○	○	○
Animals were sold from the operation	○	○	○	○

Q9. What pricing methods did your operation use when selling commodities (kids, fiber, dairy, etc.) during the past year? (Please choose **all that apply**.)

- ○ Price determined in a public auction
- ○ Contract sale with privately negotiated price
- ○ Contract stipulating base or formula price
- ○ Price determined via sealed-bid auction
- ○ Direct market sale with production-cost based price
- ○ Direct market sale with negotiated price
- ○ Other pricing method (Please specify: _____)

Q10. Please indicate your level of agreement or disagreement with the following statement:

When negotiating sales during the past year, my bargaining skills resulted in the best price for my production.

- ○ Strongly agree
- ○ Agree
- ○ Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

Transportation

Q11. Were goats (adults or kids) moved (trucked or herded) off your home farm/ranch for any reason between January 1 and December 31, 2014?

- ◯ No — Please skip to question 13 on page 4.
- ◯ Yes — Please continue.

Q12. We are interested in any movements of your goats (adults + kids) between January 1 and December 31, 2014.

For each production and marketing activity below, please write the typical number of animals moved during that activity. Then, under the relevant distance category, list the number of times this type of movement occurred in 2014.

A movement is defined as a group of goats moving from one location to another (trucked or herded), regardless of the number of truckloads or the number of bands of goats.

In example 1 below, 100 goats were moved once to pasture in a convoy of two trucks; the pasture was 50 to 149 miles away.

In example 2 below, 10 goats were moved twice in 2014 to shows, once less than 25 miles and once over 250 miles.

Examples:	Typical Number of Goats in this Type of Movement	Distance Traveled for each Movement				
		>25 miles	25-49 miles	50-149 miles	150-249 miles	250+ miles
1) Goats were moved from the home farm/ranch to pasture/range	***100***			***1***		
2) Goats were moved for showing, exhibition, or 4-H	***10***	***1***				***1***
How many goats (adults + kids) were moved for the following production activities? And over which distance?						
Goats were moved from the home farm/ranch to pasture/ range						
Goats were moved between pasture/range locations away from the home farm/ranch						
Goats were moved to or between locations for weed control						
Goats were moved for production activities not listed above (for example, movements to breeding or birthing locations)						
How many goats (adults + kids) were moved for the following marketing activities? And over which distance?						
Goats were moved to a feedlot, backgrounder, or dealer						
Goats were moved to a USDA-inspected processor						
→ If you moved goats to a USDA-inspected processor was it kosher/halal certified? ◯ Yes ◯ No ◯ Don't Know						
Goats were moved to a livestock auction barn/facility						
Goats were moved to another breeding herd						
Goats were moved directly to a consumer or restaurant						
Goats were moved to a state-inspected slaughter/butcher facility						
→ If you moved goats to a state-inspected slaughter/butcher facility was it kosher/halal certified? ◯ Yes ◯ No ◯ Don't Know						
Goats were moved for showing, exhibition, or 4-H						
Goats were moved for marketing activities not listed above						

Management Practices

Q13. How many times in the past year (January 1 and December 31, 2014) did each of the following people or groups visit the location of your goats? Did these visits typically result in physical contact with your goats?

Type of Visitor	Number of Visits in 2014	Typically result in physical contact with your goats?
Veterinarians or other animal health professionals		◯ Yes ◯ No
Artificial insemination technicians		◯ Yes ◯ No
Milk truck		◯ Yes ◯ No
Mohair/cashmere haulers		◯ Yes ◯ No
Livestock haulers		◯ Yes ◯ No
Manure haulers		◯ Yes ◯ No
Mobile slaughter teams		◯ Yes ◯ No
Renderers		◯ Yes ◯ No
Shearers or hoof trimmers		◯ Yes ◯ No
Video auction representatives (videotaping, sale arrangements)		◯ Yes ◯ No
Agricultural tours (school groups, university classes, demonstrations, etc.)		◯ Yes ◯ No
Extension agents (not counting tours listed above)		◯ Yes ◯ No
Nutritionists or feed company consultants		◯ Yes ◯ No
Feed (hay or grain) haulers		◯ Yes ◯ No
Other livestock producers		◯ Yes ◯ No
Other visitors (for example, package delivery or utility company personnel)		◯ Yes ◯ No

Q14. Which of the following types of animals—not part of your operation—were in contact or proximity with your goats between January 1 and December 31, 2014? And roughly how often?

Examples of "contact" include nose-to-nose contact, sharing a pasture or pen, or comingling of herds on open range.
Examples of "proximity" include fence-line proximity, or animals/herds within sight of each other on pasture or range (but not comingling).

Type of Animal (not part of your operation)	Contacts with your Goats in 2014				Proximity to your Goats in 2014			
	Never	Contact on 1-7 Days	Contact on 8+ Days	Don't Know	Never	1-7 Days of Proximity	8+ Days of Proximity	Don't Know
Domestic goats or sheep	◯	◯	◯	◯	◯	◯	◯	◯
Beef cattle	◯	◯	◯	◯	◯	◯	◯	◯
Dairy cattle	◯	◯	◯	◯	◯	◯	◯	◯
Domestic pigs	◯	◯	◯	◯	◯	◯	◯	◯
Farmed bison or beefalo	◯	◯	◯	◯	◯	◯	◯	◯
Farmed deer or elk	◯	◯	◯	◯	◯	◯	◯	◯
Wild bison	◯	◯	◯	◯	◯	◯	◯	◯
Wild antelope, deer, elk, or moose	◯	◯	◯	◯	◯	◯	◯	◯
Feral goats, bighorn sheep, or mountain goats	◯	◯	◯	◯	◯	◯	◯	◯
Feral swine	◯	◯	◯	◯	◯	◯	◯	◯

Sheep/Goat Producer Questionnaire First Mailing Cover Letter

UNIVERSITY
OF WYOMING

Department of Agricultural and Applied Economics
Dept. 3354 • Agriculture Building •
1000 E. University Ave., Laramie, WY 82071-3354
(307) 766-2386 • fax (307) 766-5544 • www.uwyo.edu/agecon

[Input recipient name and addres from file]

[Date]

Dear [Input recipient name or Sheep/Goat Producer:]

I am writing to ask for your help with an important survey of [sheep/goat] producers in the intermountain West. The University of Wyoming with assistance from the USDA is conducting a study of [sheep/goat] production, marketing, and transportation practices in Idaho, Montana, Utah, and Wyoming. We would greatly appreciate your help with providing details about important management activities associated with your [sheep/goat] operation during 2014.

Participation is entirely voluntary and your responses are completely confidential, but responses will help us obtain accurate information about [sheep/goat] operation practices in your region. You will not be individually identified in our results. Once the data from the survey has been recorded and verified, the printed surveys will be destroyed. We will not use your address for any mailings outside of this study.

The survey should take 10 to 15 minutes to complete.

A postage-paid envelope is included for you to return the survey to us.

If you have any questions or concerns, please contact me by phone (307-766-4377) or email (bastian@uwyo.edu), and I will be sure to respond. A summary of the results will be published in a report that will be made available to the public. Your time is much appreciated. Thank you.

Sincerely,

Chris Bastian
Associate Professor
Agricultural and Applied Economics
Telephone: 307-766-4377
e-mail: bastian@uwyo.edu

Sheep/Goat Producer Questionnaire Reminder Post Card

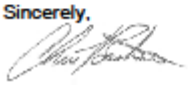
Intermountain West [Sheep/Goat] Production Survey

A survey concerning your [sheep/goat] operation was recently mailed to you. If you have already completed and returned the survey, please accept our sincere thanks. If you have not returned the survey, please take a few minutes to do so. Your participation is essential and we value your response. The information you provide will help us to serve you better; it is important we receive your completed survey.

If by some chance you did not receive the survey, or need another copy, please do not hesitate to contact me and I will be happy to send you another.

Thank you again for participating in this survey.

Sincerely,



Chris Bastian
bastian@uwyo.edu
307-766-4377
College of Agriculture and Natural Resources
Department of Agricultural and Applied Economics
Dept. 3354 1000 E University Ave.
Laramie, WY 82071

Sheep/Goat Producer Questionnaire Second Mailing Cover Letter

UNIVERSITY
OF WYOMING

Department of Agricultural and Applied Economics
Dept. 3354 • Agriculture Building •
1000 E. University Ave., Laramie, WY 82071-3354
(307) 766-2386 • fax (307) 766-5544 • www.uwyo.edu/agecon

[Input recipient name and address from file]

[Date]

Dear [Input recipient name or Sheep/Goat Producer:]

About two weeks ago we mailed you a survey to better understand [sheep/goat] production, marketing, and transportation practices in the intermountain west. As we have not yet heard from you, we have enclosed another copy of the survey along with a return envelope in case the first survey was misplaced. **Your input and participation is vital.** We would greatly appreciate your filling out the enclosed survey and returning it to us.

Participation is entirely voluntary and your responses are completely confidential. You will not be individually identified in our results. Once the data from the survey has been recorded and verified, the printed surveys will be destroyed. We will not use your address for any mailings outside of this study.

The survey should take 10 to 15 minutes to complete.

A postage-paid envelope is included for you to return the survey to us.

If you have any questions or concerns, please contact me by phone (307-766-4377) or email (bastian@uwyo.edu), and I will be sure to respond. A summary of the results will be published in a report that will be made available to the public. Your time is much appreciated. Thank you.

Sincerely,

Chris Bastian
Associate Professor
Agricultural and Applied Economics
Telephone: 307-766-4377
e-mail: bastian@uwyo.edu

APPENDIX B: Descriptive Statistics for All Sheep and Goat Survey Respondents

Section 1: Operation Characteristics

Are you currently involved in sheep/goat production?

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	812	84.2%	135	79.9%	947	83.6%
No	150	15.6%	31	18.3%	181	16.0%
No response	2	0.2%	3	1.8%	5	0.4%
Total	964	100.0%	169	100.0%	1133	100.0%

Which type (or types) of livestock are currently on your home farm/ranch? (Please choose all that apply.)

	Sheep		Goat		Overall	
	Frequency	Percent (n=964)	Frequency	Percent (n=169)	Frequency	Percent (n=1133)
Goats	92	9.5%	133	78.7%	225	19.9%
Sheep	807	83.7%	42	24.9%	849	74.9%
Beef cattle	437	45.3%	45	26.6%	482	42.5%
Dairy cattle	50	5.2%	10	5.9%	60	5.3%
Pigs	54	5.6%	12	7.1%	66	5.8%
Llamas or alpacas	99	10.3%	21	12.4%	120	10.6%
Farmed deer or elk	1	0.1%	0	0.0%	1	0.1%
Farmed bison or beefalo	3	0.3%	0	0.0%	3	0.3%
Horses	367	38.1%	67	39.6%	434	38.3%
Poultry	185	19.2%	47	27.8%	232	20.5%
Total responses	2095		377		2472	

In which state do your sheep/goats spend most (or all) of their time? (Please choose one state.)

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Idaho	133	13.8%	35	20.7%	168	14.8%
Montana	313	32.5%	30	17.8%	343	30.3%
Utah	189	19.6%	36	21.3%	225	19.9%
Wyoming	162	16.8%	35	20.7%	197	17.4%
Other state not listed	2	0.2%	1	0.6%	3	0.3%
No response	165	17.1%	32	18.9%	197	17.4%
Total	964	100.0%	169	100.0%	1133	100.0%

How many sheep (adults + lambs)/goats (adults + kids) are on your home farm/ranch as of today?

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0 sheep/goats	8	0.8%	3	1.8%	11	1.0%
1 to 24 sheep/goats	68	7.1%	27	16.0%	95	8.4%
25 to 99 sheep/goats	307	31.8%	85	50.3%	392	34.6%
100 or more sheep/goats*	431	44.7%	25	14.8%	456	40.2%
No response	150	15.6%	29	17.2%	179	15.8%
Total	964	100.0%	169	100.0%	1133	100.0%

*Aggregated to ensure anonymity.

What was the peak size your sheep/goat herd (adults + lambs/kids) at any one time between January 1 and December 31, 2014?

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0 sheep/goats	4	0.4%	1	0.6%	5	0.4%
1 to 24 sheep/goats	50	5.2%	11	6.5%	61	5.4%
25 to 99 sheep/goats	303	31.4%	97	57.4%	400	35.3%
100 or more sheep/goats*	460	47.7%	31	18.3%	491	43.3%
No response	147	15.2%	29	17.2%	176	15.5%
Total	964	100.0%	169	100.0%	1133	100.0%

*Aggregated to ensure anonymity.

Section 2: Production and Marketing

Which of the following describes the purpose (or purposes) of your goat operation? (Please choose all that apply.)

	Sheep		Goat		Overall	
	Frequency	Percent (n=964)	Frequency	Percent (n=169)	Frequency	Percent (n=1133)
Sheep/Goats for meat (lamb/kid) production	733	76.0%	113	66.9%	846	74.7%
Sheep/Goats for fiber (wool/mohair, cashmere) production	516	53.5%	10	5.9%	526	46.4%
Sheep/Goats for dairy (milk, cheese) production	4	0.4%	38	22.5%	42	3.7%
Sheep/Goats for seed or breeding stock	261	27.1%	56	33.1%	317	28.0%
Sheep/Goats for weed control	212	22.0%	49	29.0%	261	23.0%
Sheep/Goats for show, exhibition, or 4-H	137	14.2%	38	22.5%	175	15.4%
Sheep/Goats for pack animals/pets or companion animals	33	3.4%	18	10.7%	51	4.5%
Other purpose	13	1.3%	5	3.0%	18	1.6%
Total responses	1909		327		2236	
Total number of purposes indicated						
1	162	16.8%	41	24.3%	203	17.9%
2	324	33.6%	40	23.7%	364	32.1%
3	210	21.8%	38	22.5%	248	21.9%
4	89	9.2%	11	6.5%	100	8.8%
5	19	2.0%	6	3.6%	25	2.2%
6	3	0.3%	3	1.8%	6	0.5%
No response	157	16.3%	30	17.8%	187	16.5%
Total responses	964	100.0%	169	100.0%	1133	100.0%

What best describes the primary source of profits (market commodity, product, or service) from your goat operation in 2014? (Please choose only one.)

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Meat (lamb/kid) production	569	59.0%	100	59.2%	669	59.0%
Fiber (wool/mohair, cashmere) production	18	1.9%	7	4.1%	25	2.2%
Dairy (milk, cheese) production	1	0.1%	12	7.1%	13	1.1%
Sheep/Goats sold for seed or breeding stock	58	6.0%	2	1.2%	60	5.3%
Sheep/Goats sold or contracted for weed control	2	0.2%	2	1.2%	4	0.4%
Sheep/Goats sold for show, exhibition, or 4-H	39	4.0%	10	5.9%	49	4.3%
Sheep/Goats sold or contracted for pack animal use/pets or companions	2	0.2%	1	0.6%	3	0.3%
Other product or service	4	0.4%	4	2.4%	8	0.7%
More than one response	105	10.9%	0	0.0%	105	9.3%
No response	166	17.2%	31	18.3%	197	17.4%
Total	964	100.0%	169	100.0%	1133	100.0%

What pricing methods did your operation use when selling commodities (kids, fiber, dairy, etc.) during the past year? (Please choose all that apply.)

	Sheep		Goat		Overall	
	Frequency	Percent (n=964)	Frequency	Percent (n=169)	Frequency	Percent (n=1133)
Price determined in a public auction	500	51.9%	74	43.8%	574	50.7%
Contract sale with privately negotiated price	342	35.5%	69	40.8%	411	36.3%
Contract stipulating a base price or formula price	34	3.5%	1	0.6%	35	3.1%
Price determined via sealed-bid auction	24	2.5%	3	1.8%	27	2.4%
Direct market sale with production-cost based price	69	7.2%	15	8.9%	84	7.4%
Direct market sale with negotiated price	136	14.1%	31	18.3%	167	14.7%
Other pricing method	33	3.4%	5	3.0%	38	3.4%
Total responses	1138		198		1336	

Please indicate your level of agreement or disagreement with the following statement:
When negotiating sales during the past year, my bargaining skills resulted in the best price for my production.

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree (1)	98	10.2%	25	14.8%	123	10.9%
Agree (2)	251	26.0%	42	24.9%	293	25.9%
Neither agree nor disagree (3)	313	32.5%	46	27.2%	359	31.7%
Disagree (4)	76	7.9%	6	3.6%	82	7.2%
Strongly disagree (5)	26	2.7%	8	4.7%	34	3.0%
More than one response	2	0.2%	1	0.6%	3	0.3%
No response	198	20.5%	41	24.3%	239	21.1%
Total	964	100.0%	169	100.0%	1133	100.0%

Were goats (adults or kids) moved (trucked or herded) off your home farm/ranch for any reason between January 1 and December 31, 2014?

	Sheep		Goat		Overall	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	445	46.2%	81	47.9%	526	46.4%
No	339	35.2%	55	32.5%	394	34.8%
No response	1	0.1%	0	0.0%	1	0.1%
Total	179	18.6%	33	19.5%	212	18.7%

Section 3: Transportation

Sheep and Goat Movement Distribution Fit

Sheep Survey
For each production and marketing activity below, please write the typical number of animals moved during that activity.

	@RISK AIC[1] Best Fit
How many sheep (adults + lambs) were moved for the following production activities?	
Sheep were moved from the home farm/ranch to first spring pasture/range	Exponential = β , Shift (1331.9, 1)
Sheep were moved from their final spring pasture/range to first summer pasture/range	Log-normal = μ, σ, shift (3612.7, 26087.1, 8.015)
Sheep were moved from their final summer pasture/range to first winter pasture/range	Log-normal = μ, σ, shift (2654.4, 15815.5, 6.9465)
Sheep were moved from their final summer pasture/range to the home farm/ranch	Log-normal = μ, σ, shift (1844.6, 12109.8, 7.0298)
Sheep were moved for production activities not listed above (for example, weed control, breeding or birthing locations)	Log-normal = μ, σ, shift (931.83, 11599.9, 0.75847)
Combined: All production-related sheep movements	Log-normal = μ, σ, shift (2220.4, 14271, -0.04006)
How many sheep (adults + lambs) were moved for the following marketing activities?	
Sheep were moved to a feedlot, backgrounder, or dealer	Log-normal = μ, σ, shift (1986.5, 14485.2, 5.8803)
Sheep were moved to a USDA-inspected processor	Log-normal = μ, σ, shift (6248.4, 839083.6, 0.99774)
Sheep were moved to a livestock auction barn/facility	Inverse Gaussian = μ, λ, shift = (89.077, 57.233, -3.8643)
Sheep were moved to another breeding flock	Pareto = θ, a (0.35091, 1)
Sheep were moved to a consumer or restaurant	Pearson5 = α, β, shift (0.90275, 2.939, 0.22634)
Sheep were moved to a state-inspected slaughter/butcher facility	Levy = μ, c (0.59783, 2.4124)
Sheep were moved for showing, exhibition, or 4-H	Log-logistic = γ,β,α (0.53976,6.8328, 1.6176)
Sheep were moved for marketing activities not listed above	Inverse Gaussian = μ, λ, shift (165.07, 17.646, -1.5282)
Combined: All marketing-related sheep movements	Log-normal = μ, σ, shift (359.17, 4043.4, 0.90484)

[1] Akaike Information Criterion

Goat Survey

For each production and marketing activity below, please write the typical number of animals moved during that activity.

	@RISK AIC[1] Best Fit
How many goats (adults + kids) were moved for the following production activities?	
Goats were moved from the home farm/ranch to pasture/range	Pearson5 = α, β, shift (1.6247, 51.608, -5.7255)
Goats were moved between pasture/range locations away from the home farm/ranch	Pareto = θ, a (0.9436, 10)
Goats were moved to or between locations for weed control	Levy = μ, c (-0.68023, 8.1157)
Goats were moved for production activities not listed above (for example, movements to breeding or birthing locations)	Levy = μ, c (-0.60141, 8.1182)
Combined: All production-related goat movements	Log-logistic = γ, β, α (0.76529, 14.532, 1.2426)
How many goats (adults + kids) were moved for the following marketing activities?	
Goats were moved to a feedlot, backgrounder, or dealer	Pareto = θ, a (0.56165, 4)
Goats were moved to a USDA-inspected processor	(Insufficient data)
Goats were moved to a livestock auction barn/facility	Log-logistic = γ, β, α (-0.066135, 23.576, 1.8199)
Goats were moved to another breeding herd	Pareto = θ, a (0.60411, 1)
Goats were moved directly to a consumer or restaurant	Extreme value = a, b (15.558, 13.393)
Goats were moved to a state-inspected slaughter/butcher facility	Pareto = θ, a (0.47992, 2)
Goats were moved for showing, exhibition, or 4-H	Exponential = β , shift (10.554, 1.5411)
Goats were moved for marketing activities not listed above	Pareto = θ, a (0.38092, 1)
Combined: All marketing-related goat movements	Log-logistic = γ, β, α (0.76529, 14.532, 1.2426)

[1] Akaike Information Criterion

Sheep and Goat Visitor Contacts Distribution Fit

Sheep Survey
How many times in the past year (January 1 and December 31, 2014) did each of the following people or groups visit the location of your sheep?

Number of Visits in 2014

	@RISK AIC[1] Best Fit
Veterinarians or other animal health professionals	Pareto = θ, a (1.4645, 1)
Artificial insemination technicians	Pareto = θ, a (17.312, 1)
Milk truck	(Insufficient data)
Wool haulers	Pareto = θ, a (7.3337, 1)
Livestock haulers	Pareto = θ, a (1.2926, 1)
Manure haulers	Pareto = θ, a (1.8593, 1)
Mobile slaughter teams	Pareto = θ, a (1.548, 1)
Renderers	Pareto = θ, a (5.023, 1)
Shearers or hoof trimmers	Pareto = θ, a (4.4081, 1)
Video auction representatives (videotaping, sale arrangements)	Pareto = θ, a (3.9068, 1)
Agricultural tours (school groups, university classes, demonstrations, etc.)	Pareto = θ, a (1.245, 1)
Extension agents (not counting tours listed above)	Pareto = θ, a 1.9297, 1)
Nutritionists or feed company consultants	Pareto = θ, a (1.4714, 1)
Feed (hay or grain) haulers	Pareto = θ, a (0.93198, 1)
Other livestock producers	Pareto = θ, a (0.71216, 1)
Other visitors (for example, package delivery or utility company personnel)	Log-normal = μ, σ, shift (14.284, 22.432, 0.2638)
Combined: All visits to sheep locations (n = 2127)	Pareto = θ, a (1.3982, 1)

)[1] Akaike Information Criterion

Goat Survey

How many times in the past year (January 1 and December 31, 2014) did each of the following people or groups visit the location of your goats?

Number of Visits in 2014

	@RISK AIC[1] Best Fit
Veterinarians or other animal health professionals	Pareto = θ, a (1.5012, 1)
Artificial insemination technicians	(Insufficient data)
Milk truck	(Insufficient data)
Wool haulers	(Insufficient data)
Livestock haulers	Pareto = θ, a (2.0317, 1)
Manure haulers	Pareto = θ, a (1.0693, 1)
Mobile slaughter teams	(Insufficient data)
Renderers	(Insufficient data)
Shearers or hoof trimmers	Pareto = θ, a (2.7093, 1)
Video auction representatives (videotaping, sale arrangements)	(Insufficient data)
Agricultural tours (school groups, university classes, demonstrations, etc.)	Pareto = θ, a (0.94783, 1)
Extension agents (not counting tours listed above)	(Insufficient data)
Nutritionists or feed company consultants	(Insufficient data)
Feed (hay or grain) haulers	Pareto = θ, a (0.81554, 1)
Other livestock producers	Pearson5 = α, β, shift (1.2802, 3.2425, 0.37741)
Other visitors (for example, package delivery or utility company personnel)	Exponential = β , shift (10.448, 0.63971)
Combined: All visits to goat locations (n = 225)	Pareto = θ, a (0.93955, 1)

[1] Akaike Information Criterion