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INCREASING MARKET LAMB PRODUCTION EFFICIENCY

Clarence V. Hulet,
S. K. Ercanbrack

INTRODUCTION

Lamb production efficiency should be measured in relation to the total pounds of lamb meat produced per pound of feed consumed by the entire flock. The quality and cost of that feed also must be considered. These assumptions imply that for greatest lamb-production efficiency--every female in the flock should begin production as early in life as possible and produce lambs as rapidly as management constraints permit. Lambs should be fed until efficient gains stop.

Four practices that can have a great impact on improving efficiency are: 1) breeding ewes to lamb at 1 year of age, 2) producing more twins, 3) improving rate and efficiency of gain, and 4) producing larger lambs.

PRODUCING A GOOD LAMB CROP AT 1 YEAR OF AGE

When a strike idles a manufacturing plant for a year it usually spells economic disaster. Similarly it is costly to maintain a ewe lamb for an extra year before she starts lamb production at 2 years of age. This 1-year delay is common practice in the range industry. Many years ago the fleece would about pay the year's maintenance cost, but this is no longer true. In 1981, it cost $50.92 to maintain a replacement yearling ewe for 1 year at the Sheep Station. The fleece produced by this ewe brought $15.85, reducing the net cost of maintenance to $35.07. On the other hand, those ewes that were successfully bred at 7 to 8 months of age on the range and produced an average market lamb, in addition to the fleece, showed a profit of $10.08. This is a total income difference of $45.15 per ewe.

The pioneers in the range sheep industry who are now breeding ewe lambs are to be congratulated for their progress. Under some native range conditions where the environment is severely restrictive, breeding to lamb at 1 year of age could not be recommended. However, under many other conditions one of the easiest and fastest ways to

improve production and profit in the sheep enterprise is to breed ewe lambs to produce their first lamb crop by the time they are yearlings. In addition to the extra lamb crop, the total lifetime production of these selected ewes is greater than that when breeding is postponed. It is a commonly observed that ewes are easier to manage at first lambing at 1 year of age than at 2 years of age.

Table 1 shows what can happen to total lamb production when selection is combined with breeding ewe lambs. In the first group, ewes were bred as lambs and pregnancy tested; only pregnant ewe lambs were saved. The open lambs were sold as choice fat lambs for slaughter. The second group represents those under the common management practice of first breeding replacement ewes at 18 months of age so as to lamb at 2 years of age. Note the great advantage in lamb production each year of those bred (and selected for pregnancy) to lamb first at 1 year of age. Studies in New Zealand (Ch'ang, 1967) have shown that selection of ewes based on their ability to breed as ewe lambs will improve the twinning rate of a flock as rapidly as will selecting directly for twinning.

TABLE 1. LAMB PRODUCTION OF TARGHEE RANGE EWES BRED AND SELECTED ON PREGNANCY AS 1-YEAR OLDS VERSUS EWES LAMBING FOR THE FIRST TIME AS 2-YEAR OLDS (USDA, SEA-AR, DUBOIS, IDAHO)

Management practice	Age of ewe (yrs)	% lambs born[a]	% lambs weaned	Total lambs weaned (lb)
Lambed first as 1-year-olds	1	111	83	56
	2	143	115	84
	3 & over	158	134	107
Lambed first as 2-year-olds	1	0	0	0
	2	102	82	58
	3 & over	141	115	87

[a] Percentage of lambs born or weaned of ewes in the flock.

Breeding ewe lambs is not easy. A lot of planning and good management is required, but it pays good dividends.

Points for Successful Breeding of Ewe Lambs

Consider the breed. Research and practical experience have shown that certain breeds mature earlier and conceive more readily than do other breeds (table 2). We have been especially successful in breeding lambs of the new Polypay breed for production at 1 year of age. Crosses with as

TABLE 2. EFFECT OF BREED ON FERTILITY[1] AND PROLIFICACY[2] IN EWE LAMBS (1978)

Breed	% ewes		Prolificacy	
Rambouillet (R)	54		112	
Targhee (T)	42	45*	105	111*
Columbia (C)	34		115	
Polypay (Poly)	90		138	
Poly x R, T, C	88		134	
(Finn x T, C) x T, C	74	86*	122	141*
Finn x R, T, C	91		158	

[1] Percentage lambing of ewes exposed to rams.
[2] Percentage of lambs born to ewes lambing.
* Weighted means.

little as 12.5% Finnsheep breeding have high conception rates. Targhees, Columbias, and Rambouillets are slower maturing but usually can be managed for relatively successful early breeding with a combination of good nutrition, breeding at the right time of year, and pregnancy testing. Our studies and other research show that success in ewe lamb breeding will improve if managers select lambs for this ability.

Breed at the right time of year. Ewe lambs born early in the lambing season are more likely to breed as lambs. Studies by the University of Idaho and the U.S. Sheep Experiment Station, Dubois, show that the breeding season of ewe lambs is much shorter than that of mature ewes. November is the optimum breeding time for April-born lambs at Dubois (Dahmen and Hulet, 1974). October is a satisfactory breeding time for lambs born in January and February. September is less satisfactory. However, Polypay lambs have been bred successfully in August at Dubois. Ewe lambs can be bred a month to 6 weeks earlier in California, Texas, and other areas at lower latitudes.

Feed lambs to assure fast growth and development. Adequate nutrition is essential for lambs to reach the size and sexual development necessary for early breeding. The ewe lambs should gain at least 1/3 of a lb and preferably 4/10 of a lb per day after weaning at 140 days. During the grazing season, a palatable green-grass pasture, preferably containing some legumes, should be adequate. Protect pasture-managed lambs from stomach worms. If good pasture is not available, supplement grazing so that the ewe lambs will gain at the required rate per day. Beet tops, aftermath in grain fields, or alfalfa fields have been used successfully. Good quality range can be used with adequate supplemen-

tation with range cubes or other concentrates. For ewe lambs in confinement, feed alfalfa pellets at a rate of 4.0 to 4.5 lb per day. High-quality hay with 1/2 to 3/4 lb of grain per lamb per day can produce satisfactory gains.

Breed separate from mature ewes. Studies have shown that ewe lambs breed better when kept separate from mature ewes. Ewe lambs are shy and cannot compete well for the attention of a ram while an aggressive mature ewe is in heat. Furthermore, the lamb cannot compete as well for the available feed when fed with mature ewes.

Pregnancy test. Many relatively satisfactory pregnancy-testing devices are now available. The Scanopreg II and Pregmatic II have been tested at the Station and each was found to be quite accurate and efficient in ewe lambs. (Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable.) Accuracy is poorer in fat ewes. Ewe lambs can also be pregnancy tested using the palpation-rod technique. We recommend that ewe lambs be pregnancy tested from 60 to 70 days after the rams are removed. For greatest improvement, save only the pregnant ewe lambs and send the open lambs to market as fat lambs. Depending on breed and environmental conditions, the pregnant ewe lambs should produce from 80% to 120% weaned lambs.

PRODUCING MORE TWIN LAMBS

Studies have shown that ewes selected for lambing at 1 year of age will produce more twins than those not selected at that time. Crossbreeding with prolific breeds such as the Finnsheep can quickly increase both the number of lambs born and the weight of lambs weaned. Breeding of Suffolk rams to Finnsheep x native western ewes results in high twinning rates of growthy lambs with very satisfactory carcass quality. There has been some resistance to Finncross ewes in the sheep industry because of carcass quality. We believe that in many instances this is not warranted, particularly when Finncross ewes are mated to Suffolk rams.

The Polypay is a new, developing breed designed to fit the needs of those who want a prolific breed but object to the Finncross ewes. Polypay ewes in preliminary tests have shown outstanding lamb production under typical range conditions. Table 3 compares yearling and mature lamb production performance of Polypay ewes with that of Rambouillet, Targhee, and Columbia ewes. The Polypay yearlings weaned a 90% lamb crop; whereas lamb crops were 10% to 18% for the other range breeds. The mature Polypay ewes weaned a 164% crop, which was 42% to 62% percentage points better than the

performance of the other breeds. We have over 50 Polypay ewes with a lifetime average production of over two lambs weaned per year, including the first year of age. This would equate to about 148 pounds of lamb weaned (140 days) per year. Five sheep equal one cow in animal units. This means that one beef cow would have to wean over 740 pounds of calf per year to equal the production of these ewes.

TABLE 3. COMPARATIVE LAMB PRODUCTION OF VARIOUS BREED CROSSES UNDER HERDED RANGE CONDITIONS AT THE U.S. SHEEP EXPERIMENT STATION (APRIL 1977)

Age at lambing and breed	Lambs born to ewes lambing	Lambs weaned of ewes bred
12 months	%	%
Rambouillet	106	18
Targhee	102	13
Columbia	104	10
Polypay	135	90
Mature		
Rambouillet	160	122
Targhee	160	110
Columbia	162	102
Polypay	207	164

The carcass quality of Polypay lambs appears excellent and the growth rate is very similar to that of the other range breeds. Polypay wether lambs on feed at Dubois reach market condition at an average of about 110 lb body weight. However, Polypay wool production, though of good quality, is about 2 lb per head per year lower than that of the Rambouillet or Targhee.

Dubois Polypay lambs gain at about the same rate as Rambouillet, Targhees, and Columbia lambs. Selection efforts are now being made to improve the growth rate of Polypay lambs and to extend the breeding season or eliminate the nonbreeding season so that ewes can be bred at any time of year and more frequently than once per year.

IMPROVING RATE AND EFFICIENCY OF GAIN

Efficiency of gain is related to the amount of gain made by lambs in relation to amount of feed consumed. When one improves efficiency of gain he reduces the amount of feed required per unit of gain. Rate of gain is highly correlated with efficiency of gain. This simply means that the faster a lamb grows the less feed required per pound of gain.

Our work has shown that young lambs gain much more efficiently than older lambs. This suggests, and research work demonstrates, that young lambs can be fed and marketed much more economically than older lambs.

A group of Polypay lambs were weaned at 31 days of age at the U.S. Sheep Station. They were fed diets consisting of about 60% cereal grains, 22% soybean meal, 15% alfalfa meal plus limestone, trace mineral salt, and vitamin complex. The average daily gain to 97.4 lb was .64 lb on an average of 3.55 lb of feed per pound of gain. (J. Doyle, personal communication).

Some lambs gain faster than do others and are more efficient. Is this trait heritable and, if so, how can one select to make improvements in both rate and efficiency of gain and what can the rate of that improvement be?

A preliminary five-year study at the Sheep Station showed that selection was ineffective when it was based on a 6-week test period. However, there was evidence that suggested that accuracy of selection would be improved if the feeding test period were extended over a longer period of time. Therefore, the test period was extended to 16 weeks. The test procedure was as follows:

- Spring-born lambs were weaned at about 80 days of age and placed on test. The test period was divided as follows:
- 4-week group-feeding period
- 6-week individual-feeding period
- 6-week group-feeding period
- The lambs were given all they would eat.
- The diet during the first 10 weeks was 37% barley and 63% alfalfa pellets.
- The diet during the final 6-week period was 100% alfalfa pellets.

The results of the study showed that accuracy of estimating genetic values increased over the 16-week feeding period (table 4).

TABLE 4. EFFECT OF TIME ON THE ACCURACY OF ESTIMATING GENETIC VALUES

Estimated heritabilities	Weeks on test						
	4	6	8	10	12	14	16
Body weight	.39	.38	.51	.54	.57	.65	.75
Gain per day	.22	.18	.38	.52	.61	.64	.71

Percentage superiority of selected lambs over control for rate of gain and efficiency of gain increased 3.5% and 2.9%, respectively, over the 4-year period (table 5).

TABLE 5. PERFORMANCE OF SELECTED LINE AND UNSELECTED CONTROLS DURING THE 16-WEEK TEST PERIODS OF 1978 THROUGH 1981

	Year			
	1978	1979	1980	1981
Rate of gain:				
Mean of selected line	.4528	.4698	.6216	.5914
Mean of controls	.3927	.4026	.5218	.4911
% superiority of selected line	15.3	15.7	19.1	20.4
Relative increase of selected line = 10.36%/year				
Efficiency of gain:				
Mean of selected line	287.2	245.9	326.3	289.9
Mean of controls	250.5	211.6	264.2	235.0
% superiority of selected line	14.7	16.2	23.5	23.4
Relative increase of selected line = 18.28%/year				

BIGGER MARKET LAMBS MEAN MORE EFFICIENT MEAT PRODUCTION

Can you imagine slaughtering beef cattle at 700 to 800 pounds? This would be comparable to the current practice of slaughtering lambs at 90 to 110 pounds. Heavier lamb carcasses are thought to be overly fat and wasty. This may have been true for the smaller breeds that were once popular. However, in the now-popular, larger, slower-maturing range breeds, lambs (especially ram lambs) are making efficient lean gains at weights well above 110 pounds.

Studies at the Sheep Station show that slaughter weights of Rambouillet, Targhee, and Columbia ram lambs may be increased to 140 pounds and ewe lambs to at least 125 pounds without significantly decreasing the percentage of lean meat in the carcass and without affecting tenderness or juiciness. Furthermore, slaughtering and processing costs per pound of meat at heavier slaughter weights are actually reduced, since it costs no more to slaughter, dress, and process larger lambs than smaller ones.

In cooperative work with the University of Idaho, taste-panel scores on overall acceptability and tenderness of cooked lamb racks were found to actually improve slightly as associated carcass weights increased from 46 pounds (95 pounds live) to 79 pounds (153 pound live) (Sauter et al., 1977). More important, actual consumer-acceptance tests, conducted in cooperation with Utah State University in both California and Utah retail markets and involving responses from over 338 customers, revealed that consumers liked cuts from heavier carcasses as well as those from lighter carcasses. Ninety-seven percent indicated that they would purchase the same cut again and the remaining 3% gave reasons for dislike that were in no way associated with carcass weight (Mendenhall and Ercanbrack, 1979). In further tests at Utah, cooking yields of roasts increased slightly, and tenderness also improved slightly as carcass weights increased to 70 pounds.

In the above tests consumers did not discriminate in the least against ram lamb carcasses as evaluated on the basis of tenderness, flavor, and juiciness scores. Nor were significant differences in cooking yields observed among roasts from ram, ewe, and wether lambs. Cuts from ram lambs also were found to be acceptably tender by criteria prescribed by the American Meat Science Association. The above findings are especially significant because ram lambs were found to be about 22% more efficient in feed conversion than were ewe lambs.

CONCLUSIONS

Lamb production efficiency can be markedly improved by proper management and breeding of ewe lambs, improving prolificacy in ewes, and marketing fast-growing, high-quality lambs at heavier weights.

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