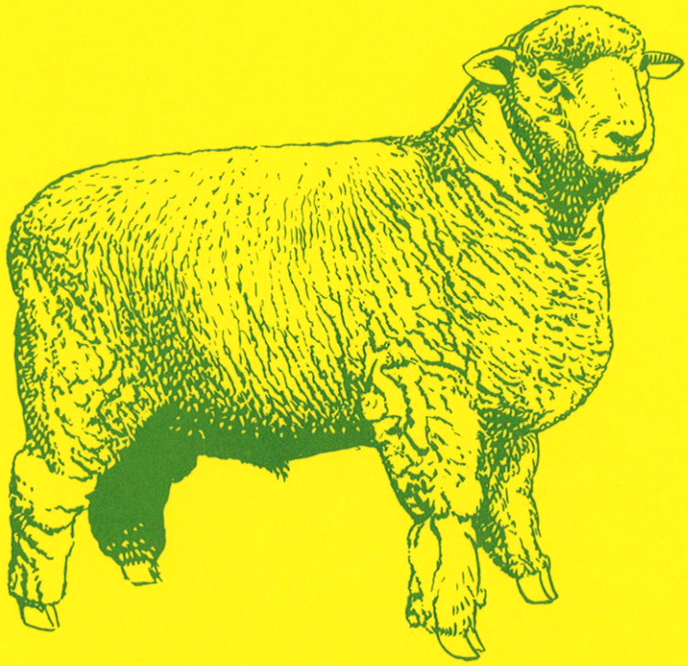

31st Annual Western Dakota

SHEEP DAY

February 14, 1990
Hettinger Armory

Timothy Faller, Superintendent
Hettinger Research & Extension Center
North Dakota State University

PROGRAM

9:00 AM (MST)	Tours at the Station
10:00 AM	Coffee
10:15 AM	Ultrasound Pregnancy Diagnosis Dr. Ralph Miller, DVM, Livingston, MT
10:30 AM	HETTINGER & FARGO STATION REPORTS Dr. Duane Erickson Dr. Kris Ringwall Mr. Timothy Faller
12:00 NOON	LUNCH: ROAST AMERICAN LAMB
1:00 PM	WELCOME & NEXT CENTURY AGRICULTURE Dr. H.R. Lund, Director Agriculture Experiment Station North Dakota State University
1:15 PM	IMPACT OF ULTRASOUND ON MANAGEMENT EFFICIENCY Dr. Ralph Miller, DVM Livingston, Montana
1:45 PM	PROSPECTIVES ON OUT OF SEASON BREEDING Dr. Lowell Slyter, Animal Scientist South Dakota State University Brookings, South Dakota
2:35 PM	NUTRITIONAL EFFECTS ON EWE REPRODUCTIVE PERFORMANCE Dr. Stewart M. Rhind Macauley Land Use Research Institute Midlothian, Scotland
3:25 PM	CLOSING REMARKS Rodney Hickle, President ND Lamb & Wool Producers Assoc. Center, North Dakota

*There will be a program for the ladies in the afternoon beginning at 1:20 PM featuring "The Nutritional Values of Red Meats" and "Care of Today's New Fabrics" coordinated by Mary Whitmer, Adams County Home Economist

SHEEP DAY DIGEST
by
Timothy C. Faller, Superintendent
Hettinger Research and Extension Center
North Dakota State University

SECTION I

REPORTS OF RESEARCH IN PROGRESS

AT THE

HETTINGER RESEARCH AND EXTENSION CENTER

AND MAIN STATION

PRESENTED BY

DR. DUANE ERICKSON

ANIMAL & RANGE SCIENCE DEPT.

NORTH DAKOTA STATE UNIVERSITY

DR. KRIS RINGWALL

NORTH DAKOTA STATE UNIVERSITY

TIMOTHY C. FALLER

SUPERINTENDENT

AT THE

31ST ANNUAL SHEEP DAY

HETTINGER RESEARCH AND EXTENSION CENTER

HETTINGER, NORTH DAKOTA

FEBRUARY 14, 1990

FINISHING LAMBS WITH BARLEY OR MILO OR COMBINATIONS OF BARLEY AND MILO

D.O. Erickson, T.C. Faller, K.A. Ringwall, P.T. Berg and S. Uriyapongson

NDSU Experiment Station, Hettinger 1989

Summary

Two 2 x 4 trials were conducted to determine the lamb performance and carcass characteristics of feeding milo or barley alone or in combinations to early weaned feeder lambs in complete mixed diets that were self fed. Eight hundred lambs were allotted by weight, breed and sex and randomly assigned one of four diets (milo, milo and 20% barley, milo + 40% barley and barley). The diets contained 26% alfalfa and balanced to contain 15.2% protein and 68% TDN. The data from the two trials were combined allowing four replicates for each dietary treatment. Lambs averaged 58 lb at the beginning of the trials and 105 lbs at the close. Daily gains and feed efficiencies were similar ($P>.05$) among diets. Feed intake was the lowest ($P<.05$) with the 40% barley in it. Carcass weights were heavier ($P<.05$) for the milo fed lambs compared to the barley resulting in a higher dressing % for the milo. These criterion were similar ($P>.05$) for the mixed (milo-barley) diets. Quality grade was also higher ($P<.05$) for the milo fed lambs which also may be related to the heavier carcass weight. There were no effects on the other carcass characteristics which is in accord with milo-barley comparisons previously reported. There were no advantages to mixing barley with milo in any of the lamb performance and carcass criterion. All diets resulted in satisfactory lamb performance and carcasses. The barley diet contained 8% soybean meal which was increased with each decreased amount of barley to 14% in the all milo diet.

Introduction and Justification

Barley, as a major feedstuff in high energy diets for finishing lambs, has been compared with corn, oats, milo and wheat and with some combinations of these feedstuffs in several trials conducted at the Hettinger and Fargo Stations. Comparisons include; various quality grades of the grains, on a one to one replacement of the grains or on an equal energy and protein basis and with various protein supplements (soybean, linseed, sunflower oil meals, distillers dried grains and urea). The general conclusions can be made that the cereal grains fed in diets of equal energy and protein result in similar lamb gains, feed efficiency and carcass characteristics.

Feed intake is higher and more constant especially in hot weather with corn and milo, but efficiencies are similar. Wheat should not make up more than 30% of the grain in the diet. Grains (milo, barley or corn) can be fed in whole form without a reduction in feedlot performance or digestible dry matter or protein. Carcass characteristics were similar with physical forms.

Milo (sorghum grain) is a popular feedstuff used in areas where it can be produced efficiently or is imported as the major grain in some countries (for example, Mexico). High energy finishing lamb diets containing either barley or milo were compared in the trials at Hettinger and Fargo last year (1988). Feed intake was more consistent and gains were higher for the lambs on milo. Feed efficiency was similar as were carcass characteristics. It is of economic importance to determine the best use of barley in lamb diets for the ND lamb producer as well as the barley producer. Combinations of barley-milo will be compared to these feeds fed alone. Relative pricing can be more accurate among grains as relative feeding values are established.

Objectives

To determine the comparable feeding values of barley or milo or combinations of barley and milo, fed in complete mixed diets to finishing lambs. Lamb performance and carcass characteristics will be used as criterion as measures of dietary treatment comparisons.

Procedure

Diets were balanced to contain about 68% TDN (1360 Dkcal/lb) and 15.2% protein (Table 2) based on analyzed and "book values" as shown in Table 1. Analysis of barley and milo samples taken during the experimental period resulted were higher in protein than those samples taken prior to the trials resulting in protein levels of about 17% (Table 3). Early weaned (56 d) lambs (400) were allotted by weight, breed and sex into eight lots in each of two trials. The four dietary treatments (Table 2) were randomly assigned. Each trial had two replicates and data were combined from the two trials making four replicates per treatment. Lamb weights and feed intake were recorded every two weeks. The trials were terminated when the average weight of the lambs was 105 lb. A representative group of each lot were used for carcass evaluation. Diets were sampled throughout the trials and analyzed for nutritional composition (32/diet).

Results and Discussion

Composition of the feedstuff used in these experiments were based on analysis and book values and are shown in Table 1. The diets (Table 2) were formulated based on the analyzed values to contain about 15.2% protein and 68% (1360 Dkcal/lb) TDN. The calcium and phosphorus levels averaged about .67 and .40% respectively. Ammonium chloride was added to reduce the probability of urinary calculi. There were cases observed. The diets were sampled throughout the two trials as described in the procedure. The results of the average composition of the diets along with standard deviations are shown in Table 3. The fibrous fractions of neutral detergent fiber, acid detergent fiber and acid detergent lignin were similar among diets indicating similar diet digestibilities. The lambs averaged 105 lb across diets and trials at the close of the experiments. The final weights were similar ($P>.05$) among diets. The carcass weights were heavier for the milo compared to the barley fed lambs. This can occur because only a portion of the lambs of each lot are followed through for carcass information. The differences in carcass weight between milo and barley and the resulting higher dressing % and quality grade for the lambs on milo may not have been due to dietary treatment but rather size of lambs slaughtered. Gains and feed efficiencies were similar among diets ($P>.05$). The data generated from these experiments indicate that mixing milo and barley does not effect lamb performance or feed intake as was hypothesized at the start of the trials. Economic considerations should be involved in the selection of grain or grains to use in lamb diets. The use of barley or oats reduces the levels of protein supplement needed.

Acknowledgement

The support provided by the North Dakota Barley Council in the conduct of these experiments is appreciated.

TABLE 1. NUTRITIONAL COMPOSITION[a] OF FEEDSTUFFS USED TO FORMULATE LAMB DIETS (HETTINGER 1989)

Feedstuff	Bushel wt.	Protein	TDN	DE/#	ADF	Ca	P
Alfalfa	----	16	52	1040	34	1.25	.17
Barley	47	12.0	77	1540	6.2	.05	.34
Milo	57	8.5	76	1520	6.0	.04	.34
SBM	----	44.0	78	1560	10.0	.25	.60
Limestone	----	----	----	----	----	36	----
Dicalcium phosphate	----	----	----	----	----	22	18

[a]90% dry

TABLE 2. DIETARY[a] TREATMENTS AND NUTRITIONAL COMPOSITION[b] FOR 1989 LAMB FEEDING TRIALS (HETTINGER 1989)

Feedstuff	% of Diet	% Protein	% TDN	DE/#	% ADF	% Ca	% P
Diet 1							
Alfalfa	26	4.16	13.5	270	8.84	.325	.045
Milo	57	4.85	43.3	866	3.42	.023	.194
SBM	14	6.16	10.9	218	1.40	.035	.084
Totals	97	15.2	67.7	1354	13.7	.673	.413
Diet 2							
Alfalfa	26	4.16	13.5	270	8.84	.325	.045
Milo	40	3.40	30.4	608	2.40	.016	.136
Barley	19	2.28	14.6	292	1.18	.009	.065
SBM	12	5.28	9.4	187	1.20	.030	.072
Totals	97	15.1	67.3	1357	13.6	.670	.408
Diet 3							
Alfalfa	26	4.16	13.5	270	8.84	.325	.045
Milo	20	1.70	15.2	304	1.20	.008	.068
Barley	41	4.92	31.6	631	2.54	.021	.139
SBM	10	4.40	7.8	156	1.00	.025	.060
Totals	97	15.2	68.1	1361	13.6	.669	.402
Diet 4							
Alfalfa	26	4.16	13.5	270	8.84	.325	.045
Barley	63	7.56	48.5	970	3.91	.031	.214
SBM	8	3.52	6.2	125	.80	.020	.048
Totals	97	15.2	68.2	1365	13.6	.666	.397

[a]All diets will have .5% each of TM salt, limestone, dicalcium phosphate and ammonium chloride. 1.25% ionophore supplement, .05% Vit. A, D & E and 2.5 g Terramycin/100# mix. The Ca & P are calculated with the supplement added.
[b]90% dry

TABLE 3. LABORATORY ANALYSIS (MEANS[a] and SD) OF DIETS BASED ON SAMPLES[b] TAKEN DURING THE TWO TRIALS

	Milo		Milo 20 Bly		Milo 40 Bly		Barley	
DM	89.5	.62	90.2	.33	90.4	.43	90.7	.24
Ash	5.20	.31	5.06	.18	6.09	.13	5.72	.47
NDF	21.2	1.99	22.4	2.97	20.7	1.16	22.0	1.67
ADF	10.7	.56	11.1	1.20	10.6	.80	10.1	1.08
ADL	3.31	.57	3.44	.56	3.38	.49	3.37	.50
Protein	17.1	.63	16.4	.55	17.2	.77	17.6	.57
P	.43	.025	.40	.017	.42	.026	.45	.024
Ca	.67	.065	.69	.041	.79	.122	.80	.158

[a]As is basis except Ca and P dry.
[b]8 samples composited for each of 4 replicates.
[c]Neutral detergent fiber, [d]Acid detergent fiber, [e]Acid detergent lignin.

TABLE 4. FEEDLOT PERFORMANCE OF LAMBS ON BARLEY, MILO OR COMBINATIONS (FARGO 1989)

	Milo	Milo Bly 20	Milo Bly 40	Barley	SE
Int. wt.	58	58	59	59	6.0
Final wt.	105	105	106	103	3.5
Daily gain	.604	.611	.612	.589	.101
Daily feed	4.16[b]	4.22[b]	3.73[a]	4.10[ab]	.201
Feed/gain	6.97	7.01	6.27	7.11	1.06

[a,b]Different P<.05.

TABLE 5. CARCASS CHARACTERISTICS OF LAMBS FED MILO OR BARLEY OR COMBINATIONS OF MILO AND BARLEY

	Milo	Milo Bly 20	Milo Bly 40	Barley	SE
Leg sc.	11.4	11.2	11.1	11.2	1.05
% Kid.	2.19	2.34	2.14	2.10	.719
Qual. grd.	12.9[a]	11.9[ab]	12.31[ab]	11.7[b]	1.41
Backfat	.185	.200	.170	.162	.060
Dress %	52[a]	51[ab]	51[ab]	50[b]	2.57
Live wt.	108	105	105	104	12.66
Carc wt.	56[a]	53[ab]	53[ab]	52[b]	6.26

[a,b]Different @ P<.05.

BARLEY AND MILO FED WITH AND WITHOUT BEET PULP TO LAMBS

D.O. Erickson, B.L. Moore, P.T. Berg and S. Uriyapongson

Animal and Range Sciences Department, Fargo Station 1989

Summary

A 4 x 4 experiment was conducted to determine the feedlot performance and the carcass characteristics of early weaned lambs fed barley or milo with and without beet pulp. One hundred and twenty-eight lambs were allotted by sex, breed and weight (65 lb) and randomly assigned to one of the four dietary treatments with four replicates per treatment. Diets were balanced to contain about 15% protein and 70% (1400 Dkcal/lb) TDN and were self-fed in a complete mixed coarse ground form. The average final weight of lambs across diets was 116 lb. Lambs on milo were heavier (P<.004), gained faster (P<.053) and consumed more (P<.006) feed per day than the lambs on barley however the lambs on barley were equally efficient in feed conversion to gain. There was a feed per gain interaction between grains and beet pulp. Feed efficiency appeared to improve with the addition of beet pulp to barley (5.53 bly vs 5.10 bly-BP) whereas the addition of beet pulp to milo had the opposite effect. Carcasses from lambs fed barley had less (P<.02) backfat and a lower (P<.02) yield grade compared to the milo fed lambs. Those comparisons were made across no beet pulp and with beet pulp. The barley diet required only 3% soybean meal compared to 9% for the milo diet.

Introduction and Justification

Barley as the major grain in lamb-finishing diets has been compared to corn, wheat, oats and milo and supplemented with various protein sources. Generally results (from NDSU) indicate that lambs on barley eat less and intake is more variable especially in hot weather and when lamb approach the finished condition. Barley fed lambs are equally efficient in the conversion of feed to gain compared to corn or milo and are more efficient when compared to oat diets. It has been reported that the starch in barley is fermented more rapidly in the rumen than other grains which may be one of the factors involved in the reduced intake because of the more acid pH. Research at NDSU indicate that beet pulp is a highly digested feedstuff even though it is high in fiber (27% ADF). Beet pulp was added to the diets (20%) to determine if it would improve feed intake with barley and determine its effects on milo diets. Beet pulp is a relatively unique feed in that it has a high fiber content which lends it useful in supplying increased physical fiber in high energy finishing diets yet total digestibility of the diet is not effect because the high level of fiber digestibility.

Objective

To determine the effects of adding beet pulp to barley or milo diets fed to early weaned finishing lambs.

Procedures

Diets were balanced to contain 70% TDN (1400 Dkcal/lb) and 15% protein based on feedstuff analysis (Table 1 and 2). Diets were sampled several times during the experiment and the results of the nutritional analysis is shown in Table 3. The diets were complete mixed and fed in ground form. The 20% beet pulp diets were higher in fiber but the digestibility among diets was similar (P>.05) as determined by IVDMD (Table 3). Early weaned (56 d) lambs (128) were allotted into 16 lots by weight, sex and breed. The four dietary treatments were randomly assigned (barley, milo, barley-BP or milo-BP). The average initial and final weights were 65 and 116 lbs respectively. Lamb weights and feed intake was recorded every two weeks. Six lambs from each dietary treatment were used for the carcass information. Statistical methods were applied to establish the effects of dietary treatments.

Results and Discussion

The analysis of the feedstuffs used in the diets and the analysis of the diets along with standard deviations are shown in Tables 1 and 3 respectively. The dietary composition (feedstuffs) and calculated protein (15%) and TDN (70%) contents are shown in Table 2. Diets were balanced to exceed protein (15%) and energy (70% TDN) requirements. The analysis of the diets based on several samples taken during the coarse of the experiments indicate that the protein of the milo diets contained about 16% protein. The fibrous fractions (NDF and ADF) were higher in the barley diets compared to milo and in the diets with the added beet pulp however the digestibilities (IVDMD) were similar across diets ranging from 68 to 71%. Calcium and phosphorus levels exceeded the requirements and ratios of Ca to P ranged from 1.25 to 1.69 : 1. There were no problems with urinary calculi.

The feedlot performance criterion are shown in Table 4. Lambs on milo were heavier at the end of the trial (P<.05) compared to those on barley (120 and 111 lbs). Daily gains were higher (P<.053) for lambs on milo compared to barley across beet pulp treatments. This supports results previously reported with barley and milo diets. Feed intake levels are higher (P<.006) for the lambs on milo compared to barley but the addition of beet pulp did not alter (P>.05) feed intake. Even though feed intake and gains were higher for the lambs on milo there was no (P>.05) advantage in feed efficiency. These data also support those previously reported on barley-milo comparisons. The addition of 20% beet pulp to barley diets appeared to improve all criterion measured in feedlot performance although levels of improvement were below probability levels of (P>.05). The same affects of beet pulp to milo were not observed.

Carcass characteristics were similar (P>.05) when measured across the four dietary treatments (Table 5). When comparing barley to milo across beet pulp treatments the backfat and yield grades were lower (P<.02) for barley both of which are desirable characteristics. There were no carcass characteristic differences (P>.05) when comparing beet pulp to no beet pulp across grains.

Both barley and milo can be used as the major grain in complete mixed diets for finishing lambs. These data along with previously reported research indicates that lambs have a lower daily consumption of barley based diets and in some cases this results in slower gains but the utilization of feed for gain is similar between barley and milo. Similar results have been obtained in barley and corn based diet comparisons. The addition of 20% beet pulp to the barley diet appeared to improve daily intake and the consistency of intake thereby improving gain and efficiency. Less protein supplement is required when diets are based on barley compared to milo or corn. This can be an important economic consideration in the selection of the major grain to use in lamb finishing diets.

Acknowledgement

The North Dakota Barley Councils partial support of this research is very much needed and appreciated.

TABLE 1. COMPOSITION[a] OF FEEDSTUFFS USED IN DIETS FOR FINISHING LAMB TRIALS (FARGO 1989)

		%					
Feedstuff	lb/bu	Protein	TDN	DE/lb	ADF	Ca	P
Barley	46	14.0	77	1540	6.2	.05	.34
Milo	60	11.0	76	1520	6.0	.04	.34
Beet pulp[b]	--	9.0	74	1480	27.0	.60	.10
SBM	--	46	78	1560	10.0	.25	.60
Alfalfa	--	16	52	1040	34.0	1.25	.17
Limestone	--	--	--	--	--	36	--
Dicalcium	--	--	--	--	--	22	18

[a]90% dry or as fed basis.
[b]With molasses.

TABLE 2. DIETARY TREATMENTS AND CALCULATED NUTRITIONAL COMPOSITION FOR FINISHING LAMBS (FARGO 1989)

Diet	Barley	Milo	Barley Beet pulp	Milo Beet pulp
Alfalfa	12	12	12	12
Barley	79	--	56	--
Milo	--	73	--	52
Beet pulp	--	--	20	20
SBM	3	9	6	10
Limestone	.5	.5	.25	.25
Dicalcium phosphate	.25	--	.25	.25
	Nutritional Composition			
TDN %	71	71	70	70
Protein %	15.1	14.8	15.0	14.7

all diets will contain:

- 2.2% Bovatec
- .5% each of TM salt and ammonium chloride
- .7 sun oil
- .207 antibiotics
- .025 vitamins ADE

TABLE 3. NUTRITIONAL COMPOSITION[a] OF DIETS BASED ON LABORATORY ANALYSIS WITH STANDARD DEVIATIONS (FARGO 1989)

	Barley		Milo		Barley-BP		Milo-BP	
Dry matter	89.4	.70	88.2	.57	89.8	.59	89.0	.90
Ash	5.00	.36	4.28	.27	4.80	.22	4.54	.27
NDF[b]	21.3	1.46	14.1	.54	26.6	1.61	21.7	1.75
ADF[c]	8.0	1.09	7.5	.90	12.5	1.03	11.4	1.38
Protein	15.0	.45	16.3	.65	15.0	.61	15.9	.84
IVDMD[d]	69.0	2.15	71.0	1.74	67.7	3.58	70.0	1.36
P	.49	.026	.35	.032	.41	.012	.36	.025
Ca	.61	.059	.59	.088	.61	.069	.61	.084

[a]As is basis except Ca and P on dry basis.
[b]Neutral detergent fiber.
[c]Acid detergent fiber.
[d]In vitro dry matter digestibilities.

TABLE 4. LAMB PERFORMANCE COMPARING BARLEY TO MILO FED WITH AND WITHOUT BEET PULP (FARGO 1989)

	Barley	Milo	Barley-BP	Milo-BP	SE
Initial wt.	64	65	64	65	.59
Final wt.	111[a]	120[b]	115[ab]	118[ab]	1.69
Daily gain	.802	.950	.874	.909	.043
Daily feed	4.40[a]	4.70[ab]	4.44[a]	5.07[b]	.140
Feed/gain	5.53	4.97	5.10	5.59	.205

Grain and Beet Pulp Comparisons

	Barley	Milo	SE	Prob.	No Beet Pulp	Beet Pulp	SE	Prob.
Final wt.	113	119	1.69	.004	116	117	1.69	ns
Daily gain	.838	.930	.043	.053	.876	.892	.043	ns
Daily feed	4.42	4.89	1.40	.006	4.55	4.76	1.40	ns
Feed/gain	5.32	5.28	.205	ns	5.25	5.35	.205	ns

[ab]Different @ P<0.5.
NS = no differences @ P>.05.
F/G interaction @ P<.05.

TABLE 5. CARCASS CHARACTERISTICS COMPARING BARLEY TO MILO FED WITH AND WITHOUT BEET PULP (FARGO 1989)

	Barley	Milo	Barley-BP	Milo-BP	SE
Kidney %	2.58	3.25	3.08	3.00	.293
Qual grd	11.0	11.3	11.5	11.0	.45
Leg score	10.8	11.4	11.5	11.2	.48
Back fat in	.108	.147	.085	.148	.020
Loin area	2.44	2.59	2.57	2.63	.097
Dress. %	50.4	52.5	49.8	51.2	.93
Yield grd	2.49	2.88	2.42	2.84	.161

	Barley	Milo	SE	Prob.	No BP	BP	SE	Prob.
Kidney %	2.83	3.12	.293	ns	2.92	3.04	.293	ns
Qual grd	11.3	11.2	.45	ns	11.3	11.3	.45	ns
Leg score	11.2	11.3	.48	ns	11.1	11.3	.48	ns
Back fat in	.097	.147	.020	.02	.137	.117	.020	ns
Loin area	2.51	2.61	.097	ns	2.53	2.60	.097	ns
Dress. %	50.1	51.8	.93	ns	51.5	50.5	.93	ns
Yield grd	2.46	2.86	.161	.02	2.68	2.63	.161	ns

ns = no differences P>.05.

REPRODUCTIVE CHARACTERISTICS OF FEMALE OFFSPRING FROM RAMS SELECTED FOR PREDICTABLE OR NO PREDICTABLE CHANGE IN SEASONAL SCROTAL CIRCUMFERENCE

K.A. Ringwall, T.C. Faller, and P.M. Berg

INTRODUCTION

A major problem in the sheep industry is seasonal infertility. Not only is seasonal infertility a biological puzzle, but the effects of seasonal lambing limits managerial options and restricts a constant and dependable supply of lamb products to the consumer. In North Dakota, virtually all lambs are born from late January to early May. Producers have not been able to consistently produce a fall lamb crop for the purpose of grazing fall stubble and decreasing winter feed resources for the dry ewe. The purpose of this project is to provide additional information as to how the season of the year affects the ram and to explore the possibility of increasing the consistency of fall lambing for North Dakota producers by identifying potential sires that may produce daughters that will better fit a northern fall lambing program.

PROCEDURE

The influence of season on scrotal circumference of Rambouillet rams and reproductive characteristics of their offspring are being evaluated. Rambouillet rams are purchased yearly and classified as seasonal or nonseasonal rams. Seasonal rams are defined as those rams whose scrotal circumferences increase predictably from the January, February and March average scrotal circumferences to the August scrotal circumferences. Nonseasonal rams show less seasonal trend to change in scrotal circumferences. Initially, scrotal measurements are obtained in late February and late July from the Glenn Brown flock, Buffalo, SD and ram selection is based on these two measurements. The two rams with the greatest change and two rams with the least change are selected to assure that variability exists within the purchased rams for change in scrotal circumference. The rams range from 10 to 14 months of age when the initial scrotal measurements are obtained and 15 to 19 months of age when they arrive at the Research Extension Center.

Rams are permanently classified after a one-year residence at the Research Extension Center utilizing the previous January, February, March and August scrotal measurements. Rams may only be re-classified following the August scrotal measurement taken at 27 to 31 months of age. If a ram dies before August, the permanent classification equals the purchased classification. Blood sampling for later analysis for luteinizing hormone (LH) was started in October 1987 and has been done seasonally. The rams are bled at -30, 0, 15, 60 and 75 minute intervals with 1 microgram GnRH administered at 1 and 61 minute time periods. All rams are exposed to ewes during each breeding season and maintained during the non-breeding seasons on a 20% grain ration fed ad libitum.

Initially, 25 to 30 purchased Rambouillet ewes per ram were randomly mated yearly to four seasonal and four nonseasonal rams to produce first generation progeny. First generation seasonal and nonseasonal daughters were being compared at 10 months of age for ovulation rate and 14 to 18 months of age for the ability to conceive at the beginning or end of the breeding season. These ewes were initially evaluated as dry ewes exposed to rams during August or April. Once exposed to rams, all ewes go into an accelerated program for three years being exposed to rams as wet (recently weaned) or dry ewes during April, August or November.

Second and subsequent generation ewes are being produced based on an upgrading breeding program were each ewe is mated to seasonal sires if she is a seasonal ewe or to nonseasonal rams if she is a nonseasonal ewe. Second and future generations will enter the accelerated breeding schedule at 10 to 12 months of age and remain for three years. When possible, the ewes will be mated to individual sires, but if individual sire fertility is questionable, the ewes will be group mated by seasonal or nonseasonal rams. Both types of ewes will be exposed to teaser wethers, teaser ewes and rams during the April breeding season to assure that both types of ewes have equal exposure to aggressive males. All ewes will be bled 7 days after the rams are removed in May to determine serum progesterone levels. Rams are fitted each breeding season with a "Sire-Sine" (Mid States Wool, Hutchinson, Kansas) marking harness to monitor daily mating activity. Marks are recorded as light if one or two marks are visible on the rump, medium if three or more individual marks are evident and heavy if individual marks have all blended into one solid mark.

Breeding seasons start based on the calendar day and the rams are pulled on the 34th day of breeding. All ewes are exposed each breeding season regardless of pregnancy status. August breeding starts August 8th (plus or minus one day). All lambs resulting from the August breeding are weaned 234 days (March 30) from the introduction of the rams. The November breeding season starts 100 days (November 16) after the introduction of rams in August. Lambs resulting from the November breeding are weaned at 56 days of age. The April breeding season starts 7 days (April 6) after weaning the January/February lambs or 241 days after the introduction of the rams in August. All lambs resulting from the April breeding are weaned 17 days (December 3) after the initiation of November breeding or 117 days after the introduction of rams in August.

RESULTS AND DISCUSSION

The results presented are preliminary and are provided for discussion only. First generation daughters are just starting to complete the accelerated program, at which time a detailed evaluation of the data will be undertaken. Table 1 gives the current status and classification of the purchased rams. The first 16 rams that were purchased have had the January/March to August measurements collected and the scrotal circumference changes were similar to changes prior to purchase with the exception of three rams. Those rams purchased in 1989 have not been permanently classified. Selecting rams based on two measurements has been satisfactory for obtaining the variation needed in the sample of Rambouillet sires. Table 2 indicates the early growth characteristics of first, second and third generation seasonal and nonseasonal daughters. At this time, nonseasonal daughters tend to be slightly heavier than seasonal daughters.

Those ewes that started the accelerated program in 1987 have completed two years. Tables 3 and 4 provide the overall reproductive performance of these ewes. Over the course of two years, those ewes born during 1986 have had the opportunity to lamb 0, 1, 2, or 3 times. Table 3 indicates the frequency that these ewes have lambed as well as the subsequent lambing performance according to how many times that each ewe lambed. No obvious difference in lambs per ewe lambing or lambs per ewe weaned presently exists. In other words, ewes that only lambed once raised those lambs similarly to those ewes that lambed three times. Currently, seasonal ewes are producing 1.25 annual lambings per ewe exposed versus 1.00 annual lambings per ewe exposed for nonseasonal ewes (table 4). This translates into producing a 207% lamb crop born and 173% lamb crop weaned per ewe exposed for the seasonal ewe and 180% lamb crop born and 156% lamb crop weaned per ewe exposed for nonseasonal ewes. The annual attrition rate is slightly greater for nonseasonal ewes versus seasonal ewes (table 4). The lower performance of the nonseasonal ewes can be partially explained by table 5. A decreased percentage of nonseasonal ewes are expressing estrus as determined by number of ewes with greater than 1 nanogram of progesterone or marking data. Not only did fewer nonseasonal ewes express estrus, but of those that did, fewer conceived (table 5).

Reproductive performance for first and second generation ewes is presented in tables 6-10. These tables are incomplete, but as more ewes progress through the acceleration phase of the trial, the tables will become more informative. Tables 6 and 7 reflect the prebreeding weight, lambs born per ewe lambing and lambs weaned per ewe lambing. For the first and second generation ewes, nonseasonal ewes tend to be slightly heavier prior to breeding. No real trend has developed in lambs born per ewe exposed for either ewe class or breeding period. The November breeding period is currently producing the least in terms of lambs weaned per ewe lambing. A possible cause for this is that the ewes are bred with lambs at side during November. The stress of lactation plus winter would stress the ewes more so than the April or August breeding periods resulting in a poorer conditioned ewe for April lambing.

Tables 8 and 9 report estrous expression and the percentage of ewes mated within first and second generation ewes for each breeding season. Very few second generation ewes have had an opportunity to mate at this time. The nonseasonal ewes tend to have less estrous expression during April and August than the seasonal ewes. The seasonal and nonseasonal ewes tend to be similar in regards to the percentage of ewes mating during the first cycle (1st 17 days) of the breeding season (table 8). Conception data is presented in tables 10 and 11 for both generation types of ewes. Very little data is available on the second generation ewes. A trend does seem to be developing, indicating that the nonseasonal sheep have lower conception rates than do the seasonal ewes.

TABLE 1

SCROTAL CIRCUMFERENCE CHANGE FROM THE AVERAGE JANUARY, FEBRUARY AND MARCH SCROTAL CIRCUMFERENCE TO THE AUGUST (PRE-BREEDING) SCROTAL CIRCUMFERENCE FOR SEASONAL (S) AND NONSEASONAL (N) RAMS

PURCHASE YEAR	RAM NUMBER	CLASSIFICATION PURCHASED	PERMANENT	AVERAGE CHANGE (CM) PURCHASED	PERMANENT	ATTRITION YEAR
1985	2532	N	N	2.3	.1	1987
	4066	N	N	1.0	.3[a]	1989
	4162	S	S	9.4	2.9	1989
	3289	S	S	11.9	3.8	1987
1986	6014	N	N	1.3	-.-	1987
	5367	S	N	8.2	3.1	
	6135	N	N	.6	4.9	
	5303	S	S	8.4	8.0	
1987	6559	N	N	2.4	-.-	1988
	6579	S	S	8.0	4.7	
	T311	S	S	6.3	5.2	
	7242	S	S	9.0	7.0	
1988	7495	S	N	2.2	.8	
	7479	N	N	-2.4	1.4	
	8360	S	S	4.7	3.1	
	7680	N	S	- .7	4.2	
1989	9196	N	?	3.0		
	9402	N	?	1.8		
	9344	S	?	7.9		
	9566	S	?	7.8		

[a] Underline denotes division between seasonal and nonseasonal rams.

TABLE 2

ACTUAL BIRTH, WEANING, EIGHT MONTH AND TEN MONTH WEIGHT FOR EWE LAMBS SIRED BY SEASONAL AND NONSEASONAL RAMS

SIRE TYPE	GENERATION	NUMBER WEANED	BIRTH WEIGHT	WEANING WEIGHT	7 M WEIGHT	10 M WEIGHT
nonseasonal	first	87	11.4	35.7	112.5	121.4
	second	66	11.2	40.0	108.6	122.4
	third	3	11.2	59.0		
seasonal	first	124	11.4	36.5	113.9	119.2
	second	89	10.2	35.0	101.8	116.2
	third	5	9.9	46.6		

TABLE 3

LAMBS PER EWE LAMBING AND LAMBS WEANED PER EWE LAMBING FOR SEASONAL AND NONSEASONAL EWES CLASSIFIED ON NUMBER OF LAMBINGS IN TWO YEARS

EWE TYPE	TOTAL LAMBINGS PER EWE IN TWO YEARS	NUMBER OF EWES	NUMBER OF LAMBS PER EWE LAMBING	NUMBER OF LAMBS WEANED PER EWE LAMBING
seasonal	0	0		
	1	3	1.33	0.67
	2	8	1.88	1.69
	3	17	1.61	1.33
nonseasonal	0	2		
	1	3	1.67	1.67
	2	7	1.68	1.36
	3	7	1.89	1.67

TABLE 4

ANNUAL LAMBINGS PER EWE EXPOSED, ANNUAL LAMBS BORN PER EWE EXPOSED, ANNUAL LAMBS WEANED PER EWE EXPOSED AND ANNUAL EWE ATTRITION RATE FOR SEASONAL AND NONSEASONAL EWES

EWE TYPE	TOTAL EWES	ANNUAL LAMBINGS PER EWE EXPOSED[a]	ANNUAL LAMBS BORN PER EWE EXPOSED[b]	ANNUAL LAMBS WEANED PER EWE EXPOSED[c]	ANNUAL EWE ATTRITION RATE
seasonal	28	1.25	2.08	1.70	07.1%
nonseasonal	19	1.00	1.80	1.56	10.5%

[a]Parturitions divided by initial ewe numbers.
[b]Lambs born divided by initial ewe numbers.
[c]Lambs weaned divided by initial ewe numbers.

TABLE 5

NUMBERS OF SEASONAL OR NONSEASONAL EWES WITH LESS THAN ONE NG SERUM PROGESTERONE OR ONE NG OR GREATER SERUM PROGESTERONE FOLLOWING APRIL EXPOSURE FOR TWO 17 DAY ESTROUS CYCLES

SIRE	NUMBER OF EWES					CONCEPTION
TYPE	TOTAL	<1 NG	>1 NG	MATED	LAMBED	PERCENTAGE[a]
seasonal	125	27	98	100	82	83.7
nonseasonal	106	34	72	71	44	61.1

[a]Number lambed divided by number of ewes with >1 ng progesterone.

TABLE 6

REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS FOR FIRST GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL, AUGUST AND NOVEMBER WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

BREEDING PERIOD	EWE STATUS	SIRE TYPE	PREBREEDING WEIGHT	LAMBS BORN/ EWE LAMBING	LAMBS WEANED/ EWE LAMBING
April	Dry	N	156 (76)	1.39 (28)	1.07 (28)
April	Dry	S	151 (78)	1.29 (52)	1.10 (52)
April	Wet	N	155 (21)	1.42 (12)	1.17 (12)
April	Wet	S	150 (29)	1.61 (23)	1.43 (23)
August	Dry	N	162 (76)	1.83 (23)	1.43 (23)
August	Dry	S	154 (63)	1.66 (32)	1.47 (32)
August	Wet	N	157 (22)	---- (0)	---- (0)
August	Wet	S	156 (31)	---- (0)	---- (0)
November	Dry	N	120 (10)*	1.25 (4)	1.25 (4)
November	Dry	S	107 (15)*	2.00 (1)	1.00 (1)
November	Wet	N	178 (38)	1.76 (21)	1.05 (21)
November	Wet	S	168 (73)	1.50 (32)	1.09 (32)

*Includes 1989 ewes bred at 10 months of age.

TABLE 7

REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS FOR SECOND GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL, AUGUST AND NOVEMBER WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

BREEDING PERIOD	EWE STATUS	SIRE TYPE	PREBREEDING WEIGHT	LAMBS BORN/ EWE LAMBING	LAMBS WEANED/ EWE LAMBING
April	Dry	N	160 (9)	1.20 (5)	0.80 (5)
April	Dry	S	146 (15)	1.50 (8)	1.38 (8)
April	Wet	N	--- (0)	---- (0)	---- (0)
April	Wet	S	--- (0)	---- (0)	---- (0)
August	Dry	N	131 (19)	---- (0)	---- (0)
August	Dry	S	123 (36)	---- (0)	---- (0)
August	Wet	N	--- (0)	---- (0)	---- (0)
August	Wet	S	--- (0)	---- (0)	---- (0)
November	Dry	N	102 (27)[a]	---- (0)	---- (0)
November	Dry	S	92 (27)[a]	---- (0)	---- (0)
November	Wet	N	165 (4)	---- (0)	---- (0)
November	Wet	S	142 (8)	---- (0)	---- (0)

[a]Includes 1989 ewes bred at 10 months of age.

TABLE 8

ESTROUS EXPRESSION AND PERCENTAGE OF TOTAL EWES MATED FOR FIRST GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL, AUGUST AND NOVEMBER WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

			ESTROUS EXPRESSION[a]					
BREEDING PERIOD	EWE STATUS	SIRE TYPE	NONE	1ST CYCLE	2ND CYCLE	BOTH CYCLES	1ST CYCLE PERCENTAGE[b]	PERCENTAGE OF TOTAL EWES MATED[c]
April	Dry	N	34	28	11	4	74.4	55.8
April	Dry	S	16	20	38	5	39.7	79.7
April	Wet	N	1	4	6	11	71.4	95.5
April	Wet	S	1	11	1	16	96.4	96.6
August	Dry	N	11	14	39	12	40.0	85.5
August	Dry	S	3	18	26	16	56.7	95.2
August	Wet	N	1	8	9	4	57.1	95.5
August	Wet	S	1	8	19	3	36.7	96.8
November	Dry	N	2	3	0	1	100.0	66.7
November	Dry	S	1	1	0	0	100.0	50.0
November	Wet	N	1	12	11	2	56.0	96.2
November	Wet	S	2	23	10	2	71.4	94.6

[a] Includes those ewes that have medium or heavy breeding marks only.
[b] Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[c] Total ewes mated divided by total ewes.

TABLE 9

ESTROUS EXPRESSION AND PERCENTAGE OF TOTAL EWES MATED FOR SECOND GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL, AUGUST AND NOVEMBER WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

BREEDING PERIOD	EWE STATUS	SIRE TYPE	ESTROUS EXPRESSION[a] NONE	1ST CYCLE	2ND CYCLE	BOTH CYCLES	1ST CYCLE PERCENTAGE[b]	PERCENTAGE OF TOTAL EWES MATED[c]
April	Dry	N	1	3	3	2	62.5	88.9
April	Dry	S	5	2	8	--	20.0	66.7
April	Wet	N	--	--	--	--	----	----
April	Wet	S	--	--	--	--	----	----
August	Dry	N	4	2	11	2	26.7	78.9
August	Dry	S	3	10	17	6	48.5	91.7
August	Wet	N	--	--	--	--	----	----
August	Wet	S	--	--	--	--	----	----
November	Dry	N	--	--	--	--	----	----
November	Dry	S	--	--	--	--	----	----
November	Wet	N	--	--	--	--	----	----
November	Wet	S	--	--	--	--	----	----

[a] Includes those ewes that have medium or heavy breeding marks only.
[b] Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[c] Total ewes mated divided by total ewes.

TABLE 10

CONCEPTION CYCLE AND PERCENTAGE OF MATED EWES CONCEIVED FOR FIRST GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL, AUGUST AND NOVEMBER WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

BREEDING PERIOD	EWE STATUS	SIRE TYPE	CONCEPTION CYCLE[a] FAILED	1ST CYCLE	2ND CYCLE	1ST CYCLE PERCENTAGE[b]	CONCEPTION PERCENTAGE[c]
April	Dry	N	49	10	18	35.7	65.1
April	Dry	S	27	12	40	23.1	82.5
April	Wet	N	10	2	10	16.7	57.1
April	Wet	S	6	6	17	26.1	82.1
August	Dry	N	13	3	20	13.0	85.2
August	Dry	S	7	10	22	31.3	86.5
August	Wet	N	--	--	--		----
August	Wet	S	--	--	--		----
November	Dry	N	2	3	1	75.0	100.0
November	Dry	S	1	1	0	100.0	100.0
November	Wet	N	5	12	9	57.1	84.0
November	Wet	S	5	21	11	65.6	91.4

[a] Conception cycle based on actual estrous date or 150 day gestation length (actual mean seasonal and nonseasonal gestation length = 150.48 days; st. dev. = 2.82; min = 144; max = 165;).
[b] Number conceived in the 1st cycle divided by the total number of ewes that conceived.
[c] Number of ewes lambing divided by number of ewes mated.

TABLE 11

CONCEPTION CYCLE AND PERCENTAGE OF MATED EWES CONCEIVED FOR SECOND GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL, AUGUST AND NOVEMBER WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

BREEDING PERIOD	EWE STATUS	SIRE TYPE	CONCEPTION CYCLE[a] FAILED	1ST CYCLE	2ND CYCLE	1ST CYCLE PERCENTAGE[b]	CONCEPTION PERCENTAGE[c]
April	Dry	N	4	3	2	60.0	62.5
April	Dry	S	7	2	6	25.0	80.0
April	Wet	N	--	--	--	----	----
April	Wet	S	--	--	--	----	----
August	Dry	N	--	--	--	----	----
August	Dry	S	--	--	--	----	----
August	Wet	N	--	--	--	----	----
August	Wet	S	--	--	--	----	----
November	Dry	N	--	--	--	----	----
November	Dry	S	--	--	--	----	----
November	Wet	N	--	--	--	----	----
November	Wet	S	--	--	--	----	----

[a] Conception cycle based on actual estrous date or 150 day gestation length (actual mean seasonal and nonseasonal gestation length = 150.48 days; st. dev. = 2.82; min = 144; max = 165;).
[b] Number conceived in the 1st cycle divided by the total number of ewes that conceived.
[c] Number of ewes lambing divided by number of ewes mated.

EWE REPRODUCTION AND OFFSPRING PERFORMANCE OF BOOROOLA MERINO X RAMBOUILLET SHEEP SELECTED FOR HETEROZYGOSITY OR HOMOZYGOSITY OF THE BOOROOLA F GENE

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INTRODUCTION

Several questions have been raised in regards to the recent importation of the Booroola Merino. Booroola Merino sheep are noted for exceptional prolificacy and appear to produce a 60's to 62's fleece. However, Booroola sheep are small by American standards and ewes that weigh less than 100 pounds are not uncommon. Because of the severe restrictions on size, the initial cross between Booroola Merino rams and another ewe breed may not overcome the size restriction. Fortunately, prolificacy of the Booroola Merino is thought to be transmitted through classical Mendelian inheritance as a single gene called the F gene. This is in contrast to Finnish Landrace sheep which transmit their prolificacy through additive gene action which results in dilution of the genes with each successive outcross. In the case of Booroola Merino sheep, if ewes or rams that carry the gene can be easily identified early in life, then producers can select for prolificacy independent of body size. Eventually an acceptable ewe should be achieved that carries the Booroola prolificacy gene. The purpose of this study is to evaluate the genetic mechanism which determines increased prolificacy of Booroola Merino ewes and develop breeding schemes to introduce Booroola fertility into North Dakota flocks.

PROCEDURE

A flock of F1 Booroola Merino X Rambouillet ewes were produced at the NDSU Research Extension Center - Hettinger during 1984 and 1985 utilizing a group of Wyoming Rambouillet range ewes and Booroola Merino rams loaned from USDA-Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska. F1 ewes and rams produced from these matings have been utilized to produce two sets of ewes. One set, Dakota Rambouillets, is being upgraded towards Rambouillet through successive backcrossing to Rambouillet. The other set, Dakota Merinos,is being upgraded towards Booroola Merino through backcrossing to Booroola Merino rams or to progeny tested Booroola Merino X Rambouillet rams.

Dakota Rambouillets were initially produced in 1986 when F1 Booroola Merino X Rambouillet rams were mated to Wyoming Rambouillet ewes to produce the first set of 1/4 Booroola Merino X 3/4 Rambouillet ewes. In 1988, the second set was produced by mating F1 Booroola Merino X Rambouillet ewes to Rambouillet rams. The Dakota Merinos were initially produced in 1985, 1986 and 1987 by mating the F1 Booroola Merino X Rambouillet ewes to Booroola Merino rams loaned from USDA-Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska. Additional Dakota

Merinos were produced in 1988 by mating Dakota Merino ewes to F1 Booroola X Rambouillet rams and in 1989 by mating the F1 Booroola Merino X Rambouillet ewes to F1 Booroola Merino X Rambouillet rams. The control Rambouillet ewes were produced from the Wyoming ewes bred to Rambouillet rams and are maintained as a line of straight bred Rambouillets.

Dakota Rambouillet ewes are selected based on the first two estimates of ovulation rate obtained. These can be either ovulation rate determined from corpora lutea number or lambing rate. Ewes are maintained as Dakota Rambouillet if the ovulation rate at the first two estimates is 2 or greater or one of the estimates is three or greater. Dakota Merino ewes are selected based on a minimum of two sequential corpora lutea estimates of ovulation rate at a minimum of 18 months of age. Ewes are maintained as Dakota Merinos if the corpora lutea count averages four or greater. No selection is applied to the Rambouillet flock.

Breeding seasons start based on the calendar day and the rams are pulled on the 34th day of breeding. All Dakota Rambouillet ewes are exposed starting August 8th (plus or minus one day). All lambs resulting from the August breeding are weaned 234 days (March 30) from the introduction of the rams. A November cleanup breeding season starts 100 days (November 16) after the introduction of rams in August. Lambs resulting from the November breeding are weaned at 56 days of age. Sequential ovulation rate data are collected on the Dakota Merino ewes starting with the August breeding season. The Dakota Merino ewes are not exposed to intact rams until the November breeding season. Dakota Merino ewes are either bred naturally or through AI procedures to random homozygous Booroola Merino rams. Dakota Merino lambs are managed the same as Dakota Rambouillet lambs. All ewes are fed according to 1985 NRC standards.

RESULTS AND DISCUSSION.

Growth data are presented in Table 1 for Rambouillet, Dakota Rambouillet and Dakota Merino ewes. All the growth traits are influenced to some extend by the percentage of Booroola Merino present within the ewe type. Birth weight, weaning weight, eight month and ten month weight all tend to increase as the Rambouillet percentage increases.

The classification for the Dakota Rambouillet was derived based on the data presented in table 2. The objective was to maximize the percentage of ewes that carry the F gene within the selected group of replacement ewes. Table 2 represents two types of sheep. The Rambouillet which does not carry the F gene, and all the F1 1/2 Booroola ewes which should carry one copy of the F gene. Three cases are presented, each differing on how estimated twin ovulators are selected. In each case if a ewe produced triplet ovulations or lambs, the ewe is automatically included. If only one observation for twin ovulation rate was made (case A), only 55.8% of the carriers would be identified along with

20.4% that would be called carriers but really were not (55.8% for F1 1/2 Booroola and 20.4% for Rambouillet). Case B represents the same criteria as case A but the ewes are given two chances to produce an estimated ovualtion rate of two, one based on corpora lutea and the other on lambing rate. In case B, 91.6% of the carriers were identified along with 62.4% that would be called carriers but really were not (91.6% for F1 1/2 Booroola and 62.4% for Rambouillet). In case A, too many carrier ewes would be eliminated and in case B excessive non-carrier ewes would be kept. Case C requires that the ovulation rate average two based on two estimates. The third situation (case C) is more desirable since a producer's goal is simply to average two live lambs per ewe. Case C is the one selected as the criteria for Dakota Rambouillets since almost 78% of the carriers appear to be retained along with only 12% of the non-carriers. As long as a ewe produces two live lambs the biological reason becomes a moot issue. A more critical test could be applied to assure that subsequent replacement ewe lambs are progeny of F gene carriers by requiring evidence of a triplet ovulation within the first two estimates of ovulation rate. The percentage of ewes having 3 or greater corpora lutea or producing 3 or more lambs at their first parturition were 56.8% for F1 1/2 Booroolas and only 2.2% for Rambouillets. Therefore, almost all ewes that produce a triplet or greater ovulation within the first two estimates of ovulation rate are predicted carriers of the F gene, providing the ewes were produced from a Rambouillet base.

The classification of Dakota Merinos was developed from table 3. Theoretically, 50% of the progeny from the F1 Booroola Merino ewes mated to Booroola Merino rams should carry one copy of the Booroola F gene and the other 50% should carry two copies of the F gene. Reviewing the distribution of average corpora lutea presented in table 3, the selection criteria of 4 or greater corpora lutea was established to allow ewes to be retained within the Dakota Merino herd. This criteria only assumes that the probability is enhanced that a greater percentage of the homozygous ewes are included in the set of ewes with corpora lutea averages of four or more.

As mature ewes, the growth differences observed as ewe lambs are still evident as reflected in heavier prebreeding weights of the Rambouillet ewes (Table 4). As the percentage of Rambouillet increases, the prebreeding weight of the ewe increases but the lambs born per ewe lambing and lambs weaned per ewe decrease. Table 5 and 6 presents the estrous and conception data. An interesting difference can be observed between the Dakota Rambouillet ewes and Rambouillet ewes. A greater percentage of Dakota Rambouillet ewes conceive to the first 17 days of ram exposure than do Rambouillet ewes and Dakota Rambouillet ewes have greater conception rates during August.

TABLE 1

ACTUAL BIRTH, WEANING, EIGHT MONTH AND TEN MONTH WEIGHT FOR RAMBOUILLET, DAKOTA RAMBOUILLET AND DAKOTA MERINO EWE LAMBS

EWE TYPE	NUMBER WEANED	BIRTH WEIGHT	WEANING WEIGHT	7 M WEIGHT	10 M WEIGHT
Rambouillet	250	11.4	36.3	115.5	120.1
Dakota Rambouillet	134	9.9	35.3	101.2	119.4
Dakota Merino	118	7.8	29.7	88.5	89.8

TABLE 2

CLASSIFICATION OF EWES BASED ON CORPORA LUTEA AT 10 OR LESS MONTHS OF AGE AND/OR NUMBER OF LAMBS AT FIRST PARTURITION FOR RAMBOUILLET AND F1 BOOROOLA MERINO X RAMBOUILLET

EWE TYPE	PERCENTAGE OF EWES PRODUCING[a]			
	2 CL[b]	2CLor2L[c]	2CLand2L[d]	3CL/3L
Rambouillet	20.4	62.4	11.8	02.2
F1 1/2 Booroola	55.8	91.6	77.9	56.8

[a] CL=number of corpora lutea at 10 or less months of age, L=number of lambs at first parturition.

[b] Case A.

[c] Case B.

[d] Case C.

TABLE 3

FREQUENCY DISTRIBUTION OF AVERAGE CORPORA LUTEA PER 3/4 BOOROOLA MERINO X RAMBOUILLET EWE FROM SEPTEMBER THROUGH NOVEMBER

AVERAGE CORPORA LUTEA[a]	FREQUENCY[b]	TOTAL EWES
1.3	X	1
1.5		
1.7	X	1
2.0	X X X X X	5
2.3	X	1
2.5	X X	2
2.7	X X X X X X X X X	9
3.0	X X X X X X X X X X X X X X X X X	17
3.3	X X X X X X	6
3.5	X X X X X X	6
3.7	X X	2
---[c]		
4.0	X X X X X X X X X X X X X	13
4.3	X X	2
4.5	X X X	3
4.7	X X X X	4
5.0	X X X X X	5
5.3	X X X	3
5.5	X	1
5.7	X	1
6.0	X X	2
6.3	X X	2
6.5	X	1
6.7	X	1
7.0		
7.3		
7.5		
7.7	X	1
8.0	X	1

[a] Average corpora lutea number is based on 2 or 3 consecutive estrous cycles starting in August.
[b] X=average value for an individual ewe.
[c] arbitrary division between predicted homozygous and heterozygous ewes.

TABLE 4

REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS FOR RAMBOUILLET, DAKOTA RAMBOUILLET AND DAKOTA MERINO

EWE TYPE	PREBREEDING WEIGHT	LAMBS BORN/ EWE LAMBING	LAMBS WEANED/ EWE LAMBING
Rambouillet	151 (247)	1.73 (55)	1.45 (55)
Dakota Rambouillet	139 (65)	2.70 (33)	1.36 (33)
Dakota Merino	110 (51)	2.45 (11)	1.82 (11)

TABLE 5

ESTROUS EXPRESSION AND PERCENTAGE OF TOTAL EWES MATED FOR RAMBOUILLET, DAKOTA RAMBOUILLET AND DAKOTA MERINO

	ESTROUS EXPRESSION[a]					
EWE TYPE	NONE	1ST CYCLE	2ND CYCLE	BOTH CYCLES	1ST CYCLE PERCENTAGE[b]	PERCENTAGE OF TOTAL EWES MATED[c]
Rambouillet	23	60	121	43	46.0	90.7
Dakota Rambouillet	2	39	15	10	76.6	97.0
Dakota Merino[d]	1	6	2	3	81.8	91.7

[a] Includes those ewes that have medium or heavy breeding marks only.
[b] Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[c] Total ewes mated divided by total ewes.
[d] In 1989 ewes were bred AI, so no estrous data was collected.

TABLE 6

CONCEPTION CYCLE AND PERCENTAGE OF MATED EWES CONCEIVED FOR RAMBOUILLET, DAKOTA RAMBOUILLET AND DAKOTA MERINO

EWE TYPE	CONCEPTION CYCLE[a] FAILED	1ST CYCLE	2ND CYCLE	1ST CYCLE PERCENTAGE[b]	CONCEPTION PERCENTAGE[c]
Rambouillet	20	13	42	23.6	85.9
Dakota Rambouillet	0	19	14	57.6	100.0
Dakota Merino	1	8	3	72.7	100.0

[a] Conception cycle based on actual estrous date or 150 day gestation length (actual mean Rambouillet gestation length = 150.48 days; st. dev. = 2.82; min = 144; max = 165; actual mean Dakota Rambouillet gestation length = 149.8 days; st. dev. = 1.78; min = 145; max = 153; actual mean Dakota Merino gestation length = 148.8 days; st. dev. = 2.14; min = 145; max = 153).
[b] Number conceived in the 1st cycle divided by the total number of ewes that conceived.
[c] Number of ewes lambing divided by number of ewes mated.

EWE REPRODUCTION AND OFFSPRING PERFORMANCE OF F1 BOOROOLA MERINO X RAMBOUILLET, F1 FINNISH LANDRACE X RAMBOUILLET AND RAMBOUILLET UNDER SEMI-RANGE AND SEMI-CONFINEMENT MANAGEMENT SYSTEMS

K.A. Ringwall, T.C. Faller, P.M. Berg and L.D. Young

INTRODUCTION

Sheep producers that desire to provide a fine-wool product along with maximum pounds of lamb per ewe have not had many options in the past. These producers have utilized Rambouillet or Rambouillet type sheep and have had to rely on selection to increase the reproductive capacity of their flocks. Selection for increased reproduction has been a very slow process, and since the Rambouillet sheep does not provide much variation in reproductive capacity, improvement has been little to none over the years. A new development within the sheep industry has been the importation of the Booroola Merino. The Booroola Merino is a sheep that would not decrease wool quality and offers increased reproductive capacity. By incorporating the Booroola Merino into a fine-wool producer's operation, the producer would have the ability to increase lamb production without hindering wool quality and subsequent income. The objective of this trial is to evaluate ewe production and offspring performance of specific crosses of Booroola Merino, Finnish Landrace, and Rambouillet breeds of sheep under different management systems so that a better understanding of the Booroola Merino sheep can be achieved and properly evaluated for use in North Dakota sheep flocks.

PROCEDURE

Reproductive performance, wool production, and attrition are being evaluated for F1 Booroola Merino x Rambouillet (BxR), F1 Finnish Landrace x Rambouillet (FxR) and Rambouillet (Rambouillet) ewes under confinement versus semi-range management. Crosses to obtain these ewes were made in 1984 and 1985 utilizing a group of Wyoming Rambouillet range ewes and Finnish Landrace or Booroola Merino rams loaned from USDA-Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska. The Rambouillet control ewes were purchased from the same source as the ewes utilized in making the F1 crosses. In the falls of 1986 and 1987, a minimum of 36 BxR ewes, 36 FxR ewes, and 36 Rambouillet ewes were randomly selected from those lambs born during 1985 and 1986. These ewes were managed similarly until the fall of 1987 when the surviving ewes were assigned to confinement or semi-range management groups. The ewe were either 1 1/2 or 2 1/2 years of age at the start of the trial.

Ewes and lambs are fed by current NRC requirements for sheep with the exception that no increase in nutrition is given at breeding. Confinement lambs are raised under total confinement and go to the feedlot following weaning. Under the semi-range system, lambs are weighed the same time as the confinement group for weaning, but are returned to range for the rest of the summer with their dams. Both groups of ewes are combined from breeding to just prior to lambing and allowed to stubble graze until winter and are then fed under drylot conditions. Starting in mid November, Rambouillet rams have been used during the first 17 days of the breeding season. Suffolk or Columbia rams are used the last 17 days of the breeding season.

In 1989 all ewes were synchronized. Ewes were injected with a combined dose of .5 mg fenprostalene and 200 mg of oxytetracycline at 1:00 pm on November 2. Teaser wethers were placed with all the ewes on November 3 through November 6. The ewes were injected with a combined dose of .5 mg fenprostalene and 200 mg of oxytetracycline at 9:00 am on November 13. Rams were placed with all ewes at the time of the second injection. A random sample (nine ewes) of each breed group within treatment was placed with teaser wethers for AI to a Merino sire (J.C.&S. 50 Like - Western Breeders International) at 9:00 am November 14. The remaining ewes were randomly divided, with 15 head per pen and one Rambouillet ram per pen. At 9:00 am on November 15 all the ewes exposed to natural service were grouped into a multi-sire lot. The AI ewes were returned to the main breeding group November 17. All ewes remained with Rambouillet rams until December 7. Columbia rams replaced the Rambouillet rams on December 7 and the ewes were exposed to these rams until December 21.

RESULTS AND DISCUSSION

April reproductive performance and subsequent lamb growth are presented in table 1. These preliminary data only include 1987 and 1988 growth and reproductive performance information. Management system does not have any obvious effects on ewe size at the start of the trial, but confined ewes fed a maintenance ration with no flush lost weight prior to the 1988 breeding and substantially more weight prior to the 1989 breeding season. The outside ewes that had access to fall grazing have maintained or even gained weight prior to breeding. Currently, FxR and Rambouillet ewes are similar in weight and are the heaviest ewe types. BxR are the lightest ewes within each system. FxR ewes are also the most fertile in both systems during November breeding, however, BxR ewes are the most prolific.

The FXR ewes are weaning the greatest percentage of lambs per ewe lambed. The BXR and Rambouillet ewes are similar in percentage of lambs weaned. The weaning percentage does not include those lambs that were sold as bum lambs at one day of age. Weaning weights are similar between breeds within the confinement system, but more differences seem to be developing between breeds under semi-range. In either situation, the Rambouillet are producing a slightly heavier lamb. As lambs approach 5 months of age, the same trends are evident as were present at weaning time. In 1987, the confinement lambs were heavier at five months of age than the range lambs. The opposite was true in 1988. The range lambs outweighed the confinement lambs at five months of age. Lambs from BxR ewes appear to be expressing an early maturing growth pattern in contrast to the Rambouillet lambs. Table 2 presents the results of synchronizing the ewes in 1989. Although the ewes have not lambed, the procedure used was quite successful for the purpose of bring the ewes in to estrus.

The ewes involved in this trial will produce their final lamb crop under the present management system this coming April. Conclusions will be made this coming fall based on the data collected. Speculation would indicate that BxR ewes have difficulty competing with larger framed FxR and Rambouillet ewes. Excessive prolificacy of BxR ewes increases the stress these ewes are under and the BxR ewes may require additional inputs and a non-competitive environment to express their full potential. Currently, FxR ewes are producing more lambs that grow similarly to Rambouillet lambs, therefore, suggesting increased total lamb pounds marketed. Rambouillet ewes indicate the least fertility and prolificacy, so even with similar lamb growth rate of FxR ewes, total lamb marketings are limited.

TABLE 1

APRIL REPRODUCTIVE PERFORMANCE AND SUBSEQUENT LAMB GROWTH OF BOOROOLA MERINO X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND RAMBOUILLET X RAMBOUILLET EWES BORN DURING 1985 AND 1986 AND MAINTAINED UNDER SEMI-CONFINMENT OR SEMI-RANGE MANAGEMENT

	BOOROOLA MERINO		FINNISH LANDRACE		RAMBOUILLET	
	CONF.	RANGE	CONF.	RANGE	CONF.	RANGE
INITIAL EWE NUMBERS						
1987	31	32	32	34	37	30
1988	28	29	31	31	34	28
1989	25	28	27	25	32	27
PRE-BREEDING WEIGHT (LBS)						
1987	128	126	152	150	140	139
1988	128	139	157	161	153	160
1989	102	138	125	156	122	159
ACCUMULATED EWE ATTRITION (%)						
1987	09.7	09.4	03.1	08.8	08.1	06.7
1988	19.4	12.5	15.6	26.5	13.5	10.0
EWES LAMBING (%)						
1987	96.8	84.4	96.9	91.2	81.1	86.7
1988	89.3	93.1	93.5	96.8	85.3	96.4
LAMBS BORN PER EWE LAMBED (%)						
1987	263	274	229	235	160	158
1988	244	263	214	260	148	174
AVERAGE JULIAN LAMBING DATE						
1987	104	106	105	102	108	103
1988	113	113	111	111	117	113
LAMBS WEANED PER EWE LAMBED (%)						
1987	130	119	168	165	117	123
1988	128	152	162	167	110	148
AVERAGE 56 DAY WEIGHT (LBS)						
1987	38.4	33.1	36.3	37.9	41.1	36.6
1988	35.0	38.8	38.4	42.8	38.6	48.1
AVERAGE FIVE MONTH WEIGHT (LBS)						
1987	69.0	56.4	73.4	65.3	74.5	64.4
1988	70.0	77.1	81.7	84.4	78.4	88.9
FEEDER LAMBS MARKETED PER EWE EXPOSED (%)						
1987	090.3	100.0	150.0	147.1	081.1	106.7
1988	107.1	127.6	135.5	148.4	085.3	132.1
AVERAGE ANNUAL WOOL WEIGHT (LBS)						
1987	11.7	12.9	10.1	10.3	11.3	11.9
1988						

TABLE 2

ESTROUS RESPONSE TO SYCHRONIZATION WITH FENPROSTALENE

Date	Time	Post injection time (hours)	Number ewes in estrus	Percentage in estrus	Accumulated percentage
Nov 14	3:00 pm	30	0	0.0	0.0
Nov 14	6:00 pm	33	19	11.6	11.6
Nov 15	8:00 am	47	78	47.6	59.2
Nov 15	12:00 pm	51	15	9.1	68.3
Nov 15	6:00 pm	57	15	9.1	77.4
Nov 16	7:00 am	70	16	9.8	87.2
Nov 16	5:00 pm	80	3	2.8	89.0

LOW INPUT CROP-LIVESTOCK PRODUCTION
(PROGRESS REPORT)

T.C. Faller and K.A. Ringwall

Hettinger Research Extension Center

Introduction

Many questions have been raised on the feasability of utilizing crop residue (straw) and grain residue (screenings) for sustaining the ewe flock. North Dakota produces ample amounts of both types of residues to warrant further investigation. To improve the economics for the sheep producer, technology must help them increase levels of productivity or reduce expenses per unit of production. The first objective of this investigation will look at reducing expenses per unit of production utilizing crop and grain residues.

Quality and quantity of manure produced have historically not been evaluated as a component of the total animal production system. There is renewed interest in the utilization of naturally produced forms of fertilizer. The second objective of this investigation is to evaluate quantity and quality of manure produced as a potential component of the crop livestock production system.

Procedure

A flock of ninety western whitefaced two year old ewes will randomly be allotted to three treatments with two replications. High Input (HI) diets will consist of alfalfa hay ground and self-fed. Low Input (LI) diets will consist of 50% alfalfa hay ground and 50% wheat straw ground and self-fed. Control (C) diets will consist of ground alfalfa and whole grains fed according to N.R.C. requirements. LI diets will be supplemented with grain residue prior to breeding, lambing and during lactation periods. HI and C diets will be supplemented with whole grain prior to breeding, lambing and during lactation. All groups will be maintained in a controlled environment.

Data collected will be normal annual production information including breeding efficiences. Additional ewe data will be collected, routinely evaluating ewe body weights and condition scores. Condition scores will be on a 1-5 scale with 1 being emaciated and 5 being obese. All feed and bedding inputs will be recorded. Manure weights and quality will be recorded. Quality of manure will be measured by NIRS analysis and varified by wet lab analysis. Core samples of the manure pack will be taken prior to removing and weighing the manure. Routine fecal samples will be collected.

Objectives

The first objective is to determine comparable feeding values of various salvage feedstuffs when compared to traditional sheep feeds. The second objective is to determine replacement fertilizer value of raw manure produced from non-traditional feeding regimes based on salvage feeds harvested.

Results and Discussion

The results from the first year of this trial are shown in Tables 1 through 6. Ewe body condition scores and weights are shown in Table 1. Ewe body weights for the HI feeding regime were significantly greater ($<.05$) than LI at breeding, C at lambing and LI and C at weaning. Condition scores for the HI feeding regime were significantly greater (P<.05) than C and LI at lambing and weaning. Table 2 indicates the effects on reproductive performance. Ewes on the LI diet bred significantly earlier than ewes on the C diet. Table 3 indicates that lamb birth and growth information was quite similar across treatments with no significant differences. Table 4 indicates actual differences in consumption of alfalfa, straw and bedding use for the different feeding regimes. This data has not been analyzed for significance in the first year. Feeds costs as represented in Table 5 are based on the consumption data of Table 4. While neither have been analyzed for significance, there are apparent economic advantages when comparing LI diets to HI and C diets. LI diets indicate the value of straw as a component of sheep rations. Table 6 indicates raw manure production of the different feeding regimes. The manure has not been submitted for composition analysis.

The ewe's first years response to the LI diet and feeding regime when comparing performance to costs warrants further investigation.

Acknowledgement

The grant provided by the North Central Region LISA Project was very instrumental in accomplishing this research.

Technician support of Dave Pearson and Don Stecher was very important in the accuracy of reporting and data collection in this trial.

TABLE 1

TREATMENT EFFECT ON BODY WEIGHT AND CONDITION SCORE

	INITIAL		BREEDING		LAMBING		WEANING	
TREATMENT	WT	COND	WT	COND	WT	COND	WT	COND
1 (C)	131	3.0	156	3.1	169^b	3.2^a	139^a	2.5^a
2 (HI)	132	3.0	163^a	3.3	184^a	3.6^b	152^b	2.8^b
3 (LI)	131	3.0	151^b	3.1	175	3.1^a	138^a	2.4^a

[ab] means with different superscript in the same column within the same year differ (P<.05)

TABLE 2

TREATMENT EFFECT ON REPRODUCTIVE PERFORMANCE

TREATMENT	WOOL WT*	LAMBING DATE (JULIAN)	LAMBS BORN PER EWE	LAMBS WEANED PER EWE
1 (C)	10.8	116[a]	1.57	1.11
2 (HI)	11.6	115	1.47	1.10
3 (LI)	10.5	112[b]	1.71	1.29

*Differences in wool production should not be attributed to treatment effect rather real differences due to randomization.

[ab] means with different superscript in the same column within the same year differ (<.05)

TABLE 3

TREATMENT EFFECT ON LAMB BIRTH WEIGHT AND GROWTH

TREATMENT	BIRTH WT	LAMB ACTUAL WEANING WT	LAMB ADJUSTED WEANING WT
1 (C)	12.2	45.4	42.3
2 (HI)	12.3	45.7	42.0
3 (LI)	11.7	44.8	39.4

TABLE 4

ANNUAL FEED AND BEDDING CONSUMPTION PER EWE

	Rep 1			Rep 2		
	Pen 1	Pen 2	Pen 3	Pen 1	Pen 2	Pen 3
Treatment	(C)	(HI)	(LI)	(C)	(HI)	(LI)
Hay	1563.2	2142.2	1092.5	1565.6	2164.3	1099.8
Grown	176.1	176.1	176.1	176.1	176.1	176.1
Straw Fed	0	0	1007.5	0	0	1015.5
Bedding	222.7	220.7	219.2	219.3	237.9	215.5

TABLE 5

ANNUAL FEED AND BEDDING COSTS* PER EWE

	Rep 1			Rep 2		
	Pen 1	Pen 2	Pen 3	Pen 1	Pen 2	Pen 3
Treatment	(C)	(HI)	(LI)	(C)	(HI)	(LI)
Hay	46.90	64.27	32.78	46.97	64.93	32.99
Grain	8.14	8.14	3.26	8.14	8.14	3.26
Straw	0	0	15.11	0	0	15.23
Bedding	3.34	3.31	3.29	3.30	3.57	3.23
Total	58.38	75.82	54.44	58.41	76.64	54.74

*Costs are based on assuming: Hay $60/T, Straw $30/T, Grain $100/T and Wheat Screenings $40/T.

TABLE 6

ANNUAL MANURE* PRODUCTION PER EWE

	Rep 1			Rep 2		
	Pen 1	Pen 2	Pen 3	Pen 1	Pen 2	Pen 3
Treatment	(C)	(HI)	(LI)	(C)	(HI)	(LI)
Manure (lbs)	2709.7	3049.7	3030.0	2929.3	3240.3	3271.3

*Represents raw manure production with no correction for moisture content.

SECTION II

GUEST SPEAKER SECTION

PRESENTED BY

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AT THE
31ST ANNUAL SHEEP DAY
HETTINGER RESEARCH AND EXTENSION CENTER
HETTINGER, NORTH DAKOTA

FEBRUARY 14, 1990

NUTRITION AND REPRODUCTION IN THE EWE

Speaker: Stewart M. RHIND B Sc, PhD

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SUMMARY OF PRESENTATION

The importance of nutritional limitations on reproductive performance under U.K. conditions will be outlined briefly and discussed in relation to conditions in the U.S.

Nutritional effects on ewe reproductive performance operate over periods of:

Years--undernutrition of the ewe at 0-6 months of age reduces subsequent lifetime lamb production.

Months--undernutrition at 6 months before mating reduces lamb production from that mating.

Weeks--ewes which are moderately fat during the month before mating produce more lambs.

Days--flushing (increased feed before mating) results in more lambs.

Nutrition is important at all seasons and at all ages, not just at mating.

Effects of nutrition could be mediated through effects on:

Oestrus--no problem in practice.

Ovulation--important.

Fertilization--no problem in practice.

Embryo survival--important.

NUTRITION AND REPRODUCTION IN THE EWE

Speaker: Stewart M. RHIND

What are the effects of nutrition on ovulation rate (number of eggs shed)?

The effects of ewe body condition (fatness) and or level of food intake are separate but the two effects interact. (Very fat or very thin ewes are less likely to respond to increased feed intake before mating.) In summary:

1. Fat ewes shed more eggs than thin ewes.
2. Ewes with a high feed intake at/before mating shed more eggs than ewes with a moderate/low intake.
3. The relationship between fatness/intake and number of eggs shed differs with breed (e.g., nutrition has much less effect in Finnish Landrace ewes than in more conventional breeds).

What are the effects of nutrition on embryo survival rates?

1. Overfatness increases embryonic loss.
2. Declining body condition (fatness) during and after mating increases embryonic loss.
3. Very high food intakes in early pregnancy can increase embryonic loss.

What about artificial stimulation of reproductive performance?

Nutritional restrictions on reproductive performance can be overcome using "fertility drugs" such as pregnant mares serum gonadotrophin (PMSG) or immunological techniques such as Fecundin **BUT** success depends on them being used along with good nutritional management and **NOT** as a substitute for good nutrition and/or good management.

Conclusions

1. Nutrition of the ewe is important at all ages and seasons.
2. Moderate to good body condition at mating is desirable; obesity adversely affects reproductive performance.
3. Increasing liveweight and body condition during the month before mating is desirable; very high levels of intake in early pregnancy may be counterproductive.
4. Loss of liveweight and condition during the month following mating should be avoided whenever possible.
5. There are aids to lamb production but there is no substitute for good nutritional management.

ULTRASOUND PREGNANCY DIAGNOSIS AND ITS POTENTIAL FOR THE SHEEP PRODUCER

DR. RALPH MILLER, D.V.M.

The advent of real-time ultrasound scanning of ewes for pregnancy diagnosis has opened up several new marketing options that can yield significant profit increases for the sheep producer. In addition, information derived from fetal number determinations in the pregnant ewe can aid in selective culling and feeding in the flock.

OPTION 1 - CULLING OF THE OPEN EWE

No one wants to feed and maintain an open non-productive ewe. An open ewe at best produces 10-12 lbs. of wool worth approximately $24. That is her net income. Her cost of maintenance includes the following:

200 days on grass at 3¢/day	$ 6.00
165 days on hay/grain at 12¢/day	19.80
Interest on investment for a $90 ewe at 10% per annum	9.00
Labor, wear and tear and depreciation on facilities	1.00
Net cost of maintenance	$ 35.80

A ewe that fails to conceive at breeding time has a lost net income of $35 if she were to carry a singleton lamb. If she were to have twins as 25-50% of most ewes do, her lost net income would be $70.

Net wool income	$ 24.00
Net cost of maintenance	-35.80
Net lost income of a singleton lamb	-35.00
Net loss per singleton bearing open ewe	$-46.80

These figures may differ slightly from operation to operation, but, the basic fact is: It costs money to maintain an open ewe!

OPTION 2 - MAXIMIZING THE VALUE OF THE EWE LAMB

In 1988 and again in September of 1989 fat lamb prices have dropped to 55¢/lb. That means that the net worth of a ewe lamb weighing 120 lbs. is $66. However, the net worth of a 120 lb. pregnant ewe lamb is $100-110/head. If the producer or feeder were to turn bucks in with 90-95 lb. ewe lambs and sort off the pregnant ones he could protect himself against a falling fat lamb market. A $100 pregnant ewe lamb weighing 120 lb. is the same as 83¢/lb. on the fat lamb market.

One should also remember that ewe lambs that conceive as ewe lambs, produce offspring with similar breeding genetics. In addition those ewes often become the multiple lamb producing members of the flock.

OPTION 3 - SEPARATING SINGLETON CARRYING EWES FROM MULTIPLE CARRYING EWES FOR SELECTIVE FEEDING

Being able to separate ewes carrying singleton lambs from those carrying multiples enables the producer to selectively feed and pen ewes for lambing. 80% of fetal growth occurs during the last 6 weeks of gestation. To insure proper conditioning of ewes during pregnancy, to avoid pregnancy toxemia in the third trimester, and to produce strong healthy lambs at birth, the following feeding regime is recommended.

- During the first 15 weeks of gestation a singleton and multiple carrying ewe in good condition should be fed to gain .066 lb. per day or 7 lbs. over the first 105 days.

- During the last 6 weeks of gestation singleton carrying ewes should be fed to gain .4 lbs. per day or 16.5 lbs. over the last 42 days.

- Energy requirements for twin bearing ewes are 180% of those carrying singletons during that last 6 week period.

- Energy requirements for triplet bearing ewes are 240% of those carrying singletons.

Selective feeding has been shown to increase lamb birthweights and survivability. One should not be fooled into believing that because a pregnant ewe is in good shape she does not need supplemental feed during the last trimester. Overconditioned ewes as well as thin ewes are equally susceptible to pregnancy toxemia, especially in the absence of supplemental energy.

If selective feeding does not fit a particular producer's operation, supplemental grain at 1-1 1/2 lb. per day per ewe should be fed to the entire flock during the third trimester of pregnancy.

OPTION 3 - SEPARATING SINGLETON FROM MULTIPLE CARRYING EWES FOR SELECTIVE PENNING AT LAMBING TIME

Selective penning of ewes offers both the range lamber and the shed lamber an opportunity to more efficiently utilize his/her labor resources at lambing time.

The producer that shed lambs all of his ewes, but has limited shed space, has several alternatives. First he could use the information from the ultrasound evaluation to stage where in the 150 day gestation period each ewe was. Those ewes bred early in the heat cycles could be brought to the lambing sheds first, and thereby reduce crowding and improve the efficiency of observation at lambing time. Another alternative for the producer would be to shed lamb those ewes carrying multiple lambs, and to drop lot those ewes with singletons.

This last alternative also exists for the range lamber. Last year, several range producers in Eastern Wyoming pregnancy tested their ewes and separated them for lambing time on the basis of singleton versus multiple lamb carrying ewes. In one operation only multiple carrying ewes were shed lambed. Weaned lamb percentages on that ranch increased from 92% to 112% as compared to the previous year. In this particular flock 3,000 head were tested. An increase of 20% in that weaned lamb crop was 600 lambs.

OPTION 5 - PREGNANCY TESTING FOR IMPROVED MARKETING

A number of producers in Eastern Montana, Colorado, Wyoming, and South Dakota have discovered that selling ewes as "guaranteed - pregnant at the time of sale" has increased the market value of the individual ewe by an average $10-20.

One producer in northeastern Wyoming had tried for over a month to market his 800 ewe lambs for $105 per head. The ewes were divided into two separate groups based on weight and breed. One group consisted of 115 lb average Rambouillet ewes and the other consisted of 135 lb. average Rambouillet-Columbia cross ewes. The groups conceived at rates of 35% and 72% respectively. All the guaranteed pregnant ewes sold one week later at St. Onge Livestock in Newell, S.D. for a $126 per head average.

Livestock markets that are now pregnancy testing ewes are drawing better quality ewes from sellers assured a good price, and higher paying buyers from the producer market. This is true because as well as udder condition and age, actual lambing dates and approximate percentage of lamb drop can now be accurately predicted and passed on to the buyer.

ACCURACY AND SPEED OF REALTIME ULTRASOUND PREGNANCY TESTING

Determination of whether a ewe is pregnant or open is virtually 100% accurate in any ewe 30 days after conception.

Separation of pregnant ewes into groups carrying singleton versus multiple lambs can be done with 96-98% accuracy. In the case of the aforementioned 3,000 head that were separated, 455 were diagnosed as carrying multiples, 450 of those did have multiple lambs. 2,445 ewes were diagnosed as carrying singletons and 50 of those had multiples. All ewes diagnosed as pregnant had lambs.

Producers with sheep crews of 5-6 people can easily test 2,000-2,500 head per day on a pregnant versus open basis. To differentiate singleton from multiple carrying ewes, in similar situations, average rates of 135 head per hour have been achieved.

CONCLUSION

With the information gained from scanning his/her sheep, the producer should be able to market his ewe lambs and breeding stock for higher prices. If he/she has a range lamb operation, increases of 20-30% in weaned lamb crops can easily justify the expense of shed lambing multiple bearing ewes. As shown above, no one can afford to maintain open non-productive ewes.

In general a producer should realize at least $10-15 in profit and/or savings for each dollar spent on ultrasound pregnancy diagnosis. This last fact alone should decide for the producer whether the ultrasound technique has a place in his/her operation.

SECTION III

MANAGEMENT SECTION

TIMOTHY C. FALLER

SUPERINTENDENT

HETTINGER RESEARCH AND EXTENSION CENTER

DR. KRIS RINGWALL

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NORTH DAKOTA STATE UNIVERSITY

31ST ANNUAL SHEEP DAY

HETTINGER RESEARCH AND EXTENSION CENTER

HETTINGER, NORTH DAKOTA

FEBRUARY 14, 1990

THE NORTH DAKOTA SHEEP DEVELOPMENT PROJECT

In 1989 the N.D. Sheep Development Project was active in southwestern North Dakota. Programs continued in Bowman, Mott, and Belfield. The program was presented in the community of Richardton however not enough interest was shown to offer the program there on a long term basis.

A similar program has been planned for implementation in the eastern part of the state. The program in eastern North Dakota will be running this fall.

Spring of 1989 was the first lambing season for the participants of the program and results have been very good. Nine of the participants in the program have completed the North Dakota Sheep Production Records for 1989 at this time and the results are an average lambing rate of 142% and a 9% death loss in lambs. Average production per ewe exposed was 90 pounds of lamb.

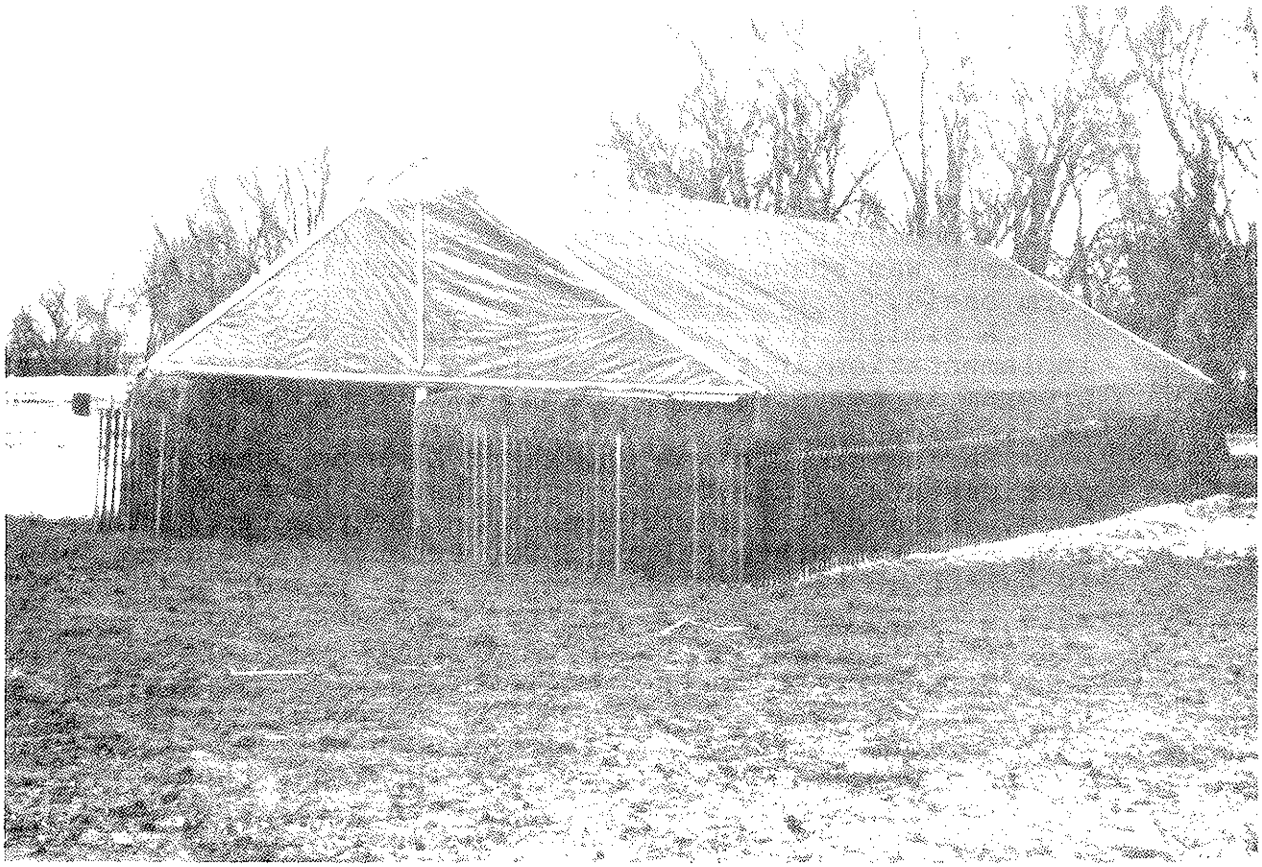
Participants in the program have also completed a financial analysis program called SHEEPBUD. Initial results look very favorable. The data will be analyzed in the summer of 1990 and will be published then.

Participants in the project held a ewe lamb sale in the fall of 1989 and will do so again in 1990. The sale will be held in conjunction with the ram sale at Hettinger on September 12. The sale will feature a larger number of consignments this year, many from production tested flocks. Mark this date on your calendar as it will be a good place to obtain your replacements. The group is also actively working on a plan to direct market lamb to the consumer.

Guidelines for membership in this program include attending the three day sheep school at Hettinger, attending at least 50% of the monthly sessions in the communities, completing a yearly SHEEPBUD, and paying a fee of one dollar per ewe. Production records are also strongly encouraged.

Benefits to the producer include both initial and continuing education, access to the groups marketing efforts, access to the groups scale, processing of production and financial records, also on farm visits and telephone consultation to address the specific concerns of each producer.

For more information contact Dan Nudell at the NDSU Research and Extension Center, Box 1377, Hettinger, ND 58639. Phone 701-567-4323.



A SHED MADE FROM STRAW USED FOR A SHEEP SHELTER

Faller,T., Nudell,D., Olson,R., Stecher,D.

ABSTRACT: In 1989 a shed was constructed of straw walls with a roof made of 2"x4" rafters covered with a plastic tarp. Total usable inside space is 765 square feet. Total cost of the materials was $892 dollars. Total labor was approximately three man days. Excluding labor charge the cost of shelter is $1.17 per square foot. Average price of traditional pole construction is approximately $2.50-$3.00 per square foot. Consumption of the flax straw walls has been a problem. Life of the tarp is unknown.

In the fall of 1989 a shed was constructed on the south unit of the NDSU Research and Extension Center at Hettinger, N. D. The shed was needed to house ewe lambs over winter. To meet this need it was decided to construct a shed made primarily of straw. Straw barns were at one time fairly common in ND and a few still exist. The shed at Hettinger was built both to provide a low cost solution for the housing need at the Research Center and as an experiment to test the practical use of this type of building.

North Dakota is also aggressively pursuing an expansion in the sheep industry in the state. With a strong push on to create new livestock producers in the state, many on farms that previously did not have stock, there is a need for a low cost shelter design. This design must be of very low capital input, preferably using farm labor to erect. If the straw shed design works as anticipated it may be the answer to this need. The building could be built with farm machinery and labor, from materials that are readily available and may already be unused on the farm. The producer will be able to use the building during the start up years when cash is at a premium and then replace the building with one of a more permanent type when finances permit. If after a trial period the farmer finds that the new livestock enterprise does not fit his operation and he wishes to stop the venture the building could be easily dismantled with most of the components being reusable. The producers financial exposure would be very small.

The sheds main component is large square bales of flax straw. The bales are approximately three feet by three feet by eight feet long (3'X 3'X 8'). The weight of these bales was approximately 400 pounds. This size bale was chosen over bales four feet by four feet by eight feet long (4'X 4'X 8') to allow handling with smaller sized equipment. Flax straw was chosen for its resistance to weather damage and its unpalatability to livestock.

The second major component of the shed is a light weight structure supporting a plastic tarp as the roof. This method was chosen to both reduce the cost and labor involved in roofing the shed. Support is provided by five inch by six inch (5"X 6") pressure treated poles set two and one half feet (2.5') in the ground. A ridge pole constructed of two 2"x4"'s nailed together spans the distance between poles. The span varies from 16 to 18 feet (16'-18'). Rafters made from single 2"x4"'s are spaced six feet (6') apart. Height at the peak is fourteen feet (14') and the pitch of the rafters is 9.8/12. The steep roof was used to reduce the amount of structure required as it was felt that snow would not stick to such a roof. A significant problem in straw barns of old was water leaking through the roof. It is hoped that the tarp roof will eliminate this problem. An unexpected benefit of the tarp roof is the amount of daylight that penetrates it and lights the inside of the barn.

The third largest expense item is the cost of snow fence to protect the bales from the sheep. The original specifications did not call for this item as we believed that the sheep would find the flax straw very unpalatable and would not eat it. This was not the case and a substantial expense was incurred in protecting the straw from the livestock. This problem may have some benefits in that more readily available straws can be used if their resistance to the weather is satisfactory.

The material cost for the shed is:

large flax bales	$300
5"X 6" treated posts	$140
ridgepole	$ 31
2"X 4" rafters @	$ 77
1"X 6" sills and crossties	$ 43
30' X 60' plastic tarp @ $70	$ 75
rolls wood snow fence and posts	$198
anchors, hardware	$ 28
	====
Total Cost	$892

Time of construction was approximately four (4) partial days. Two men could erect a shed like this in one and one half days, however three men are needed to pull the tarp over the roof.

An unexpected problem encountered during construction was consumption of the bales by the sheep. The shed at Hettinger is smaller than originally planned because the sheep totally destroyed seventeen (17) bales. In fact three sheep were killed during the construction phase because during the night the sheep ate enough straw from the stack to cause it to be unstable and tip. The three ewes were trapped under the falling bales

The possibility of using bales of wheat, barley, or corn needs to be tested. Since snow fence is required even with flax straw to prevent consumption the possibility exists to use more palatable, but also more accessible straws. An unanswered question is how will the life span of the more common straws compare to flax straw.

A concern that was not anticipated was snow sticking to the plastic roof. Even during very cold weather snow has been sticking to the roof and we are concerned about the ability of the roof to handle the snow load. We were originally concerned that wind would be a problem, however that has not been a problem so far. The barn has stood through winds of sixty (60) mph. The barn is built in the lee of a shelter belt to protect it from the wind. This may have been a mistake as wind does not seem to be causing any problems and constructing the barn in a more exposed location may help to keep the snow blown off the roof.

Total out of pocket cost of the building if home raised straw was used and posts and lumber were scavenged from the farm would be very small. However it is important to remember that this design is not tested for safety or longevity. A short usable life and/or high upkeep costs may make this building economically impractical compared to higher initial cost structures. The usable life of the tarp is unknown, if frequent replacement is needed the cost of ownership would be very high.

The esthetics of the building are very pleasing. This is a plus for this type of building as old designs are not known for a attractive appearance. Fire danger and rodent problems are two additional factors that must be considered before an investment in this type of structure is made. A building of this type may not be insurable and may in fact increase the fire risk of present structures on the farm.

Faller is Superintendent of the NDSU Research and Extension Center at Hettinger, ND, Nudell is Project Coordinator of the ND Sheep Development Project, Olson and Stecher are Research Technicians at the NDSU Research and Extension Center at Hettinger, ND.

WEAR ON CONFINEMENT SHEEP BARN AND HAY STORAGE

Dexter Johnson

After ten years of continuous use the 76' x 144' confinement sheep production barn is wearing very well. Constructed in September-December 1979 a total of 6,000 lambs have since been born and raised in it through subzero cold and over 100°F temperatures. The barn has been intensively used nearly every day since constructed.

The 60' x 48' hay storage on the east end was constructed in 1979 when additional dollars were available. Total investment in the barn, hay storage, water system, electric wiring, pens and feedbunks amounted to about $91,000.

Some major items were noted after a recent close look was made on the facility:

1. General structure is standing straight and with little rot or rusting. The screwed on corrugated metal (over the pole frame, clearspan building frame) shows little corrosion or leakage. Birds and flies are nuisances. Corrosion is showing up inside in areas above salt troughts.

2. Insulation in the ceiling was eight inches thick, blown-in type cellulose. An initial invasion of mice packed down a network of "runways" in this insulation before annihilation through an intense long range program of poison, sheet metal around poles going up into the attic (to prevent mice crawling up) and continuous use of cats. The feed and water always available plus the insulation for nesting makes a continuous rodent control program essential.

3. Water system has had few problems from leaks or wear since the initial homemade flow through pipe system was replaced in 1981 with unheated, float-controlled waterers (Ritchel model "Little Porker"). It is a daily chore to hand clean out feed/filth that accumulates in open fountains, water over-flowing from stuck float valves hasn't happened.

4. Ventilation system has performed satisfactorily with none of the six fans having been repaired since being installed. One power outage required the use of a standby generator. Fans and shutters need to be thoroughly cleaned each year so dirt doesn't foul their operation.

Condensation/frost problems are showing up more around worn doors, ceiling fresh-air inlets out of adjustment and ceiling areas where insulation has been moved. A couple of days work are needed for these repairs/improvements. A supplement heater (120,000 BTU/hr) is used at -10°F (or colder) to clear out fog that develops in the barn.

An in-depth study of air movement and temperature in various parts of the barn was made in 1984-5. The findings were that temperatures varied about 2°F from one part to another in the barn and air distribution/circulation was steady. Outdoor wind pressure differences tend to cool the windward side and push warm air to the downwind side of the barn in cold weather.

5. Manure cleaning the bedded manure pack is done 3½ times a year using a skid steer loader. Long straw has been the only bedding tried. It is dusty.

6. Collapsible feedbunks designed and installed in 1979 have performed beyond expectation. Feed alley width could be 1-2' wider. Feeding space of 12 inches per ewe is adequate when feed is always available and lambs have separate creep feed space.

7. Pen space of 15-16 sq. ft. ewe is adequate for 150 lb. ewes. For 220 lb. ewes it is too crowded especially with twin lambs resulting in lambs stepped on and feeding space limitations. A barn full of ewes is needed to provide heat for cold weather operation. Ewes are sheared prior to lambing which helps reduce pen space needs.

8. Feeding ground hay is very dusty. Mixed ground hay, ground straw and grain needs about 24 gallons of water added per ton to reduce problems. Haylage rations should reduce dust problems and will be used starting in 1990. Opening and closing doors to feed is troublesome, especially in cold weather.

9. Breeding, lambing, sorting, treating, shearing in confinement barn is no more troublesome than in traditional lambing facilities and because of intensity of operation total labor per ewe is reduced.

10. Management of the barn has involved a herd of 432 ewes which were continuously housed in the barn. This was done to research effects of continuous confinement on production. Labor averaged 1.64 hours/ewe per year. Water needs averaged 413 gallons, bedding 300 lbs. and electricity use 32 KWH per ewe per year. Feed needs were approximately 20 percent less than that needed for ewes on pasture with accessible shelter.

Since 1985 another management scheme has been researched. This involves putting two sets of ewes through the barn based on lambing through weaning. Low cost outside housing is used for the ewes that are out of the barn. This management system has improved feasability of confinement rearing of sheep.

SHEARING MANAGEMENT

Timothy C. Faller

Hettinger Research Extension Center

Animal production systems are in a constant state of flux. Producers are always making decisions that eventually effect their profitability. Some decisions such as breed selection and sire selection are of a long term nature. Normal management decisions may have long term effects but in general are thought of as only effecting profitability on an annual basis. Time of shearing is one of those management choices that is made on an annual basis and really only effects profitability in one given year. Producers have already made a decision when they wish to lamb and this decision may effect if they decide to shear prior to or after parturition. The hazard of environmental and climatic change are essential determinates of time of shearing.

The following is a list of considerations for producers when deciding which shearing date might fit them best.

ADVANTAGES

1. Reduced space requirements based on removing the annual wool clip or the provision of needed space for the baby lambs which are soon to arrive. If you shear after lambing you must provide space for the ewe, the wool and the lambs.

2. Warmer and drier lambing facilities are very positive advantages to consider when making shearing time decisions. Wool has a very absorbant characteristic which tends to keep more moisture in the lambing facility when the ewes are in full fleece. Wool is also an excellent insulator which reduces the effect of body heat when the ewes are housed inside in full fleece.

3. It is a well known fact that newborn lambs will find the teat more easily when the udder is bare. If your system requires shearing after lambing then you should shear away all wool from the udder to assist the newborn lamb in finding the teat. You may do this individually as the ewes lamb providing that you are usually present at lambing, if not you should crutch the whole brood ewe flock just prior to the first lamb being born. Crutching does increase variable costs.

4. More ewes will tend to lamb indoors when you allow them to go outside during the day for feeding purposes if they are shorn as opposed to not. Producers may experience a reduced problem with chilled udders when the ewes are shorn and fed outside than when they are crutched and fed outside.

5. A much cleaner wool clip is a major advantage to shearing prior to the onset of lambing. Most wool contamination from the lambing process comes from bedding techniques, lambing fluids, and normal body fluids associated with parturition.

6. Many times a wool break occurs because of the lambing process. It occurs because of normal fevers and stress associated with lambing. If it does occur it is better to have the break on the outside of the fleece than on the inside.

7. Paint brands will remain more legible when the ewe is branded and in short fleece as opposed to the long staple. Shearing after lambing may set up the incidence of having to rebrand the ewes and again increasing variable costs.

8. A major advantage of shearing prior to lambing is that the producer has an opportunity to evaluate and pick up body condition if the ewes are found to be too thin. The producer may find that only certain individuals are too thin possibly because of age differences or the presence of internal parasites. To use this management tool effectively it would suggest that shearing should occur about thirty days prior to the onset of lambing.

9. The most effective time to treat for external parasites is when the ewe is freshly shorn. The elimination of both internal and external parasites prior to lambing is just one less stress the ewe must contend with at this very important time.

After considering the advantages of shearing prior to lambing producers should not fail to equally weigh the disadvantages which may not be as numerous but may be the limiting factors for his operation.

DISADVANTAGES

1. If the sheep producer has selected a very severe or variable climatic time as his best time to lamb and availability of quality housing is limited the sheep producer may chose to shear after lambing. In a future year the producer might adjust his lambing time to better mesh lambing time with the desire to shear in advance of lambing.

2. Taking the wool off the ewes body when it is cold or inclement increases her energy requirement. This clearly says that a shorn ewe requires more feed during bad weather than a ewe with her wool coat on.

After you weigh the pros and cons of shearing time it would appear that most but not all sheep operations would profit by selecting a shearing date prior to the onset of lambing. The producer that does select to shear prior to lambing is faced with some additional managment considerations.

Many producers perform a wide array of management tasks approximately 25-35 days prior to the start of lambing. Shearing, treating for internal and external parasites, vaccinating for entrotoxemia, and trimming hooves are all routine management tasks that fit well together. Actual shearing date selection, lining up quality shearers, providing dry clean housing, and climatic conditions of the date selected are all factors that will influence success of accomplishing actual shearing on the date selected.

Management associated with harvesting of the sheep producers second crop is a very important factor in determining ultimate profitability of the total sheep enterprise.

HETTINGER BRANCH EXPERIMENT STATION

FLOCK CALENDAR - OUTLINE

The following guidelines are neither inclusive nor intended to fit every sheep operation. Each operation is different, therefore each "calendar of events" should be tailored to each flock's needs.

PRIOR TO BREEDING

1. Bag and mouth ewes and cull those that are not sound.
2. Replace culled ewes with top-end yearlings or ewe lambs.
3. Keep replacement ewe lambs on growing ration.
4. Evaluate sires: use production records.
    a. Be sure they are vigorous, healthy and in good breeding condition.
    b. Rams should be conditioned at least a month before the breeding season. Flush rams in poor condition.
    c. Allow at least two mature rams or four buck lambs per 100 ewes.
5. Flush ewes:
    a. 1 pound grain/day two weeks to five weeks before breeding (usually 17 days).
    b. If ewes are overconditioned, the effect of flushing will be lessened.
6. Vaccinate ewes for vibriosis and enzootic abortion (EAE).
7. Identify all ewes and rams with ear tags, paint brands or tattoos.

BREEDING

1. The ovulation rate of a ewe tends to be lowered at the first part of the breeding season. Vasectomized or teaser rams run with the ewes through the first heat period tend to stimulate them and increase the ovulation rate at the second heat period.
2. Use a ram marking harness or painted brisket to monitor breeding. Soft gun grease with paint pigment mixed in works well for painting the brisket. A color sequence of orange, red and black is recommended with colors being changed every 17 days.
3. Leave rams in NO LONGER than 51 days (35 days is more desirable).
    a. An exception may be with ewe lambs. Allowing them four heat cycles or 68 days may be beneficial.
4. Remove rams from ewes after the season (don't winter rams with ewes).

PRIOR TO LAMBING - EARLY PREGNANCY (First 15 Weeks)

1. Watch general health of ewes. If possible sort off thin ewes and give them extra feed so they can catch up.

2. Feed the poor quality roughage you have on hand during this period, saving the better for lambing.

3. An exception to the above is feeding pregnant ewe lambs. They should receive good quality roughages and grain (about 20 percent of the ration) during this period.

4. Vaccinate all ewe lambs and new ewes in the flock with their second shot for Vibrio and EAE during midgestation.

LAST SIX WEEKS BEFORE LAMBING

1. Trim hoofs and treat for internal parasites.

2. Six to four weeks before lambing, feed 1/4 to 1/3 pound grain/ewe/day.

3. Shear ewes before lambing (even up to one to two weeks prior is satisfactory). Keep feeding schedule regular and watch weather conditions immediately after shearing (cold).

4. Vaccinate ewes for enterotoxemia.

5. Control ticks and lice immediately after shearing.

6. Four weeks before lambing increase grain to 1/2 to 3/4 pound/ewe/day (usually done immediately after shearing).
7. Give A-D-E preparations to ewes if pastures and/or roughages are or have been poor quality.

8. Feed selenium-vitamin E or use an injectable product if white muscle is a problem. **Caution!** Don't do both.

9. Check facilities and equipment to be sure everything is ready for lambing.

10. Two weeks before lambing increase grain to 1 pound per ewe per day.

LAMBING

1. Be prepared for the first lambs 142 days after turning the rams in with the ewes, even though the average pregnancy period is 148 days.

2. Watch ewes closely. Extra effort will be repaid with more lambs at weaning time. Saving lambs involves a 24-hour surveillance. Additional help at this time is money well spent.

3. Put ewe and lambs in lambing pen (jug) after lambing (not before).

4. Grain feeding the ewes during the first three days after lambing is **not** necessary!

5. Be available to provide assistance if ewe has troubles.

6. Disinfect lamb's navel with iodine as soon after birth as possible.

7. Be sure both teats are functioning and lambs nurse as soon as possible.

8. Use additional heat sources (heat lamps, etc.) in cold weather.

9. Brand ewe and lambs with identical number on same sides. Identify lambs with ear tags, tattoos or both.

10. Turn ewe and lambs out of jug as soon as all are doing well (one to three days).

11. Bunch up ewes and lambs in small groups of four to eight ewes and then combine groups until they are a workable size unit.

12. Castrate and dock lambs as soon as they are strong and have a good start (two days to two weeks of age). Use a tetanus toxoid if tetanus has been a problem on the farm (toxoids are not immediate protection, it takes at least 10 days for immunity to build).

13. Vaccinate lambs for soremouth at one to two weeks of age if it has been a problem in the flock.

14. Provide a place for orphaned lambs. Make decision on what lambs to orphan as soon after birth as possible for the best success. Few ewes can successfully nurse more than two lambs.

END OF LAMBING TO WEANING

1. Feed ewes according to number of lambs suckling. Ewes with twins and triplets should receive a higher plane of nutrition.

2. Provide creep feed for lambs (especially those born during the winter and early spring).

3. Vaccinate lambs for overeating at five weeks and seven weeks of age.

WEANING

1. Wean ewes from lambs, not lambs from the ewes. If possible, remove ewes from pen out of sight and sound of lambs. If lambs have to be moved to new quarters, leave a couple of ewes with them for a few days to lead the lambs to feed and water locations.

2. Lambs should be weaned between 50 and 60 days of age or when they weigh at least 40 pounds and are eating creep and drinking water. The advantage of early weaning is that the ewe's milk production drops off to almost nothing after eight weeks of lactation.

3. Grain should be removed from the ewes diet at least one week prior to weaning and low quality roughage should be fed. Restriction of hay and water to the ewe following weaning lessens the chance of mastitis to occur. Poorer quality roughage should be fed to the ewes for at least 10 to 14 days following weaning.

4. Handle the ewes as little as possible for about 10 days following weaning. Tight udders bruise easily. If possible, bed the area where the ewes will rest heavily with straw to form a soft bed for the ewes to lay on.

WEANING TO PRE-BREEDING

1. If ewes go to pasture, treat for internal parasites.

2. Feed a maintenance ration to the ewes. Put ewe lambs that lambed back on a growing ration once they have quit milking.

3. Adjust ewes' conditions so they can be effectively flushed for next breeding season. Don't get ewes too fat prior to breeding.

ORPHAN LAMBS - MANAGEMENT IDEAS

1. To buy a good milk replacer it should be 30% fat and at least 24% protein. Good replacers are available from:
   a. Land O'Lakes
   b. G T A

   It will cost approximately $1.00 per pound and each lamb will require from 15 to 20 pounds.

2. Use good equipment. NDSU has had good success with the LAMB Bar, K & K Mfg. They sell a self priming nipple and tube assembly that we have found to be excellent for starting orphans. Many types of feeding systems can be home made.

3. Start on nurser quickly. Young lambs start easier. Check ewes udder right after she lambs and make the decision. Lambs from ewes that are questionable in any manner should be put on artificial milk. Lambs will take to nurser best at young age.

4. Self feed cold milk replacer after lambs are started. Milk replacers should be mixed with warm water for best results and then cooled down. Lambs fed cold milk grow well with less problems from scours and other digestive disturbance. Cold milk keeps better too.

5. There is a Formaldahyde solution commercially available that retards bacterial growth in milk (1 cc/gallon milk).

6. Vaccinate to protect against overeating. For immediate protection use antitoxin. For long term protection use bacterial (cl. per fringens type C & D).

7. Vaccinate to protect against "white muscle" disease. Use 1 cc of Bo Se.

8. Best results have been obtained when lambs are fed in groups of 3 or 4. This would be advisable when lambs are just being started. After lambs are successfully trained, they can be handled in groups of 25.

9. Orphan lamb pens should be heated. A plastic tent can easily be devised and heated. Extra heat will save extra lambs.

10. Provide colostrum milk for all orphans. Colostrum should be provided as quickly as possible. Colostrum milk is rich in fats, vitamins, and antibody globulins to protect against disease organisms. Cow colostrum milk can be substituted for ewe colostrum milk. It can be kept frozen in 1-4 oz. containers, 2 ounces are ideal.

11. Provide supplemental feed immediately. Use high energy, highly palatable feed. Where few lambs are being fed it may be advisable to purchase a good commercial lamb creep feed.

12. Provide clean, fresh water.

13. Wean lambs abruptly at 21-30 days of age. When to wean depends upon whether lambs are eating creep feed and drinking water. Newly weaned lambs will go backwards for several days. Do not worry - lambs will make compensating gains later on.

SHEEP BARNS AND EQUIPMENT PLANS

Dexter W. Johnson
Extension Agricultural Engineer
North Dakota State University

NOTE: These and other plans are available through county agents or from Extension Agricultural Engineering, NDSU, Fargo, ND. The drawings show construction details and include a materials list for estimating. Due to changes in lumber sizes, lumber grades, plywood quality, and other developments in building materials, some adjustments are required for older plans. (Present charge is shown or $1.00 per sheet.)

CORRALS AND BARNS

Plan No.	Plan Title	Sheets
MW 72050	Pole Utility Buildings	$2.00
MW 72505	Slatted Floor, 40'x72', Feeder Lamb Barn	3.00
MW 72506	240 Ewe and Lambing Barn, 40'x104'	3.00
MW 72507	500 Ewe and Lamb Feeding Barn, 74'x256'	3.00
MW 72508	12' x 16' Portable Lamb Feeding Shed	2.00
MW 72509	40 Ewe and Lambing Barn, 24x32'	2.00
ND Plan	Confinement Sheep Barn & Hay Storage (at Hettinger)	1.00
Reprint #759	Practical Sheep Housing for North Dakota	No Charge
USDA 6096	Shearing Shed & Corral Arrangement	1
USDA 6236	Portable Handling Corral for Sheep (Metal Wood)	1
AE-683	Sheep Barn Layout	No Charge
AED-13	Insulation and Heat Loss	No Charge
AED-19	Slip Resistant Concrete Floors	No Charge
AED-25	Earth Tube Heat Exchange System Planning	No Charge
MWPS-3	Sheep Housing and Equipment Handbook (This 116 page booklet was revised in 1982. It includes barn and layout planning plus plans for fences and sheep equipment.)	6.00
MWPS-9	Designs for Glued Trusses	5.00

FEED HANDLING & FEEDERS

USDA 5917	Fencing, Feeding, and Creep Panels	1
Reprint #409	Chopped Hay Feeder for Sheep	No Charge
Reprint	16 ft. Collapsible Fenceline Feedbunk for Sheep	No Charge
ND 872-1-1	Stationary Roughage Self Feeder for 70 Ewes or 160 Lambs	No Charge
ND 872-1-2	Portable Roughage Self Feeder for 40 Ewes or 80 Lambs	No Charge

PLan No.	Plan Title	Sheets
MW 73110	24 ft. Wide Clearspan Pole Frame Hay Shed	$ 3.00
MW 73111	36 ft. Wide Clearspan Pole Frame Hay Shed	3.00
MW 73112	48 ft. Wide Clearspan Pole Frame Hay Shed	3.00
MW 73113	32 ft. & 48 ft. Wide Pole Frame Hay Shed (Interior Poles)	3.00
MW 73210	Moveable Grain Storage Walls, 6' to 12' High	2.00
MW 73217	20, 45, 170, and 340 Bu. Hoppered Grain Bins	3.00
MW 73220	48 ft. Wide Pole Frame Grain Storage	2.00
MW 73250	Grain Storage Buildings, 600, 1000, 1200, 15000, or 2000 Bu.	3.00
MW 73293	Grain-Feed Handling Center, Work Tower Across Drive	4.00
MW 73294	Grain-Feed Handling Center, Work Tower Beside Drive	4.00
APA	10 Ton Hoppered Feed Bin	No Charge
APA	4 Compartment Bin for Feed Mill	No Charge
AED-15	Horizontal Bunker Silos, Concrete Tilt-up	No Charge
USDA 6090	5500 Bushel Wooden Grain Bin	2
MWPS-13	Planning Grain-Feed Handling Handbook	5.00