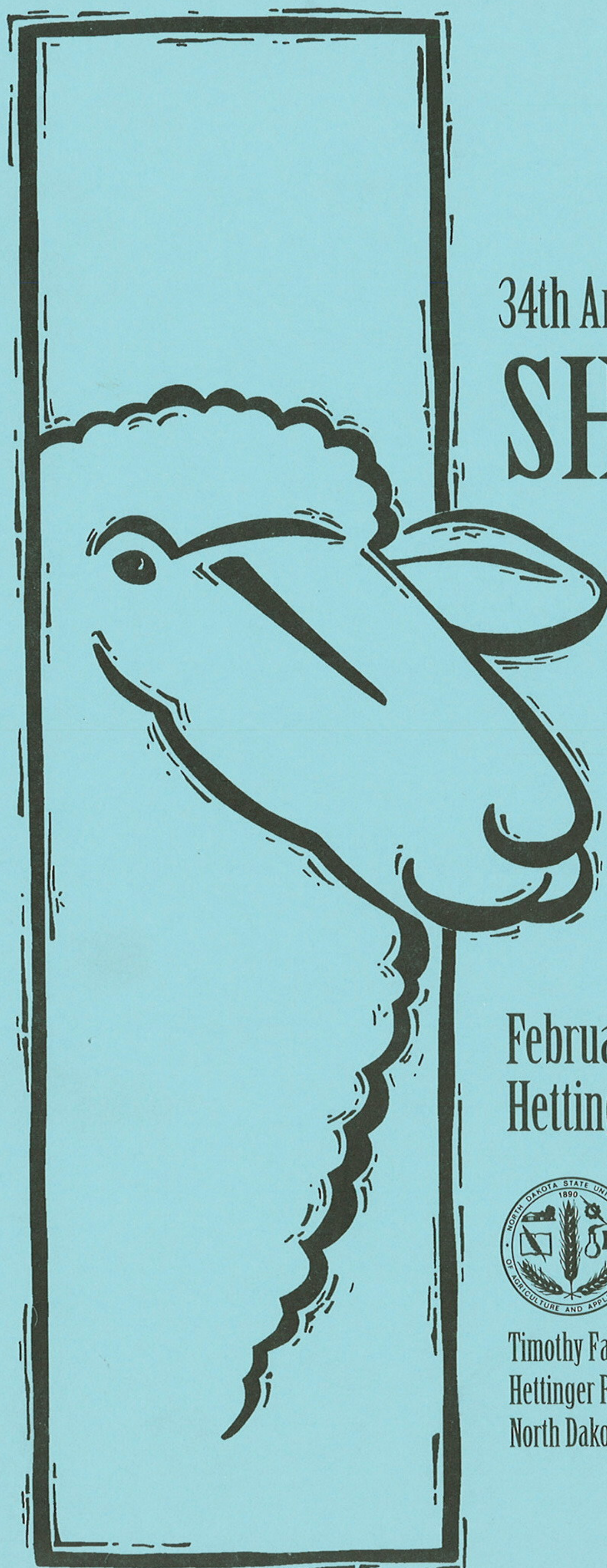

34th Annual Western Dakota

SHEEP DAY

February 10, 1993

Hettinger Armory

NORTH DAKOTA STATE UNIVERSITY 1890 OF AGRICULTURE AND APPLIED SCIENCE

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

PROGRAM

9:45 AM (MST)	Sheep Equipment Display and Coffee at the Hettinger Armory
10:00 AM	Early Bird Door Prize Drawing
10:05 AM	LIVE ANIMAL WOOL SELECTION DEMONSTRATION Hans Nel, Livestock Specialist University of Wyoming, Laramie, Wyoming
10:30 AM	HETTINGER & FARGO STATION REPORTS Dr. Duane Erickson Dr. Kris Ringwall Mr. Timothy Faller
12:00 NOON	LUNCH: AMERICAN LAMB DINNER
1:00 PM	WELCOME: NORTH DAKOTA AG EXPERIMENT STATION Dr. H.R. Lund, Director Agricultural Experiment Station North Dakota State University
1:10 PM	"FEEDING AND BREEDING FOR A LEAN LAMB" Dr. Jeff Held, Extension Sheep Specialist South Dakota State University Brookings, South Dakota
1:50 PM	"PREDATOR CONTROL" Lou Huffman, Director of Animal Damage Control Bismarck, North Dakota
2:05 PM	"MANAGEMENT FOR A PREMIUM PRICE WOOL CLIP" Dr. Rodney Kott, Extension Sheep Specialist Montana State University Bozeman, Montana
2:45 PM	"COMPUTER PROGRAMS AND TECHNOLOGY AVAILABLE TO THE SHEEP INDUSTRY" Roger Haugen, Extension Sheep Specialist North Dakota State University Fargo, North Dakota
3:20 PM	"CLOSING REMARKS" Burdell Johnson, President North Dakota Lamb and Wool Producers Tuttle, North Dakota

*There will be a spouse program in the afternoon beginning at 1:15 PM including presentations on "Living with Change" and "How to Save $1000 in 1993"

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
DICKINSON RESEARCH CENTER AND MAIN STATION

MR. ROGER HAUGEN
EXTENSION LIVESTOCK SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

DR. KRIS RINGWALL
EXTENSION LIVESTOCK SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

TIMOTHY C. FALLER
SUPERINTENDENT
HETTINGER RESEARCH EXTENSION CENTER

DR. DUANE ERICKSON
RESEARCH NUTRITIONIST
NORTH DAKOTA STATE UNIVERSITY

AT THE
34TH ANNUAL SHEEP DAY
HETTINGER RESEARCH AND EXTENSION CENTER
HETTINGER, NORTH DAKOTA
FEBRUARY 10, 1993

COMPARING STANDARD CREEP FEEDS TO A HIGH FIBER BABY LAMB CREEP PROGRESS REPORT

N.D. - 6261

T.C. Faller and K.A. Ringwall
Hettinger Research Extension Center

INTRODUCTION

Baby lamb survival and growth are major factors influencing profitability of the sheep enterprise. There are many questions about the use of creep feeds as a component of profitable sheep production. North Dakota produces the necessary ingredients for formulating acceptable baby lamb creep feeds. Most baby lamb creeps are formulated on the basis of high energy and low fiber recipes.

PROCEDURE

A flock of 360 western whitefaced ewes lambing in January were utilized to alot 180 ewes with 264 lambs to 12 pens consisting of three treatments with four replications. A typical pen would have 15 ewes with either 22 or 23 baby lambs. The lambs were sired by Rambouillet rams. The three treatments were a standard pelleted 17 percent protein high energy - low fiber creep, which will serve as the control (C), a rolled high grain textured creep that was treated with liquid molasses and 17 percent protein (TEX), and a high fiber 16 percent protein pelleted lamb creep (H.F.). Lambs were weighed initially, at 30, and 50 days from the onset of the experiment when they were weaned at approximately 66 days of age. Ewes were weighed on condition scored at the onset of the trial. Condition scores were on a 1-5 basis with 1 being emaciated and 5 being obese. All lambs were subjected to a standard grower-finisher program at the conclusion of the initial trial until they attained slaughter weigh. Carcass data was collected at slaughter time. An attempt was made to measure rumen papillae differences at slaughter time.

OBJECTIVE

The objective was to determine comparable baby lamb survivability and performance using a natural high fiber creep feed (HF), a texturized creep feed (TEX) to a standard high energy low fiber lamb creep (C).

RESULTS AND DISCUSSION

The results of the trial are shown in tables 1-6. Creep feed consumption was measured from the onset of the trial thru day 30, and for day 30-51, and then for the total duration of the trial.

The (HF) creep had the highest level of consumption and the (TEX) lamb creep had the lowest, as shown in Table 1.

TABLE 1
CREEP FEED CONSUMPTION

Daily Feed Consumption/hd	Custom High Fiber(HF)	Texturized(T)	Standard Lamb Creep(C)
1-28-92 to 2-28-92	0.41	0.28	0.30
2-28-92 to 3-19-92	1.62	1.26	1.42
1-28-92 to 3-19-92	0.87	0.66	0.74

Average daily gains of lambs in the trial differed as shown in Table 2. Lambs subjected to the (HF) gained best during the creeping period and significantly (P>.05) slower in the feedlot phase when compared to (C).

TABLE 2
LAMB AVERAGE DAILY GAIN (POUNDS)

Average Daily Gain	Custom High Fiber(HF)	Texturized(TEX)	Standard Lamb Creep(C)
1-28-92 to 2-29-92	0.52	0.42	0.46
2-28-92 to 3-19-92	0.74	0.72	0.78
1-28-92 to 3-19-92	0.61	0.54	0.58
(Creep Period)			
3-19-92 to 5-23-92	0.64	0.67	0.63
5-23-92 to 6-19-92	0.47[a]	0.54	0.63[b]
3-19-92 to 6-19-92	0.63[a]	0.67	0.67[b]
(Feedlot Period)			

[ab] Means in the same row with different superscripts differ (P<.05)

Lamb survivability was measured at four junctures from the onset of the creep feeding trial till slaughter time. While significant differences did not surface statistically, the differences that did occur in this trial would be significant to the producer; especially if they were considering using a (TEX) lamb creep. Death losses are displayed in Table 3. Differences of this magnitude certainly warrant further investigation.

TABLE 3
LAMB DEATH LOSS DURING EACH WEIGH INTERVAL[a]

Interval (days)	Custom High Fiber(HF)	Texturized(TEX)	Standard Lamb Creep(C)
1 - 31	1.2%	2.4%	8.9%
32 - 51	1.2%	6.0%	1.3%
52 - 116	4.8%	8.8%	0.0%
117 - 143	2.4%	11.8%	2.7%
TOTALS (1 - 143)	(9.6%)	(29.0%)	(12.9%)

^ Lamb death loss after day 51 bases on on male lambs.

Lamb weights displayed in Table 4 represent 4 weigh days from the onset of the trial until slaughter time.

TABLE 4
ADJUSTED 46,66,131 and 158 DAY WEIGHT[a]

Adjusted Weight	Custom High Fiber(HF)	Texturized(TEX)	Standard Lamb Creep(C)
46 day weight	33.3	29.9	30.2
66 day weight	48.2	44.0	45.4
131 day weight	88.2	87.5	86.3
158 day weight	105.4	103.1	106.9

[a] Weight adjusted for age only.

Table 5 summarizes carcass imformation of those lambs that went to slaughter. There were significant differences ($P<.05$) in leg conformation score and loin eye area when comparing those lambs that received the (HF) diet as a baby lamb to those that received the (C) diet.

TABLE 5

PERCENTAGE KIDNEY FAT, LEG CONFORMATION SCORE, USDA QUALITY GRADE, 12TH RIB FAT THICKNESS, LOIN EYE AREA AND USDA YIELD GRADE.

	Custom High Fiber (HF)	Texturized(TEX)	Standard Lamb Creep(C)
Percent Kidney Fat(%)	3.18	3.00	2.66
Leg Conformation Score	12.6[a]	11.6	11.8[b]
USDA Quality Grade	11.6	11.6	11.4
12th Rib Fat Thickness	0.17	0.21	0.17
Loin Eye Area	2.34[a]	2.19	2.14[b]
USDA Yield Grade	2.96	3.20	2.88

[ab] Means in the same row with different superscripts differ ($P<.05$)

An attempt was made to measure differences in rumen papillae development, while the data was not subjected to statistical analysis; the mean differences found in Table 6, would suggest support of other findings in this investigation that tend to favor the (HF) creep feed.

TABLE 6

RUMEN PAPILLAE LENGH IN (CM)

	High Fiber(HF)	Texturized(TEX)	Standard(C)
No Measured	16	13	23
Mean Length	.49	.43	.47

CONCLUSIONS

While the differences in baby lambs survivability and the superior carcass merit of lambs fed (HF) during days 10-66 of life, suggest that further investigation is necessary to further prove the merit of a high fiber natural creep feed for baby lambs; nothing in this trial would indicate that this industry shouldn't consider formulating baby lamb creep rations that are higher in fiber.

LOW INPUT CROP-LIVESTOCK PRODUCTION

ND-6261

T.C. Faller and K.A. Ringwall

Hettinger Research Extension Center

Introduction

To improve the economics of the sheep producer, technology must assist them to increase the level of productivity or reduce the expenses per unit of production with productivity and feed costs being the major factors affecting bottom line, technology that would increase productivity and reduce feed costs would have a major positive effect industry wide. There are many unanswered questions relating to the use of crop residues for sustaining the ewe flock. North Dakota produces ample amounts of crop residue, primarily grain straw and some corn stalks, which has much greater implications on a multi-state regional basis. The first objective of this project will look at reducing expenses per unit of production and subsequent effect on productivity.

The second objective will be to evaluate quantity and quality of manure produced. Historically manure production has not been evaluated as a component of production. There is renewed interest in evaluating all components of the crop livestock production system, such as animal manure as a natural fertilizer.

Procedure

A flock of ninety western white-faced 3 year old ewes was randomly alloted to three treatments with two replications in 1990 and re-randomized in 1991. Additional ewes were added to compensate attrition in 1992. The ewes added were of similar genetic background. High input (HI) diets consisted of alfalfa haylage wilted to 45 percent dry matter. Low input diets consist of: 50% wheat straw, 50% alfalfa haylage (LIW), and 50% corn stalks, 50% alfalfa haylage (LIC). All diets were self fed allowing the bunks to run empty 3 times per week. Diets were based on alfalfa haylage being 45% drymatter and straw and corn stalks being 90% dry matter. All diets were supplemented with grain prior to breeding, lambing and during lactation. All groups were maintained in a controlled environment. The trials were terminated each year at the time available feedstuffs were exhausted. The 1991 feeding period was 335 days and 280 days in 1992.

Data collected was normal annual production information including breeding efficiencies. Additional ewe data was collected, routinely evaluating ewe body weights and condition scores. Condition scores were on a 1-5 scale with 1 being emaciated and 5 being obese. All feed and bedding inputs were recorded. Manure weights and quality were recorded. Quality of manure was measured by NIRS analysis and varified by wet lab analysis. Core samples of the manure pack was taken prior to removing and weighing the manure. Analysis of variance was used to evaluate the effect of treatment. Least square means were calculated for each variable.

Objectives

The first objective was to determine comparable feeding values of wheat straw and cornstalks when compared to traditional sheep feeds. The second objective was to determine replacement fertilizer value of raw manure produced from non-traditional feeding regimes based on salvage feeds harvested. Values for manure quality are to be reported in a separate report.

Results and Discussion

The results from this trial are shown in Tables 1 through 6. Ewe body weights and condition scores are shown in table 1. Ewe body conditions were significantly greater (<.05) for HI fed ewes than either (LIC) or (LIW) fed ewes at lambing and weaning. Body condition scores would be considered to be minimally adequate at all stages of production. Under a normal distribution a mean body condition score of 2.6 at lambing time such as for (LIC) would suggest that some of the ewes were too thin at lambing time.

TABLE 1

TREATMENT EFFECT ON BODY WEIGHT AND CONDITION SCORE

TREATMENT	INITIAL & BREEDING WT	COND	LAMBING WT	COND	WEANING WT	COND
HI	162	3.1	180^{a}	3.3^{a}	143^{a}	2.6^{a}
LIC	159	2.9	162^{b}	2.6^{b}	131^{b}	2.3^{b}
LIW	160	3.0	165^{ab}	2.7^{b}	131^{b}	2.4^{b}

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

Reproductive performance is reported in Table 2. (HI) fed ewes produced more grease wool than either (LI) group but the difference was not significant.

TABLE 2

TREATMENT EFFECT ON REPRODUCTIVE PERFORMANCE AND WOOL PRODUCTION

TREATMENT	WOOL[ab] WT	LAMBING DATE	LAMBS BORN PER EWE LAMBING	LAMBS WEANED PER EWE LAMBING	PERCENTAGE EWES LAMBING	ANNUAL EWE ATTRITION RATE
HI	8.4	Apr 29	1.76	1.14	89	4.8
LIC	7.6	May 1	1.80	1.17	83	16.1
LIW	7.9	Apr 30	1.65	1.22	69	16.1

[a]Grease fleece weight adjusted to 365 days production. [b]Wool weights only taken in 1991.

Table 3 indicates that lamb birth and growth information was quite similar across treatments with no significant differences.

TABLE 3

TREATMENT EFFECT ON LAMB BIRTH WEIGHT AND GROWTH

TREATMENT	AVERAGE BIRTH WT	AVERAGE WEAN WT	ADJUSTED 56 DAY WT	LAMBS WEANED PER EWE EXPOSED	ADJUSTED 56 DAY WT OF LAMB PER EWE EXPOSED
HI	11.0	38.5	37.2	1.01	37.6
LIC	10.5	36.4	36.2	0.97	35.1
LIW	11.5	41.2	40.1	0.84	33.7

Tables 4 through 6 indicate differences in the amounts of feed fed, feed costs and manure production for the trials. 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 HI diets to LIC and LIW diets. LIC and LIW diets indicate the value of straw and corn stalks components of sheep rations. Table 6 indicates raw manure production of the different feeding regimes. The ewes response to (LI) diets would indicate that further investigation is necessary to evaluate the interaction of (LI) feeding regimes and the management applied as well as timing of (LI) diets to be employed only during the maintenance periods of the ewe and then to utilize standard diets for higher production periods.

TABLE 4

ANNUAL FEED AND BEDDING CONSUMPTION PER EWE (280 DAY)

	REP 1			REP 2		
	PEN 1	PEN 2	PEN 3	PEN 1	PEN 2	PEN 3
TREATMENT	(HI)	(LIC)	(LIW)	(HI)	(LIC)	(LIW)
ALF HAYLAGE*	1007.6	396.6	395.3	1011.2	392.3	389.3
WHEAT STRAW	----	----	798.6	----	----	786.53
CORN STALKS	----	801.2	----	----	792.5	----
GRAIN LBS	146	146	146	146	146	146
BEDDING LBS	143.9	143.4	143.2	141.5	147.3	142.6
FEED CONSUMPTION AS % BODY WEIGHT	2.58%	2.99%	2.98%	2.58%	2.97%	2.95%

*Alfalfa haylage was 45% DM as harvested and converted to 90% DM.

TABLE 5

ANNUAL FEED AND BEDDING COSTS* PER EWE (280 DAY)

	REP 1			REP 2		
	PEN 1	PEN 2	PEN 3	PEN 1	PEN 2	PEN 3
TREATMENT	(HI)	(LIC)	(LIW)	(HI)	(LIC)	(LIW)
HAY	30.23	11.90	11.86	30.34	11.77	11.68
WHEAT STRAW	-----	-----	11.98	-----	-----	11.80
CORN STALKS	-----	12.02	-----	-----	11.89	-----
GRAIN	7.30	7.30	7.30	7.30	7.30	7.30
BEDDING	2.16	2.15	2.15	2.12	2.21	2.14
TOTAL	39.69	33.37	33.29	39.76	33.17	32.92

*Costs are based on assuming: Hay $60/T, Straw $30/T, Corn Stalks $30/T, and Grain $100/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	(HI)	(LIC)	(LIW)	(HI)	(LIC)	(LIW)
MANURE (LBS)						
(1991)	1664.3	1550.0	1384.7	1830.5	1515.0	1544.0
(1992)	1815.9	1525.2	1623.8	1784.4	1615.0	1665.6

*Represents raw manure production with no correction for moisture content. 1991 figures are based on 335 days of production and 1992 figures are based on 280 days.

FEED-MANAGEMENT OF CORN AND BARLEY IN FINISHING DIETS FOR LAMBS

D.O. Erickson, B.L. Moore, S. Uriyapongson,
W. Limesand, D. Rupprecht and J. Geske

NDSU Experiment Station, Fargo 1992

Summary

The feed-management methods of barley or corn fed the entire finishing period was compared to switching grains the last 28 days of the finishing period were tested utilizing 84 early weaned lambs with the genetic potential for rapid growth. The diets were balanced to contain similar protein (15-16%) and TDN (79% to 84%). Diets were fed free choice (bunks never empty and fresh feed added daily) in complete mixed form. The first 44 days there were six replicates with only two diets of barley or corn. The last 28 days three replicates were switched from barley to corn or corn to barley and the other 3 replicates remained on the same grain for the entire finishing period. Corn diets were digested to a greater (P<.05) extent than barley 78 and about 74% respectively. The NDF (neutral detergent fiber) and hemicellulose were more highly (P<.05) digested in the barley diets whereas the ADF (acid detergent fiber) digestibility was lower (P<.05) in the barley diets. Corn diet protein was 74% digested compared to 68% for protein in the barley diet (P<.05). During period one (44 d) lambs on corn compared to barley based diets ate more (2.94 vs 2.80), gained faster (.764 vs .634) and were more efficient (3.86 vs 4.44) all P<.05. None of these feedlot performance traits were different (P>.05) during period two (28 d). The feedlot performance traits of the lambs were similar (P>.05) the entire trial when corn was fed the entire trial, the first or second period. This would indicate that barley can be incorporated into a feed-management system with corn. Lambs on corn gained faster and were more efficient (P<.05) compared to barley the entire trial. The volatile fatty acid concentrations and ratios and pH of rumen fluid were similar (P>.05) across diets in both periods of the feeding trial. Lambs selected for carcass trait measures were heavier in the barley to corn treatment which may have contributed to the higher USDA grade for that treatment. The other seven carcass trait measures were similar (P>.05) among dietary treatments. This research has produced information that will assist the producer in making feed-management decisions.

Justification

Several experiments have been conducted comparing the various cereal grains (corn, oats, milo, wheat and barley), combinations of grains and grains of various quality. The feed-lot performance and carcass characteristics of lambs are similar among grains and combinations when the diets are balanced on an equal energy and protein basis. Wheat is recommended at not over 30% of the grain in the high grain diets because feed intake declined at high levels of wheat. When barley was compared to corn or milo, feed-lot performance and carcass measures were similar in several experiments. In other experiments feed intake on barley diets was lower resulting in lower gains but feed efficiency were similar. A few experiments resulted in decreased dietary intake, gains and feed efficiency on the barley diets. In these experiments it has been observed that the reduced and/or variable intakes primarily occurs the last two to four weeks. It has been suggested that the starch in barley is more rapidly fermented than in corn or milo. This may result in temporary acidotic or ketotic environment in the rumen which may effect total fermentation in the rumen and result in reduced and variable feed intakes. There is a need to determine the effects of feeding barley or corn the entire period or switch grains the last four weeks.

Objective

To determine the feed-lot performance, diet and nutrient digestibilities and carcass traits of feedlot lambs fed barley or corn based diets the entire period or switch the grain four weeks before the end of the period.

Procedure

Eighty-four early weaned (56 d) lambs were allotted by weight, breed and sex and placed in groups of six into 12 pens. The four dietary treatments were randomly assigned (three replicates per diet). Complete mixed coarse ground diets were fed fresh feed daily all they would consume. The lambs were weighed individually every two weeks and feed consumption per lot recorded. Four weeks prior to the end of the trial, three of the lots on the corn diet were switched to barley and three of the lots on the barley diet were switched to corn. The other remaining six lots continued on the same diet (corn or barley) the remainder of the trial. Lambs were adapted to diets over a two-week period at the initiation of the trial and when the switch in diets were made. Fecal samples were taken rectally from randomly selected lambs (three per pen) four times during the trial (two before and two after the grain switch). Rumen samples were taken via suction strainer at the same time fecal samples were taken. The pH of the rumen samples were taken immediately and the samples were acidified, frozen and stored for volatile fatty acid analysis. The fecal samples were frozen until analyzed for AIA (internal indicator) fibrous components and protein. These same analysis were conducted on the diet samples (9) that were taken each batch (1000 lbs) of diet processed. Four lambs from each treatment were slaughtered and several carcass measures were taken. Statistical procedures were applied to the data to assist in the interpretation.

Results and Discussion

The nutritional composition of the feedstuffs used is shown in Table 1 with TDN being table values and the other fractions analyzed from several samples. The values are on the dry basis. In previous years these were presented on the as fed (as is) basis. The nutritional composition of the feedstuffs was used as the basis for formulating the two diets (Table 2) used in the experiment and the calculated nutritional composition is shown in Table 3. The diets were formulated to contain over 15% protein, about 80% TDN, .65% Ca and about .4% P. Feed samples (9) were taken from each diet during the progress of the trial. The average and standard deviations of several nutritionally related fractions are shown in Table 4. Fibrous components are lower in the corn based diet resulting slightly higher in vitro dry matter digestibility (IVDMD) being 87 compared to 84% for the barley diet. Fecal samples were collected (2 sets before and 2 sets after the diet switch in order to determine diet and nutrient digestibilities. The internal indicator acid insoluble ash (AIA) was used in the feed and feces to calculate digestibilities that are shown in Table 5. Comparing barley to corn digestibilities were: diet 73 and 78%, protein 68 and 74% and ADF 26 and 41% all higher (P<.05) for corn. The NDF and hemicellulose fractions were more highly (P<.05) digested in the barley diet. The comparisons and digestibility values obtained the last 28 days of the trial when diets were switched were similar (P>.05) to those on the respective corn or barley the entire trial. Feedlot performance of the lambs on the two diets the first 44 days of the trial is shown in Table 6. Lambs went on trial at an average weight of about 55 lb and averaged 82 and 88 lb (P<.05) respectively on the barley and corn diets. The lambs on corn consumed more, gained faster and were more efficient (all P<.05) than those on barley. Feed required per unit of gain was 4.44 and 3.86 for barley and corn respectively both being very efficient. The lamb performance during the last 28 days of the trial (period two) is shown in Table 7. The values for all traits (consumption, efficiency and gain) were more favorable for corn but by statistical measures they were similar (P>.05) among diets. There were only three replicates for each diet the last period compared to six for period one. Table 8 shows the feedlot performance of the lambs for the entire trial. Daily feed consumption, efficiency and gain were similar (P>.05) for lambs on all diets containing corn the entire trial or the diets that were switched during period two. Lambs on barley compared to corn the entire trial were lighter (102 vs 114 lb) (P<.05) at the end of the trial because they gained .66 vs .82 lbs/day (P<.05) respectively for barley and corn. Feed efficiency was very good on all diets but more desirable on corn 4.1 compared to 4.8 on barley (P<.05). Rumen fluid was taken via suction strainer twice in each period at the same time fecal samples were taken. The average volatile fatty acid concentrations, ratios and pH for each period are presented in Tables 9 and 10. These measures were similar (P>.05) across diets in each period. The acetate to propionate ratios are narrow which would contribute to the high feed efficiency. Only four lambs from each dietary treatment were slaughtered for measurements of the carcass traits presented in Table 11. The live and carcass weights do not directly correspond with the average of all the lambs in each treatment but an average of the four used for carcass evaluation. The larger lambs used in the barley switched to corn treatment may account for the highest USDA grade. The other carcass traits were similar (P>.05) across diets.

This research along with previously reported research at the Western Dakota Sheep Days indicates that the utilization of barley as a feed grain can be very effective in feed-management systems as described in this paper or as fed a part of the grain mix. Feeding barley as the only feed grain in high energy diets for lambs also produces satisfactory results. The utilization and incorporation of the various feedstuffs is dependant on grain, roughage and protein supplement prices and the type and condition of the feeder lambs. The higher protein level of barley compared to most grains may be an economic advantage for its use in many types of diets.

Acknowledgement

To North Dakota Barley Council for their support of this research.

Table 1. Nutritional Composition of Feedstuffs Used in the Lamb Feeding Trials (Fargo 1992)

		%				
Feedstuff (dry)	bu/wt	Protein[a]	TDN[b]	ADF[a]	Ca[a]	P[a]
Alfalfa	-	18	57	34	1.25	.173
Barley	48	13	85	5	.06	.410
Corn	57	11	91	3	.01	.350
SBM	-	44	85	10	.25	.600
Beet molasses	-	11	77	-	.14	.030
Limestone	-	-	-	-	37	.22
DiCalPhos	-	-	-	-	23	19

[a]Analysis, [b]Table values.

Table 2. Feedstuff Concentrations of the Diets

	Diets	
Feedstuff	Barley	Corn
	%	
Alfalfa	12	12
Barley	78	-
Corn	-	73
SBM	6	11.5
Beet molasses	1.3	1.3
Limestone	1	1.2
DiCaP	.3	-

Common to both diets: .5% each TM salt and AmCl, .025% antibiotics, .03% Vit A, D and E, .02% and Bovatec (30 g/T).

Table 3. Calculated Nutritional Composition of Diets

Nutrient fraction	Diets (dry)	
	Barley	Corn
	%	
Protein	15.4	16.0
TDN[a]	79	84
DE kcal/kg[a]	3476	3696
Ca	.65	.63
P	.43	.35

[a]Table values.

Table 4. Analyzed[a] Nutritional Composition of Diets

Nutrient	Diets (dry)			
	Barley		Corn	
	Mean	SD	Mean	SD
Protein	16.6	.82	17.5	1.50
IVDMD	84	1.93	87	1.54
NDF	26.8	1.78	18.7	1.78
ADF	11.2	1.61	9.9	1.50
Hemicellulose	15.6	1.70	8.8	1.64
Ash	6.04	.96	6.29	.88
Ca	.81	.23	1.00	.17
P	.46	.03	.34	.02

[a]9 samples in duplicate.

Table 5. Digestibilities[1] of Diet and Selected Fractions

Trait	Barley	Corn	Barley to Corn	Corn to Barley
Diet	73[a]	78[b]	78[b]	74[a]
Protein	68[a]	74[b]	75[b]	71[ab]
NDF	45[a]	39[b]	40[b]	45[a]
ADF	26[a]	41[b]	42[b]	27[a]
Hemicell.	58[a]	40[b]	38[b]	60[a]

[1]AIA as internal indicator.
[a,b]Differ $P<.05$.

Table 6. Feedlot Performance for Period One[1]

Trait	Barley	Corn	SE
Initial wt	54.6	54.6	-
Wt at switch	82.3[a]	88.2[b]	.73
Daily feed	2.80[a]	2.94[b]	.029
Feed/gain	4.44[a]	3.86[b]	.079
Daily gain	.64[a]	.764	.017

[1]First 44 d.
[a,b]Differ $P<.05$.

Table 7. Feedlot Performance for Period Two[1]

Trait	Barley	Corn	Barley to Corn	Corn to Barley	SE
Initial wt	80.3[a]	87.8[bc]	84.7[ab]	88.9[bc]	.72
Final wt	101.7[b]	113.7[a]	109.7[ab]	111.7[a]	1.19
Daily feed	3.68	4.09	4.12	3.92	.090
Feed/gain	4.87	4.41	4.67	4.83	.138
Daily gain	.763	.928	.893	.816	.031

[1]Last 28 d.
[a,b]Differ $P<.05$.

Table 8. Feedlot Performance of Entire Trial

Trait	Barley	Corn	Barley to Corn	Corn to Barley	SE
Final wt	101.7[b]	113.7[a]	109.7[ab]	112.7[a]	1.19
Daily feed	3.11	3.36	3.35	3.35	.048
Feed/gain	4.80[a]	4.10[b]	4.40[ab]	4.24[ab]	.062
Daily gain	.656[b]	.820[a]	.765[ab]	.792[ab]	.016

[a,b]Differ P<.05.

Table 9. Ruminal Volatile Fatty Acids (mM)

	Period 1 (first 44 d) 6 reps		
Trait	Barley	Corn	SE
Acetate	39.2	38.2	1.06
Propionate	35.0	31.4	1.57
Isobutyrate	1.43	1.18	.104
Butyrate	9.37	10.16	.736
Isovalerate	1.75	1.59	.131
Valerate	4.83	6.97	.953
A/P ratio	1.14	1.24	.055
pH	6.32	6.20	.039

No differences at P>.05.

Table 10. Ruminal Volatile Fatty Acids (mM)

Trait	Barley	Corn	Barley to Corn	Corn to Barley	SE
Acetate	40.1	40.1	36.8	42.1	1.27
Propionate	31.7	32.1	32.6	29.3	1.35
Isobutyrate	1.54	1.21	.99	1.57	.077
Butyrate	7.41	11.46	10.78	8.87	.629
Isovalerate	1.94	1.81	1.49	2.06	.162
Valerate	3.28	7.38	7.60	3.28	.886
A/P ratio	1.44	1.26	1.13	1.44	.043
pH	5.96	5.96	5.87	5.99	.050

No differences at P>.05.

Table 11. Carcass Traits as Affected by Diet

Trait	Barley	Corn	Barley to Corn	Corn to Barley	SE
Live wt	103	106	121	112	3.6
Carc wt	54[a]	57[a]	66[b]	58[a]	1.9
Dress %	52	54	55	52	.6
Yield grade	2.63	2.43	2.37	2.54	.149
B fat cm	.44	.31	.34	.39	.035
Kid %	1.67	2.00	1.75	1.75	.251
USDA grade	10.3[a]	10.8[ab]	12.0[b]	11.0[ab]	.17
Loin cm^2	14.5	15.5	16.1	14.0	.27
Leg sc	12.0	11.0	12.3	11.5	.26
Conf sc	11.7	10.8	11.5	11.0	.24

[a,b]Differ P<.05   4 lambs/diet.

ALFALFA LEVELS IN BARLEY BASED DIETS FOR LAMBS

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

NDSU Experiment Station, Hettinger 1992

Summary

The results discussed in this paper are a combination of two more replicates of the trial reported in the 33rd Western Dakota Sheep Day 1992. The design is based on four levels of alfalfa (5, 15, 30 and 45%) in barley based diets fed in complete coarse ground mixed form with four replications. Lambs (432) averaging 66# (30 kg) were allotted by weight, breed and sex with 108 lambs on each diet. Diets were randomly assigned. Carcass traits were taken from a representative group from each treatment. Diets ranged from 72 (5% alfalfa) to 62% TDN (45% alfalfa) and all contained 15% protein. The NDF ranged from 19 to 26% and the ADF from 7.3 to 14.1% for the 5 and 45% diets respectively. Feed consumption increased P<.05 with increasing alfalfa with no change (P>.05) in rate of gain but a decrease (P<.10) in gain per feed. The gain per unit of feed were .147, .138, .128 and .123 respectively for 5, 15, 30 and 45% alfalfa. All carcass traits were lower (P<.05) comparing 5 to 45% alfalfa. Yield grade and backfat were more desirable on the higher levels of alfalfa. These data will be useful in making feed-management decisions. Factors such as feedstuff costs, size and type of lambs should be considerations in making decisions in diet formulation.

Introduction and Justification

Previous work at the Hettinger Station (32nd Western Dakota Sheep Day 1991) using from 10 to 40% alfalfa in barley based diets with no protein supplement showed that lambs increase their feed intake up the 30% alfalfa. The gain per unit of feed decreased with increasing alfalfa. The rate of gain decreased from .54 to .49 lbs/d but this was not different (P>.05) however there appeared to be a trend of reduced gain. Carcass traits were similar for all diets. It was of interest and economic importance to determine how lambs would respond if diets contained equal protein levels with varying levels of alfalfa (5 to 45%) in barley based diets. The primary concern was to determine if the higher level dietary protein would allow the lambs to consume more of the high alfalfa diets to compensate for the lower digestible energy.

Objective

To determine the feedlot performance and carcass traits of finishing lambs fed iso-nitrogenous barley based diets varying levels of alfalfa (5 to 45%).

Procedure

Feedstuffs were sampled and analyzed for nutritional composition. Composition of feedstuffs are reported in Table 1 of the report in 33rd Western Dakota Sheep Day. The diets (Table 1) were formulated to all contain 15% protein and vitamins and minerals all to exceed the NRC recommended levels (Table 2). Ionophore, antibiotics and ammonium chloride were included in all diets (Table 1). Diets were coarse ground, mixed and fed free choice. Each batch of feed was sampled for subsequent nutritional analysis (Table 3). There were four diets (5, 15, 30 and 45% alfalfa) and four replicates. Four hundred and thirty-two lambs were allotted by weight, breed and sex. Diets were randomly assigned. Lamb weights and feed consumption was recorded (Table 4) through the experiment. Representative groups of lambs from each dietary treatment were slaughtered and selected carcass traits (Table 5) were measured or judged. Statistical procedures were applied to assist in the interpretation of the data.

Results and Discussion

The four diets used in this experiment are shown in Table 1. As alfalfa was increased less soybean meal was required to meet the desired level of 15% protein. Each diet had varying levels of limestone and dicalcium phosphate because alfalfa has a high level of calcium. Diets were balanced to contain about .7% Ca and .4% P (Table 2). Diets ranged from 72 to 62% TDN with increasing alfalfa. The reason for the decreasing TDN is a result of the increasing fiber (NDF and ADF) levels (Table 3) with the added alfalfa. Digestibility of the diets decreased ($P<.05$) with added alfalfa as determined by in-vitro dry matter disappearance (IVDMD) method (Table 3). The average initial weight of the lambs within each lot was 66 lbs and the final weight average of 112 lbs for 5 and 15% alfalfa and 110 lbs for the lambs on the 30 and 45% alfalfa diets (Table 4). The feedlot performance is shown in Table 4. Lambs consumed more ($P<.05$) feed with increasing levels of alfalfa which provided enough energy intake to support similar gains ($P>.05$) on all diets. The gain per feed decreased ($P<.05$) with increasing alfalfa. These data support those reported in the 1991 and 1992 Western Dakota Sheep Day proceedings. The carcass traits are shown in Table 5. All carcass traits were lower ($P<.05$) for lambs on the 45 compared to the 5% alfalfa diets. Yield grade and backfat were more desirable in the carcass of lambs on high alfalfa diets. The work reported (1991 Western Dakota Sheep Day) on the carcass traits of lambs fed levels of alfalfa from 10 to 40% of barley based diets showed that carcass traits were similar ($P>.05$). The experiments conducted on varying levels of alfalfa in barley based diets (variable protein and equal protein) indicate that lambs will consume more diet with increasing alfalfa resulting in similar gains but reduced feed efficiency. It appears that carcass traits are affected when the experiment is terminated at the same time across all diets. A producer may keep the lambs on a higher roughage diet longer which may result in similar carcass traits to lambs on low roughage diets. The traits of dressing %, yield grade, USDA grade, leg score, backfat and kidney % may all be similar if the lambs were slaughtered at similar condition across level of roughage. The other factor that was of concern was potential bloat when alfalfa is fed with barley. Bloat was not a problem in any of the diets. Producers should consider the price of grains, roughages and protein supplements and type and condition of feeder lambs when making feed-management decisions.

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Table 1. Diets for Varying Levels of Alfalfa for Finishing Lambs (Hettinger 1991-92)

Feedstuffs[a]	% Alfalfa 5	15	30	45
Barley	85	76	62	48
SBM	7	6	5	4
Limestone	1.28	.83	.30	-
DiCa P	.34	.44	.60	.76

[a] .5% each of TM salt and NH_4Cl, .05% Vit ADE and antibiotics.

Table 2. Nutritional Composition (calculated from Feedstuff Analysis) (Hettinger 1991-92)

Fraction %	% Alfalfa 5	15	30	45
TDN	72	69	66	62
Dkcal/kg	3164	3058	2904	2750
Protein	15.0	14.9	15.1	15.2
Ca	.66	.64	.69	.76
P	.40	.40	.40	.40

Table 3. Average Nutritional Composition (Analyzed) and Standard Deviations

Fraction	% Alfalfa 5		15		30		45	
IVDMD[a]	80[e]	1.6	79[e]	1.0	76[f]	.8	75[f]	1.6
Protein	16.5	.58	16.6	.50	17.6	.52	17.2	1.56
NDF[b]	19	1.6	20	1.0	23	1.3	26	1.1
ADF[c]	7.3	.73	7.6	.56	10.9	.72	14.1	1.52

[a]In vitro dry matter digestibility, [b]Neutral detergent fiber,
[c]Acid detergent fiber, [e,f]$P<.05$.

Table 4. Feedlot Performance of Lambs (Hettinger 1991-92)

	% Alfalfa 5	15	30	45	SE
Int. wt. (lb)	66.7	65.6	65.6	66.4	1.8
Fin. wt. (lb)	111.7	112.0	110.8	110.8	2.5
Daily gain (lb)	.49	.51	.49	.49	.011
Daily feed (lb)	3.35[a]	3.61[ab]	3.87[b]	3.93[b]	.067
Gain/feed	.147[c]	.138[cd]	.128[d]	.123[d]	.004

[a,b]$P<.05$
[c,d]$P<.10$

Table 5. Selected Carcass Traits of Lambs (Hettinger 1991-92)

	% Alfalfa				
	5	15	30	45	SE
Dress. %	47.5[a]	47.8[a]	47.6[a]	46.3[b]	.21
Yield grade	3.29[a]	3.27[a]	3.06[b]	2.98[b]	.156
USDA grade	12.1[a]	11.8[ab]	11.4[b]	11.4[b]	.11
Leg score	12.2[a]	12.0[ab]	11.5[bc]	11.4[c]	.73
Backfat cm	.49[ab]	.53[a]	.46[ab]	.41[b]	.025
Kidney %	3.49[a]	3.11[ab]	2.60[b]	2.67[b]	.778
Loin cm^2	16.4[a]	15.9[a]	14.6[b]	14.6[b]	.15

[a,b,c]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 were being evaluated. Rambouillet rams were purchased yearly and classified as seasonal or nonseasonal rams. Seasonal rams were 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 showed less seasonal trend to change in scrotal circumferences. Initial scrotal measurements were obtained in late February and late July from the Glenn Brown flock, Buffalo, SD and ram selection was based on these two measurements. The two rams with the greatest change and two rams with the least change were selected to assure that variability existed within the purchased rams for change in scrotal circumference.

The rams ranged from 10 to 14 months of age when the initial scrotal measurements were obtained and 15 to 19 months of age when they arrived at the Research Extension Center. Rams were permanently classified after a one-year residence at the Research Extension Center utilizing the previous January, February, March and August scrotal measurements. Rams were only re-classified following the August scrotal measurement taken at 27 to 31 months of age. If a ram died before August, the permanent classification equaled the purchased classification. All rams were 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 went into an accelerated program for three years, being exposed to rams as wet (recently weaned) or dry ewes during April, August or November.

When possible, the ewes were mated to individual sires, but if individual sire fertility was questionable, the ewes were group mated by seasonal or nonseasonal rams. Both types of ewes were exposed to teaser wethers, teaser ewes and rams during the April and August breeding season to assure that both types of ewes had equal exposure to aggressive males. All ewes were bled 7 days after the rams were removed in May to determine serum progesterone levels.

Rams were fitted each breeding season with a "Sire-Sine" (Mid States Wool, Hutchinson, Kansas) marking harness to monitor daily mating activity. Marks were recorded as light if one or two marks were visible on the rump, medium if three or more individual marks were evident and heavy if individual marks had all blended into one solid mark. Breeding seasons started based on the calendar day and the rams were pulled on the 34th day of breeding. All ewes were exposed each breeding season regardless of pregnancy status.

August breeding started August 8th (plus or minus one day). All lambs resulting from the August breeding were weaned 234 days (March 30) from the introduction of the rams. The November breeding season started 100 days (November 16) after the introduction of rams in August. Lambs resulting from the November breeding were weaned at 56 days of age. The April breeding season started 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 were weaned 17 days (December 3) after the initiation of November breeding or 117 days after the introduction of rams in August.

RESULTS AND DISCUSSION

Table 1 gives the ending status and classification of the purchased rams. All 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. 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 seasonal and nonseasonal daughters. Nonseasonal daughters tend to be slightly heavier than seasonal daughters.

All ewes that started the accelerated program have completed the cycle. Table 3 provides the overall reproductive performance of these ewes. Over the course of two years, ewes have had the opportunity to lamb 0, 1, 2, or 3 times. Table 3 indicates seasonal ewes are producing more ($P<.05$) annual lambings per ewe than nonseasonal ewes (1.31 vs 1.11). This translates into producing an annual 203% lamb crop born and 167% lamb crop weaned per ewe exposed for the seasonal ewe and 197% annual lamb crop born and 149% lamb crop weaned per ewe exposed for nonseasonal ewes.

The annual attrition rate is slightly greater for nonseasonal ewes versus seasonal ewes (table 3). The lower performance of the nonseasonal ewes can be partially explained by table 4. 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 4).

Reproductive performance for seasonal and nonseasonal ewes is presented in table 5. Nonseasonal ewes were heavier (P<.05) at breeding and produced lambs that were heavier (P<.05) at birth and weaning. However, seasonal ewes had the greater (P<.05) conception percentage and tended to have more ewes mate during the breeding season.

Several other factors influenced the performance of both the seasonal and nonseasonal ewes, although there was no interactions present between these factors. Table 6 show the effect of breeding season. Ewes were heavier (P<.05) during the November breeding season. The ewes produced less (P<.05) lambs from the April breeding season and weaned the most (P<.05) lambs from the August breeding season. Lambs were heavier (P<.05) at birth and weaning from the November breeding season. More ewes mated during the August versus April (P<.05). First cycle conception was greatest (P<.05) for November breeding.

Each breeding season was composed of lactating and non-lactating ewes. The effect of lactation is shown in table 7. Although both type of ewes were similar in weight, lactating ewes had less (P<.05) body condition prior to breeding. Even though the ewes were in poorer condition, lactating ewes weaned heavier (P<.05) lambs and actually expressed a greater (P<.05) percentage of total ewes mated. Unfortunately, lactating ewes tended to have a lower conception rate. Tables 8-10 are presented to show the means for all three factors, including breeding season, lactation status and ewe type.

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	Classification Permanent	Average Change (cm) Purchased	Average Change (cm) Permanent	Attrition Year[a]
1985	2532	N	N	2.3	.1	1987
	4066	N	N	1.0	.3[b]	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	1991
	6135	N	N	.6	4.9	1991
	5303	S	S	8.4	8.0	1991
1987	6559	N	N	2.4	-.-	1988
	6579	S	S	8.0	4.7	1991
	T311	S	S	6.3	5.2	1991
	7242	S	S	9.0	7.0	1991
1988	7495	S	N	2.2	.8	1991
	7479	N	N	-2.4	1.4	1991
	8360	S	S	4.7	3.1	1991
	7680	N	S	- .7	4.2	1991

[a]Rams completed trial if attrition year is 1991
[b]Underline denotes division between seasonal and nonseasonal rams.

Table 2

ACTUAL BIRTH AND AGE ADJUSTED[a] WEANING, SEVEN MONTH TEN MONTH AND FIFTEEN MONTH WEIGHT FOR EWE LAMBS SIRED BY SEASONAL AND NONSEASONAL RAMS

Sire Type	Number	Birth Weight	Age Adjusted Wean Weight	Age Adjusted 7 M Wt	Age Adjusted 10 M Wt	Age Adjusted 15 M Wt
seasonal	96	11.2	36.4	113.3	120.5	143.7
nonseasonal	77	11.3	36.6	113.2	120.8	148.4

[a] Weaning, 7M, 10M and 15M weights adjusted to 56, 226, 298 and 438 days, respectively.

Table 3

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	96	1.31[d]	2.03	1.67	2.9 %
nonseasonal	73	1.11[e]	1.97	1.49	4.8 %

[a]Annual parturitions divided by initial ewe numbers.
[b]Annual lambs born divided by initial ewe numbers.
[c]Annual lambs weaned divided by initial ewe numbers.
[de]Means in the same column with different superscripts differ (p<.05).

Table 4

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					Mating	Conception
Type	Total	<1 Ng	>1 Ng	Mated	Lambed	Percentage[a]	Percentage[b]
seasonal	134	31	103	109[c]	88	84.0[d]	88.0[d]
nonseasonal	113	41	72	75	44	66.5[e]	61.7[e]

[a]Number of ewes mated divided by total number of ewes.
[b]Number lambed divided by number of ewes with >1 ng progesterone.
[c]One hundred nine ewes mated however one ewe was not bled.
[de]Means in the same column with different superscripts differ (p<.05).

Table 5

PRE-BREEDING WEIGHT, PRE-BREEDING CONDITION, LAMBS BORN AND LAMBS WEANED PER EWE LAMBING, LAMB BIRTH WEIGHT, LAMB ADJUSTED 56 DAY WEIGHT, PERCENTAGE OF EWES MATING AND PERCENTAGE OF MATED EWES CONCEIVED FOR FIRST GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS

	Seasonal	Non Seasonal
Pre-breeding weight (lbs)	156[a]	163[b]
Pre-breeding condition[c]	2.9	2.9
Lambs born per ewe lambing	1.59	1.61
Lambs weaned per ewe lambing	1.24	1.28
Lamb birth weight (lbs)	10.9[a]	11.6[b]
Adjusted 56 day weight (lbs)	39.3[a]	44.0[b]
First cycle mating[d] (%)	54	53
Total ewes mating[e] (%)	87	79
Cycle 1 conception[f] (%)	36	38
Conception percentage[g]	89[a]	63[b]

[ab]Means in the same row with different superscripts differ ($P<.05$).
[c]Condition score scale: 1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.
[d]Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[e]Total ewes mated divided by total ewes exposed.
[f]Number conceived in the 1st cycle divided by the total number of ewes that conceived.
[g]Number of ewes lambing divided by number of ewes mated.

Table 6

PRE-BREEDING WEIGHT, PRE-BREEDING CONDITION, LAMBS BORN AND LAMBS WEANED PER EWE LAMBING, LAMB BIRTH WEIGHT, LAMB ADJUSTED 56 DAY WEIGHT, PERCENTAGE OF EWES MATING AND PERCENTAGE OF MATED EWES CONCEIVED FOR FIRST GENERATION FEMALE RAMBOUILLET OFFSPRING MATED DURING APRIL, AUGUST AND NOVEMBER

	April	August	November
Pre-breeding weight (lbs)	156[a]	159	165[b]
Pre-breeding weight by ewe status			
Lactating (lbs)	154	155	173
Non-lactating (lbs)	157	162	156
Pre-breeding condition[c]	3.0	2.8	2.9
Lambs born per ewe lambing	1.43[a]	1.76	1.61[b]
Lambs weaned per ewe lambing	1.19	1.47[a]	1.12[b]
Lamb birth weight (lbs)	10.3[a]	11.7	11.8[b]
Adjusted 56 day weight (lbs)	39.2[a]	39.6[a]	46.1[b]
First cycle mating[d] (%)	63	45	--.-[e]
Total ewes mating[f] (%)	76[a]	90[b]	--.-[e]
Cycle 1 conception[g] (%)	24[a]	28[a]	58[b]
Conception percentage[h]	75	77	--.-[e]

[ab]Means in the same row with different superscripts differ ($P<.05$).
[c]Condition score scale:1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.
[d]Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[e]No November estrous data collected because of temperature extremes.
[f]Total ewes mated divided by total ewes exposed.
[g]Number conceived in the 1st cycle divided by the total number of ewes that conceived.
[h]Number of ewes lambing divided by number of ewes mated.

Table 7

PRE-BREEDING WEIGHT, PRE-BREEDING CONDITION, LAMBS BORN AND LAMBS WEANED PER EWE LAMBING, LAMB BIRTH WEIGHT, LAMB ADJUSTED 56 DAY WEIGHT, PERCENTAGE OF EWES MATING AND PERCENTAGE OF MATED EWES CONCEIVED FOR FIRST GENERATION FEMALE RAMBOUILLET OFFSPRING WHEN EXPOSED FOR TWO ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

	Lactating[a]	Non Lactating
Pre-breeding weight (lbs)	161	158
Pre-breeding weight by season		
April (lbs)	154	157
August (lbs)	155	162
November (lbs)	173	156
Pre-breeding condition[b]	2.6[c]	3.2[d]
Lambs born per ewe lambing	1.62	1.58
Lambs weaned per ewe lambing	1.26	1.25
Lamb birth weight (lbs)	11.5	11.1
Adjusted 56 day weight (lbs)	44.1[c]	39.1[d]
First cycle mating[e] (%)	54	53
Total ewes mating[f] (%)	94[c]	72[d]
Cycle 1 conception[g] (%)	34	40
Conception percentage[h]	70	82

[a]Weaned lambs immediately prior to ram exposure in April and August and seventeen days after ram exposure in November.
[b]Condition score scale:1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.
[cd]Means in the same row with different superscripts differ ($P<.05$).
[e]Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[f]Total ewes mated divided by total ewes exposed.
[g]Number conceived in the 1st cycle divided by the total number of ewes that conceived.
[h]Number of ewes lambing divided by number of ewes mated.

Table 8

REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS AND CONDITION SCORE 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	Pre-breeding Weight	Condition Score[a]	Lambs Born/ Ewe Lambing	Lambs weaned/ Ewe Lambing
April	Dry	N	159 (78)	3.3 (31)	1.39 (28)	1.11 (28)
April	Dry	S	155 (87)	3.2 (59)	1.36 (55)	1.22 (55)
April	Wet	N	158 (36)	2.8 (32)	1.48 (17)	1.27 (17)
April	Wet	S	151 (44)	2.7 (23)	1.49 (34)	1.18 (34)
August	Dry	N	165 (82)	3.2 (46)	1.88 (55)	1.47 (55)
August	Dry	S	159 (81)	3.2 (42)	1.72 (56)	1.48 (56)
August	Wet	N	160 (22)	2.5 (22)	1.71 (13)	1.49 (13)
August	Wet	S	149 (34)	2.3 (34)	1.68 (30)	1.41 (30)
November	Dry	N	162 (18)	3.1 (18)	1.41 (15)	1.24 (15)
November	Dry	S	149 (7)	3.1 (7)	1.75 (6)	1.00 (6)
November	Wet	N	176 (41)	2.6 (16)	1.78 (36)	1.08 (36)
November	Wet	S	171 (86)	2.9 (50)	1.51 (71)	1.15 (71)

[a]Condition score scale:1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.

Table 9

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[a]

Breeding Period	Ewe Status	Sire Type	Estrous Expression[b] None	1st Cycle	2nd Cycle	Both Cycles	1st Cycle Percentage[c]	Percentage of Total Ewes Mated[d]
April	Dry	N	33	29	12	4	72.4	57.9 (45)
April	Dry	S	21	21	41	5	56.6	69.4 (67)
April	Wet	N	7	5	14	11	53.3	81.1 (30)
April	Wet	S	2	12	12	18	68.3	96.3 (42)
August	Dry	N	14	17	40	11	33.8	78.5[e] (68)
August	Dry	S	19	18	28	16	50.0	81.4 (62)
August	Wet	N	1	6	10	5	53.8	97.2 (21)
August	Wet	S	0	11	22	1	38.6	100.0 (34)[f]

[a]No November estrous data collected because of temperature extremes.
[b]Includes those ewes that have medium or heavy breeding marks only.
[c]Total 1st cycle plus both cycle ewes divided by all ewes that mated.
[d]Total ewes mated divided by total ewes exposed.
[e]Eight ewes were excluded from the data because of ram failure.
[f]Total number of ewes mated.

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

			Conception Cycle[a]				
Breeding Period	Ewe Status	Sire Type	Failed	1st Cycle	2nd Cycle	1st Cycle Percentage[b]	Conception Percentage[c]
April	Dry	N	50	10	18	44.5	59.9
April	Dry	S	33	13	42	20.7	95.6
April	Wet	N	20	3	14	18.1	66.4
April	Wet	S	10	7	27	13.6	77.2
August	Dry	N	27	14	41[d]	18.9	77.7
August	Dry	S	25	18	38	30.2	93.0
August	Wet	N	9	4	9	36.1	49.5
August	Wet	S	4	10	20	35.9	89.0
November	Dry	N	9	9	6	67.6	_._[e]
November	Dry	S	3	4	2	58.3	_._
November	Wet	N	6	17	19	45.3	_._
November	Wet	S	17	42	29	59.5	_._

[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.
[d]Eight ewes were excluded from the data because of ram failure.
[e]No November data collected because of temperature extremes.

REPRODUCTIVE CHARACTERISTICS OF SECOND, THIRD AND FOURTH GENERATION FEMALE OFFSPRING FROM RAMS SELECTED FOR PREDICTABLE OR NO PREDICTABLE CHANGE IN SEASONAL SCROTAL CIRCUMFERENCE

Preliminary report

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

INTRODUCTION

Seasonal infertility continues to be a biological puzzle. Previous studies have helped to isolate some of the components of seasonal infertility, but sheep as a whole continue to be very seasonal in their reproduction. The interactions of management with various types of sheep make predictable solutions difficult. Hopefully a long term genetic solution would be found that would aid sheep producers in obtaining a predictable lamb crop at different times of the year. The purpose of this project is to provide additional information regarding the potential of identifying sires that may produce daughters that will better fit a northern fall lambing program.

PROCEDURE

Starting in 1986, Rambouillet ewes were randomly mated yearly to four seasonal and four nonseasonal rams (refer to previous report in this proceedings). These first generation seasonal and nonseasonal daughters were back-crossed to seasonal or nonseasonal rams for three additional generations. And starting the spring of 1992, these ewes are being evaluated in an April breeding season, with only an August clean up. Ewes will be group mated and exposed to teasers and rams during the April and August breeding season to assure all ewes have an equal exposure to aggressive males.

Rams will be fitted each breeding season with a "Sire-Sine" (Mid States Wool, Hutchinson, Kansas) marking harness to monitor daily mating activity. Marks will be 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.

RESULTS AND DISCUSSION

The preliminary results are presented in tables 1-4. All these results are very preliminary. Early observations would suggest that the second, third and fourth generation ewes are not performing as well when only mated in April and August. A potential significant factor is the reduced body condition of the ewes during the spring of 1992. This combined with a major spring storm during the main breeding days resulted in a reduced pregnancy rate during the spring of 1992. The trial will be continued to obtain at least two more years of data.

Table 1

REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS AND CONDITION SCORE FOR SECOND, THIRD AND FOURTH GENERATION RAMBOUILLET EWES DURING APRIL AND AUGUST WHEN EXPOSED AT MATURE, YEARLING OR LAMB AGES FOR THREE ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

Breeding Period	Ewe Status	Ewe Gen[a]	Ewe Age[b]	Pre-breeding Weight	Condition[c]	Lambs Born/ Ewe Lambing	Lambs Weaned/ Ewe Lambing
April	Dry	2	M	125 (83)	2.5 (83)	1.50 (28)	1.07 (28)
April	Dry	3	M	127 (11)	2.1 (11)	1.50 (04)	1.25 (04)
April	Dry	4	M	--- (00)	--- (00)	---- (00)	---- (00)
April	Dry	2	Y	100 (70)	2.4 (70)	1.00 (07)	0.86 (07)
April	Dry	3	Y	102 (33)	2.3 (33)	1.00 (05)	0.40 (05)
April	Dry	4	Y	--- (00)	--- (00)	---- (00)	---- (00)
April	Dry	2	L	85 (13)	2.1 (13)	---- (00)	---- (00)
April	Dry	3	L	85 (23)	2.1 (23)	---- (00)	---- (00)
April	Dry	4	L	91 (04)	2.5 (04)	---- (00)	---- (00)
April	Wet	2	M	122 (85)	2.1 (85)	1.33 (27)	1.00 (27)
April	Wet	3	M	109 (15)	2.0 (15)	1.00 (03)	1.00 (03)
April	Wet	4	M	--- (00)	--- (00)	---- (00)	---- (00)
August[d]	Dry	2	M	141 (169)	2.9 (46)	---- (00)	---- (00)
August	Dry	3	M	133 (49)	2.8 (42)	---- (00)	---- (00)
August	Dry	4	M	--- (00)	--- (00)	---- (00)	---- (00)
August	Dry	2	Y	113 (11)	2.7 (11)	---- (00)	---- (00)
August	Dry	3	Y	115 (22)	2.4 (22)	---- (00)	---- (00)
August	Dry	4	Y	120 (04)	2.8 (04)	---- (00)	---- (00)

[a]Ewe generation.
[b]Ewe age:M=mature ewe exposed to ram at approximately 2 years of age or older, Y=yearling ewe exposed to ram at approximately 15 months of age, L=ewe lamb exposed to the ram at approximately 12 months of age.
[c]Condition score scale: 1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.
[d]August lambing information not available at this time.

Table 2

ESTROUS EXPRESSION BY CYCLE FOR SECOND, THIRD AND FOURTH GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL AND AUGUST WHEN EXPOSED AT MATURE, YEARLING OR LAMB AGES FOR THREE ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

				Estrous Expression[a]						
Breeding Period	Ewe Status	Ewe Gen[b]	Ewe Age[c]	None	1st Cycle	2nd Cycle	3rd Cycle	Cycle 1 & 2	Cycle 2 & 3	All Cycles
April	Dry	2	M	52	2	29	6	0	3	0
April	Dry	3	M	8	0	5	0	0	0	0
April	Dry	4	M	0	0	0	0	0	0	0
April	Dry	2	Y	50	1	13	5	1	1	0
April	Dry	3	Y	26	2	3	3	0	1	0
April	Dry	4	Y	0	0	0	0	0	0	0
April	Dry	2	L	13	0	0	0	0	0	0
April	Dry	3	L	23	0	0	0	0	0	0
April	Dry	4	L	3	0	0	1	0	0	0
April	Wet	2	M	57	5	21	7	0	1	0
April	Wet	3	M	12	0	1	1	0	1	0
April	Wet	4	M	0	0	0	0	0	0	0
August	Dry	2	M	28	18	106	11	1	8	0
August	Dry	3	M	8	6	28	5	1	0	1
August	Dry	4	M	0	0	0	0	0	0	0
August	Dry	2	Y	4	1	6	0	0	0	0
August	Dry	3	Y	4	3	13	1	0	1	0
August	Dry	4	Y	0	1	1	1	1	0	0

[a]Includes those ewes that have medium or heavy breeding marks only.
[b]Ewe generation.
[c]Ewe age:M=mature ewe exposed to ram at approximately 2 years of age or older, Y=yearling ewe exposed to ram at approximately 15 months of age, L=ewe lamb exposed to the ram at approximately 12 months of age.

Table 3

PERCENTAGE OF CYCLE ONE MATINGS AND PRECENTAGE OF TOTAL EWES MATED FOR SECOND, THIRD AND FOURTH GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL AND AUGUST WHEN EXPOSED AT MATURE, YEARLING AND LAMB AGES FOR THREE ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES[a]

Breeding Period	Ewe Status	Ewe Gen[b]	Ewe Age[c]	1st Cycle Percentage[d]	Percentage Of Total Ewes Mated[e]	
April	Dry	2	M	5	43	(40)[f]
April	Dry	3	M	0	38	(5)
April	Dry	4	M	0	0	( )
April	Dry	2	Y	10	30	(21)
April	Dry	3	Y	22	26	(9)
April	Dry	4	Y	0	0	( )
April	Dry	2	L	0	0	( )
April	Dry	3	L	0	0	( )
April	Dry	4	L	0	25	(1)
April	Wet	2	M	15	37	(34)
April	Wet	3	M	0	20	(3)
April	Wet	4	M	0	0	( )
August	Dry	2	M	13	84	(144)
August	Dry	3	M	20	84	(41)
August	Dry	4	M	0	0	( )
August	Dry	2	Y	14	64	(7)
August	Dry	3	Y	17	82	(18)
August	Dry	4	Y	50	100	(4)

[a]Includes those ewes that have medium or heavy breeding marks only.
[b]Ewe generation.
[c]Ewe age:M=mature ewe exposed to ram at approximately 2 years of age or older, Y=yearling ewe exposed to ram at approximately 15 months of age, L=ewe lamb exposed to the ram at approximately 12 months of age.
[d]Total 1st cycle plus both cycle 1 and 2 plus all cycles ewes divided by all ewes that mated.
[e]Total ewes mated divided by total ewes.
[f]Total number of ewes mated.

Table 4

CONCEPTION CYCLE AND PERCENTAGE OF MATED EWES CONCEIVED FOR SECOND, THIRD AND FOURTH GENERATION FEMALE OFFSPRING OF NONSEASONAL AND SEASONAL RAMBOUILLET RAMS DURING APRIL AND AUGUST WHEN EXPOSED AT MATURE, YEARLING AND LAMB AGES FOR THREE ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES

				Conception Cycle[a]					
Breeding Period	Ewe Status	Ewe Gen[b]	Ewe Age[c]	Failed	1st Cycle	2nd Cycle	3rd Cycle	1st Cycle Percentage[d]	Conception Percentage[e]
April	Dry	2	M	64	4	21	3	14	70
April	Dry	3	M	9	0	4	0	0	80
April	Dry	4	M	0	0	0	0	0	0
April	Dry	2	Y	64	1	5	1	14	33
April	Dry	3	Y	30	1	2	2	20	56
April	Dry	4	Y	0	0	0	0	0	0
April	Dry	2	L	13	0	0	0	0	0
April	Dry	3	L	23	0	0	0	0	0
April	Dry	4	L	4	0	0	0	0	0
April	Wet	2	M	64	3	16	8	11	79
April	Wet	3	M	12	0	1	2	0	100
April	Wet	4	M	0	0	0	0	0	0
August	Dry	2	M	26	23	106	17	16	100
August	Dry	3	M	9	8	30	2	20	97
August	Dry	4	M	0	0	0	0	0	0
August	Dry	2	Y	2	1	8	0	11	100
August	Dry	3	Y	3	3	12	4	16	100
August	Dry	4	Y	1	1	2	0	33	75

[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]Ewe generation.

[c]Ewe age:M=mature ewe exposed to ram at approximately 2 years of age or older, Y=yearling ewe exposed to ram at approximately 15 months of age, L=ewe lamb exposed to the ram at approximately 12 months of age.

[d]Number conceived in the 1st cycle divided by the total number of ewes that conceived.

[e]Number of ewes lambing divided by number of ewes mated.

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

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

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 Dakota Rambouillets. The Dakota Rambouillets are being upgraded towards Rambouillet through successive backcrossing to Rambouillet. 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 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. 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. All ewes are fed according to 1985 NRC standards.

RESULTS AND DISCUSSION.

Growth data are presented in table 1 for Rambouillet and Dakota Rambouillet ewes. All the growth traits are influenced to some extend by the percentage of Booroola Merino present within the ewe type. Seven month, ten month, and fifteen month weight all tend to increase as the Rambouillet percentage increases from first to second generation.

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 three types of sheep. The Rambouillet which does not carry the F gene, and all the first generation Dakota Rambouillets (1/2 Booroola Merino X 1/2 Rambouillet) which should carry one copy of the F gene. If only the Rambouillet and first generation ewes are considered, 44% of the Rambouillet had singles while only 10% of the first generation Dakota Rambouillets had singles. Two percent of the Rambouillets had three or more lambs while 56% of the first generation ewes had three or more lambs. If the selection scheme works, than successive generations of selected Dakota Rambouillets should have a similar lambing distribution as the first generation ewes.

Table 2 shows the lambing distribution of second generation ewes. The distribution of the selected second generation ewes is what would be expected assuming the Booroola F gene is functioning as a single qualitative gene. Not until we get to the third generation of Dakota Rambouillet does the lambing distribution deviate from what is expected. In table 2, there are no triplets born to the third generation ewes and the frequency of singles is greater in the third generation ewes than the straight Rambouillets. Therefore the gene no longer appears to be present.

Table 3 looks at the one year and two year lambing performance of third generation ewes compared to the lambing performance of Rambouillet ewes at two years of age. The third generation ewes show now evidence of having maintained the Booroola fertility gene. Based on these results, the Dakota Rambouillet line will be discontinued. No explanation can be given as to why the Booroola F gene is no longer being expressed.

Table 1

ACTUAL BIRTH WEIGHT AND ADJUSTED[a] WEANING, SEVEN MONTH, TEN MONTH AND FIFTEEN MONTH WEIGHT FOR RAMBOUILLET AND DAKOTA RAMBOUILLET EWE LAMBS

Ewe Type	Birth Weight	Weaning Weight	7 M Weight	10 M Weight	15 M Weight
Rambouillet[b]	11.0(900)	37.1(823)	106(567)	112(569)	130(532)
Dakota Rambouillet					
First Generation	9.9(139)	33.7(135)	92(138)	92(53)	121(126)
Second Generation	8.8(323)	32.7(257)	107(124)	106(162)	135(129)
Third Generation	9.3(111)	32.3(93)	85(48)	106(57)	92(28)

[a]Weaning, 7M, 10M, and 15M weights adjusted to 56, 226, 298, and 438 days, respectively.
[b]Rambouillet lambs born 1986 to 1991.

Table 2

PERCENTAGE OF SINGLE, TWIN AND TRIPLET OR GREATER BIRTH TYPES OF TWO YEAR OLD RAMBOUILLET EWES AND FIRST, SECOND, AND THIRD GENERATION DAKOTA RAMBOUILLET

	Rambouillet[a]	Generation First	Generation Second	Generation Third	Second Generation Selected[b]	Second Generation Rejected
Single	44	10	28	75	0	55
Twin	54	34	42	25	38	45
Triplet or greater	2	56	30	0	62	0

[a]1986,1987 and 1988 born Rambouillet ewes.
[b]Selection based on the first two estimates of ovulation rate obtained.

Table 3

PERCENTAGE OF SINGLE, TWIN AND TRIPLET OR GREATER BIRTH TYPE OF RAMBOUILLET EWES AND THE FIRST AND SECOND LAMBINGS OF THIRD GENERATION OFFSPRING OUT OF SELECTED[a] SECOND GENERATION DAKOTA RAMBOUILLET

	Rambouillet[b]	First lambing	Second lambing
Single	44	62	75
Twin	54	29	25
Triplet or greater	2	9	0

[a]Twenty four, six and one second generation ewes were selected from 50, 14, and 8 ewes in 1987, 1989 and 1990 respectively. Selected second generation ewes had an ovulation rate of 2 at the first two estimates or one of the estimates must be three or greater.
[b]1986,1987 and 1988 born Rambouillet ewes.

PROTEIN SUPPLEMENTATION OF ANGORA NANNIES FED LOW QUALITY ROUGHAGE DIETS

1992 Update

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

INTRODUCTION

Livestock are important economic contributors to agriculture and to the national and international economy. Livestock contributes from 20-25 percent of North Dakota's agricultural cash receipts exceeding cash receipts from crops in 32 percent of the states' counties. For many rural people, additional income opportunities may exist when livestock are added to present farm enterprises. Livestock would not only utilize current waste forage in present crop production systems, but would also provide enhanced utilization of medium to low quality forage produced under current CRP acreage. The addition of small ruminants such as sheep and goats to the livestock enterprise would also enhance the utilization of harvested forage and grasslands, plus help control leafy spurge and other invading weed species.

Utilization of medium to low quality forage diets (standing crop, CRP hay or crop residue) by sheep and goats are hindered by low intakes and digestibilities. Intake of forage in sheep and goats is critical. Research with traditional protein supplements has shown increases in low quality forage intake and digestibility resulting in enhanced livestock production. Why natural protein supplementation enhances forage utilization remains unclear. Protein supplements have two areas of impact, ruminal and intestinal and the requirements for ruminal protein (rumen degraded) and intestinal protein (escape or non-degraded) are unclear.

The objective of this trial is to help determine if level of escape protein versus rumen degraded protein alters forage intake and utilization, alters reproductive performance or enhances fiber production in sheep and goats.

PROCEDURE

Eighty shorn yearling Angora nannies were purchased and acclimated to the Hettinger Research Center facilities the fall of 1991 and provided ad libitum grass/alfalfa mix hay. All nannies were synchronized with 0.125 mg Fenprostalene on December 10 and 16 and handmated to Angora billies. The forty eight nannies that mated were allocated to six pens and acclimated to grass hay (NE_m = 1.2 Mcal/Kg; Total Crude Protein = 7.3%; UDP = 2.48%; RDP = 4.82%; Ca = .43%; P = 0.14%) and shorn February 18. Nannies were weighed twice prior to breeding and once prior to side sampling mohair, shearing and kidding. Three protein supplements were formulated based on NRC requirements for Angora goats to provide increasing levels of escape (UDP) protein. The control supplement was formulated with the following analysis: NE_m = .53 Mcal/Kg;

crude protein = 75 g; UDP = 15 g; RDP = 60 g; Ca = 3.2 g; P = 3.2 g. The step one supplement was formulated with the following analysis: NE_m = .53 Mcal/Kg; crude protein = 120 g; UDP = 60 g; RDP = 60 g; Ca = 3.2 g; P = 3.2 g. The step two supplement was formulated with the following analysis: NE_m = .53 Mcal/Kg; crude protein = 165 g; UDP = 105 g; RDP = 60 g; Ca = 3.2 g; P = 3.2 g.

Throughout the trial, grass hay was fed ad libitum. Supplementation was started on March 2, following the 30 day acclimation to low quality grass hay. From March 2 to March 30, 99 grams of each supplement was fed, from March 31 to April 6, 454 grams of each supplement was fed and the last four weeks of gestation (April 7 to May 4) 301 grams of each supplement were fed along with 142 grams of corn.

Following kidding (May 6 to May 18) the nannies and their kids were placed on native pastures. Nannies and kids were removed from grazing pastures September 28, weaned and placed in confinement and fed ad libitum grass/alfalfa hay until breeding. All kids and excess nannies were sold and the same 48 nannies utilized the first year were synchronized with 0.125 mg Fenprostalene on December 10 and 21, 1992 and artificially inseminated on December 24. Those nannies that returned to heat were handmated to Angora billies January 11-15, 1993. The forty eight nannies that mated were allocated to six pens the week of January 18 and the trial is currently being repeated. Data were analyzed using general linear procedures.

RESULTS

First year results are presented in tables 1-7. Table 1 indicates the consumtion of low quality hay. There was no significant difference between treatments, however intake increased as expected when the supplement was added to the ration. There was no differences in body weight (table 2) between the treated groups, although all the nannies increased in body weight throughout the duration of the protein supplementation period. This increase in body weight would be normal weight gain for a pregnant nanny. All groups lost weight following kidding and then maintained weight while grazing.

All nannies were purchased freshly shorn, and there was no difference between treatment groups at the start of the trial as shown in table 3. The supplementation treatments were started on March 3, and there was a significant response to the supplement in which the greatest portion of the protein was escape protein within 30 days. The control and step one supplements, combined, averaged 1.55 grams of mohair growth versus 2.00 grams for the step 2 supplement ($P<.05$, table 3). Similar results were obtained the next 30 day period when the control and step one supplements, combined, averaged 1.40 grams versus 2.00 grams for step two. The protein supplements were stopped when the nannies kidded and returned to pasture. The treatments effects stopped when the supplement was ended, and there was no significant carry over effects. Total six month clip (table 3) was not significantly different between treatments.

Table 4 indicates there was no influence of supplements fed during pregnancy on kid growth performance or mohair production. Table 5 presents the reproductive performance of those nannies that cycled during the breeding season. Those nannies that did not cycle (32 nannies) were removed from the trial and sold. There was no significant difference between nannies assigned to each treatment. Only pregnant nannies were utilized in the project analysis.

Tables 6 and 7 evaluate both the 1991 and 1992 breeding season at the start of the second year of the project. Nannies were synchronized both years of the project and table 6 indicates that 0.125 mg Fenprostalene is effective in synchronizing nannies that are actively cycling. Sixty and 83 percent of the nannies expressed estrus in 1991 and 1992 respectively. The nannies were artificially bred in 1992 and table 7 documents some observations regarding mucus type and the ability to penetrate the cervix with an inseminating pipette. The most desirable mucus for insemination was sixty to sixty three hours after the second injection of fenprostalene. This was also the time that the cervix was most successfully penetrated.

Please keep in mind that these data are based on only the first year of the trial. The project has one more year of data collection to go and at that time the project will be summarized. A sheep trial has also started utilizing the same treatments and will be reported on next year.

Table 1

DAILY LOW QUALITY FORAGE AD LIBITUM INTAKE (Kg) OF ANGORA NANNIES FED THREE LEVELS OF SUPPLEMENTAL ESCAPE PROTEIN

Date	Control	Step 1	Step 2
Feb 1 to Mar 1[a]	0.72	0.72	0.73
Mar 2 to Mar 30[b]	1.05	0.99	0.98
Mar 31 to Apr 6[c]	0.87	0.76	0.73
Apr 7 to May 4[d]	0.96	0.82	0.73
Total	0.90	0.82	0.79

[a] Acclimated to forage and supplements.
[b] Daily supplement intake was 99 grams per nanny.
[c] Daily supplement intake was 454 grams per nanny.
[d] Daily supplement intake was 301 grams per nanny plus 142 grams of corn.

Table 2

BODY WEIGHT (Kg) OF PREGNANT ANGORA NANNIES FED THREE LEVELS OF SUPPLEMENTAL ESCAPE PROTEIN

Date Weighed	Control	Step 1	Step 2
11-15-91	26	25	26
12-04-91	29	27	29
02-18-92	27	25	26
04-03-92	32	32	31
05-05-92	38	38	38
07-06-92	33	32	34
09-28-92	33	32	33

Table 3

SIDE SAMPLE MOHAIR WEIGHT AND ADJUSTED SIX MONTH MOHAIR WEIGHT OF PREGNANT AND LACTATING ANGORA NANNIES

Date	Control	Step 1	Step 2
CLIP[a] (Kg)			
02-18-92	2.4	2.5	2.5
SIDE SAMPLES[b] (grams)			
04-03-92	1.5[c]	1.6	2.0[d]
05-05-92	1.3[c]	1.5	2.0[d]
07-06-92	5.8	5.9	6.3
09-28-92	9.6	9.7	9.0
TOTAL SAMPLE	18.1	18.7	19.3
CLIP[a] (Kg)			
09-28-92	2.2	2.4	2.4

[a] Mohair adjusted to 183 day growth.
[b] Mohair side sample taken 10.16 cm ventral from the last thoracic veribra ($10.16*7.62\ cm^2$).
[cd] Means in the same row with different superscripts differ ($P<.05$).

Table 4

ADJUSTED 55 AND 142 DAY BODY WEIGHT AND ADJUSTED SIX MONTH MOHAIR WEIGHT FROM ANGORA KIDS PRODUCED FROM NANNIES FED THREE LEVELS OF ESCAPE PROTEIN

Weight	Control	Step 1	Step 2
Adjusted 55 day (Kg)	13	12	12
Adjusted 142 day (Kg)	17	17	15
Kid mohair[a] (Kg)	1.1	1.2	0.9

[a]Mohair adjusted to 183 day growth.

Table 5

REPRODUCTIVE PERFORMANCE OF ANGORA NANNIES FED THREE LEVELS OF ESCAPE PROTEIN INCLUDING NUMBER EXPOSED, NUMBER DIAGNOSED PREGNANT, NUMBER CARRIED FULL TERM, NUMBER FAILING TO CONCEIVE AND PREGNANCY LOSS

Treatment	Initial number	Diagnosed pregnant[a]	Full term pregnancy	Number non-preg	Pregnancy Loss
Control	16	15	14	2	1
Step 1	16	12	10	6	2
Step 2	16	14	13	3	1[b]

[a]Realtime ultrasound evaluation February 18, 1992.
[b]Accidental dexamethasone induced premature parturition March 11, 1992.

Table 6

ESTROUS EXPRESSION OF ANGORA NANNIES FOLLOWING SYNCHRONIZATION WITH FENPROSTALENE

Year	Total Nannies	Total Nannies Injected	Estrous Expression Post Injection Time[a] <36	36	48	60	72	>72	Number Anestrus	Number Mated
1991[b]	80	80	3	7	18	6	3	11	32	48
1992[c]	48	48	0	0	0	0	0	0	48	0
1992[d]	48	48	0	12	22	4	2	0	8	48[e]

[a]Number of hours from injection time, all nannies were observed for estrus up to 72 hours post injection. In 1991 nannies were observed for estrus following the initial injection of fenprostalene for six days.
[b]1991 December 10, 0.125 mg fenprostalene injected, followed by observation of estrus. Nannies were hand mated at initial observation of estrus and 12 hours later. All nannies not expressing estrus within 6 days were reinjected on December 16 with 0.125 mg fenprostalene and observed for estrus and mated as previously described.
[c]1992 October 12, 0.125 mg fenprostalene injected, October 19, 0.125 mg fenprostalene injected, with estrous detection following the second injection.
[d]1992 December 10, 0.125 mg fenprostalene injected, December 21, 0.125 mg fenprostalene injected, with estrous detection following the second injection.
[e]All nannies were artificially bred regardless of estrus, preliminary estimated conception rate 60%.

TABLE 7

CERVICAL PENETRATION OF ARTIFICIAL INSEMINATION SHEATH AND CERVICAL MUCUS OBSERVATIONS DURING ARTIFICIAL INSEMINATION OF MATURE ANGORA NANNIES

Insemination Time[c]	N	Cervical Penetration[a] 0	1	2	3	Cervical Mucus Consistency[b] 0	1	2	3
60 hours	48	10	17	15	6	5	40	0	3
72 hours	48	3	36	5	4	8	23	13	4

[a]Zero=no penetration, 1=1 ring, 2= two to four rings, 3= uterus
[b]Zero=no observed mucus, 1=stretchy, 2=semi-stretchy, 3=non-stretchy
[c]Hours after second injection with fenprostalene.

SECTION II
MANAGEMENT SECTION

TIMOTHY C. FALLER
SUPERINTENDENT
HETTINGER RESEARCH AND EXTENSION CENTER

DR. KRIS RINGWALL
EXTENSION LIVESTOCK SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

34TH ANNUAL SHEEP DAY

HETTINGER RESEARCH AND EXTENSION CENTER
HETTINGER, NORTH DAKOTA

FEBRUARY 10, 1993

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 absorbent 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 management 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 all ewes for vibriosis and enzootic abortion (EAE) 50 days prior to breeding and booster 21 days later all ewe lambs and new ewes in the flock.

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.

LAST SIX WEEKS BEFORE LAMBING

1. Trim hooves 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.

<u>END OF LAMBING TO WEANING</u>

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.

<u>WEANING</u>

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 ewe's 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 ewe's 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 but will cost approximately $1.00 per pound and each lamb will require from 15 to 20 pounds.

2. Use good equipment. Self priming nipple and tube assemblies have been found to be excellent for starting orphans. Many types of feeding systems can be homemade.

3. Start on nurser quickly. Young lambs start easier. Check ewe's 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 short term

(two weeks) protection use antitoxin. For long term protection use bacterial toxiods (cl. perfringens 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 ounce 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