33rd Annual Western Dakota

SHEEP DAY

February 12, 1992
Hettinger Armory

Timothy Faller, Superintendant
Hettinger Research & Extension Center
North Dakota State Uniersity

PROGRAM

9:00 AM (MST)	Tours at the Station
10:00 AM	Coffee at Hettinger Armory
10:20 AM	HETTINGER & FARGO STATION REPORTS Mr. Roger Haugen Dr. Kris Ringwall Mr. Timothy Faller
12:00 NOON	LUNCH: ROAST AMERICAN LAMB
1:00 PM	WELCOME: NORTH DAKOTA AG EXPERIMENT STATION Dr. H.R. Lund, Director Agricultural Experiment Station North Dakota State University
1:15 PM	"PROCESSING LAMB AMERICAN STYLE" Glen Brown, Director American Lamb Producers Inc. Buffalo, South Dakota
1:35 PM	"LIVING TOGETHER" Jim Nelson, Interim Superintendent Dickinson Research Center Dickinson, North Dakota
2:05 PM	"OUR NEW SHEEP ENTERPRISE" Harold Gaugler Lemmon, South Dakota
2:30 PM	"WHAT DOES IRM HOLD FOR THE SHEEP PRODUCER?" Dr. Charles Parker Director of Producer Services American Sheep Industry Denver, Colorado
3:10 PM	"NATIONAL FLOCK GUARDIAN" & "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 1:00 PM including presentations on "Super Woman Syndrome" and "Cooking with Lamb"

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

JAMES NELSON
INTERIM SUPERINTENDENT & ANIMAL SCIENTIST
DICKINSON RESEARCH CENTER

AT THE
33RD ANNUAL SHEEP DAY
HETTINGER RESEARCH AND EXTENSION CENTER
HETTINGER, NORTH DAKOTA
FEBRUARY 12, 1992

VARYING CONCENTRATE TO ROUGHAGE RATIOS IN LAMB DIETS

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

NDSU Experiment Station, Hettinger 1991

Summary

Alfalfa was incorporated into barley diets for lambs at 5, 15, 30 and 45%. The TDN % ranged from 72 to 62 for the low to high level of alfalfa but the diets were all balanced to contain 15% protein. Diets were fed free choice in a complete mixed form. Lambs (168) were allotted by weight and breed into eight lots with two lots for each dietary treatment. The dietary treatments were assigned randomly. Lambs averaged 60 lbs at the start of the experiment and weighed 103, 101, 105 and 104 lbs respectively with increasing alfalfa. Daily gains (approximately .5 lb) were similar (P>.05) among treatments. Daily feed increased (P<.05) with increasing levels of alfalfa (3.14 and 4.13 lbs P<.01) from 5 to 45% resulting in feed per gain ranging from 6.71 to 8.45 (P<.01). A selected representative group of lambs were slaughtered and several carcass characteristic measures were taken. Carcass weight, dressing percentage, and yield were all lower (P<.05) for the 45% compared to the 5% alfalfa diet. The backfat, kidney percent, USDA grade and leg score were similar (P>.05) among diets. These data indicate that alfalfa can be fed up to 30% of a barley diet without appreciably affecting feedlot performance or carcass characteristics. The lambs on the 45% alfalfa diets less efficient, consumed more feed and had less carcass weight, yield and dressing percent than those on 5% alfalfa diets. Economics of feed costs and type of feeder lambs should be considerations in feed-management decisions. These data will provide information in making those decisions.

Introduction and Justification

The level of grains and roughages in finishing diets for lambs can vary considerably depending on the prices of these types of feedstuffs and of the protein supplement. The type and condition of the lambs also must be considered when determining the amount of roughage in the diets. Work reported in the 1991 Western Dakota Sheep Day which was conducted at the Hettinger Station indicates that as roughage is increased up to 40% of the diet feed intake increased and feed efficiency decreased. The carcass characteristics were similar with levels of alfalfa. The diets ranged from 13.8 to 14.4% protein for the 10 and 40% alfalfa diets respectively. There is a need to determine the effects of a wider roughage to concentrate ratios fed in diets of equal protein levels.

Objective

To determine feedlot performance and carcass characteristics of lambs fed levels of alfalfa ranging from 5 to 45% in basal iso-nitrogenous barley diets.

Procedure

Barley diets with 5, 15, 30 or 45% alfalfa were self fed in complete mixed form. One hundred sixty-eight lambs averaging 60 lb were allotted by weight and breed into eight lots (2 replicates for each diet). The diets ranged in TDN from 72 to 62%, decreasing with increasing alfalfa and all diets were balanced to contain 15% protein. Each diet was sampled 16 times during the feeding trial and analyzed for selected chemical composition. Feed intake lamb gains were recorded. A representative group of lambs from each treatment were slaughtered and carcass measurements were taken.

Results and Discussion

Composition of feeds used for balancing the diets are shown in Table 1 and the diets along with the calculated nutritional composition are shown in Table 2. The diets were balanced to contain 15% protein resulting in a decrease in soybean meal from 7 to 4% of the diet with the increase of 5 to 45% of the diet as alfalfa. Levels of Ca and P were above NRC requirements (.65 to .40%) (Table 2) with the diet with 45% alfalfa containing 76% because of the high concentration of Ca in alfalfa (Table 1). The digestibility of the diets decreased from 80 to 75% with increasing alfalfa and the protein levels were similar among all diets analyzing from 16.5 to 17.5% (Table 3). Lambs averaged 60 lb when the experiment was initiated and weighed from 101 to 105 lb at the close gaining just under .5 lb a day (Table 4). The lambs consumed more (P<.05) feed (3.14, 3.63, 3.95 and 4.13 per day) as alfalfa increased from 5 to 45% respectively. Feed required for gain increased (P<.01) from 6.71 to 8.45 from 5 to 45% alfalfa. The lambs could consume more feed as the fiber content of the diet increased from 7.3 to 14.1% ADF (Table 3). Adding alfalfa to barley diets up to 45% did not decrease total energy intake therefore gains stayed the same (P>.05) among diets. Lambs selected for slaughter were heavier (Table 5) than the average weight of the lambs at the close of the experiment (Table 4) with the carcass weight being lighter (P<.05) for the lambs on the 45% alfalfa diet. The carcass measurements are shown on Table 5. Dressing % and yield grades were lower (P<.05) for the lambs on 45% alfalfa compared to those on 5 and 15% alfalfa. The other measures of back and kidney fat, grade and leg score were not appreciably (P>.05) different. These results support those reported in the 32nd Western Dakota Sheep Day (1991). Those trials were conducted with levels of 10 to 40% alfalfa but with no protein supplement added. The information generated from the experiments with varying levels of alfalfa should be useful for producers in making feed management decision which may have impact on profit potential.

Acknowledgement

To the North Dakota Barley Council for their continued support.

TABLE 1. FEEDSTUFF COMPOSITION FOR FORMULATING DIETS (HETTINGER 1991)

Feedstuff	Protein	TDN	DE/lb	ADF	Ca	P
Alfalfa	16	52	1040	34.0	1.25	.17
Barley (46#)	13	75	1540	6.2	.05	.34
Soybean meal	44	78	1560	10.0	.25	.60
DiCalPhos	-	-	-	-	22	18
Limestone	-	-	-	-	36	-

TABLE 2. DIETARY TREATMENTS AND SELECTED NUTRITIONAL COMPOSITION (HETTINGER 1991)

Feedstuff[a]	5	15	30	45
Barley	85	76	62	48
Soybean meal	7	6	5	4
Limestone	1.28	.83	.30	-
DiCalPhos	.34	.44	.6	.76
		% nutrient		
TDN	71.9	69.5	66.0	62.5
Dkcal/#	1438	1390	1320	1250
Protein	15.0	14.9	15.1	15.2
Ca	.659	.637	.690	.764
P	.400	.398	.400	.400

[a].5% each of TM salt and ammonium chloride .05% vit. A, D, E and 2.5 g of antibiotic/100 lb diet.

TABLE 3. NUTRITIONAL COMPOSITION OF DIETS BASED ON LABORATORY ANALYSIS (HETTINGER 1991)

	% Alfalfa							
	5 n = 16		15 n = 18		30 n = 14		45 n = 14	
		SD		SD		SD		SD
Protein	16.5	.58	16.6	.50	17.6	.52	17.2	1.56
NDF	19.4	1.62	20.0	.98	23.2	1.33	25.8	1.07
ADF	7.3	.73	7.6	.56	10.9	.72	14.1	1.52
IVDMD	80	1.6	79	1.0	76	.76	75	1.6
Ash	6.9	.79	5.8	.70	7.5	.79	7.9	.99
Ca	.96	.17	.78	.16	1.17	.18	1.04	.18
P	.48	.08	.48	.06	.57	.08	.52	.07

TABLE 4. PERFORMANCE FEEDLOT LAMBS AS AFFECTED BY VARYING LEVELS OF ALFALFA (HETTINGER 1991)

	% Alfalfa				
	5	15	30	45	SE
Int. wt.	60	59	60	60	.27
Fin. wt.	103	101	105	104	1.87
DG	.474	.468	.496	.490	.020
DF	3.14[a]	3.63[ab]	3.63[ab]	4.13[b]	.108
F/G	6.71[c]	7.83[cd]	7.97[cd]	8.45[d]	.507

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

TABLE 5. CARCASS CHARACTERISTICS OF LAMBS FED VARYING LEVELS OF ALFALFA (HETTINGER 1991)

	% Alfalfa				
	5	15	30	45	SE
Live wt. #	124	124	118	116	1.30
Carc. wt. #	59[a]	59[a]	56[ab]	53[b]	.72
Dress %	47.5[a]	47.8[a]	47.6[a]	45.3[b]	.21
Yield	3.01[ab]	3.05[a]	2.90[ab]	2.44[b]	.080
Backfat in.	.191	.208	.182	.121	.010
Kid fat in.	2.54	2.33	2.35	2.00	.097
USDA grd.	11.6	11.7	11.3	11.2	.11
Leg sc.	11.2	11.7	11.4	11.0	.103

[a,b]P<.05

EFFECTS OF LASALOCID IN BARLEY OR CORN DIETS FOR LAMBS

D.S. Rupprecht, B.L. Moore and D.O. Erickson

Animal and Range Sciences Department
Fargo Station 1991

Summary

An experiment was conducted to evaluate Lasalocid in barley or corn based diets utilizing 112 early weaned lambs, which were allotted by weight, breed and sex into 16 lots. The experiment consisted of four dietary treatments (four replications), corn or barley with or without lasalocid. Lasalocid was added at a level of 30 g/T of the diet. Coarse rolled complete mixed diets were randomly assigned and were self fed. Diets were formulated to contain 15% protein (soybean meal as supplement) and all diets contained 12% alfalfa. Calcium and phosphorus levels were about .65 and .4% respectively. Lambs averaged 61 lb at the initiation of the experiment and ranged from 105 (barley without) to 113 pounds (corn without) at the close of the experiment. Lambs fed corn gained faster ($P<.05$) compared to barley (.92 vs. .79 lb/d).

Feed intakes were similar ($P<.05$) among treatments. Lambs on corn diets were more ($P<.05$) efficient 3.73 compared to 4.30 for barley. Lasalocid improved efficiency ($P<.10$) in the barley diet. Live weight was used as the co-variant for carcass characteristic adjustment. Hot carcass weights of lambs on the corn diets were heavier ($P<.01$) and lambs fed corn with Lasalocid had higher ($P<.05$) dressing percentage. Rumen fluid of barley fed lambs had a pH of 6.2 compared to 6.0 ($P<.01$) for corn fed lambs. The addition of Lasalocid to corn did not affect feedlot performance or most carcass characteristics, however, Lasalocid did improve feed efficiency with barley.

Introduction

Since the approval of lasalocid in 1984, the interest and use of ionophores has become very popular among livestock producers. Lasalocid was first introduced as coccidiostat. Since coccidiosis is a major disease problem in confined sheep that can result in substantial economic losses to sheep producers and feeders. Ionophores have been shown to improve feed efficiency and sometimes rate of gain in ruminant animals. Ionophores interact with cations and interfere with normal ion transport (Bergan and Bates, 1984). This disruption causes an ion imbalance in the cell and results in death of coccidial parasites and also changes the species population of rumen bacterial due to the selective antimicrobial activity (Dennis et al., 1981). Most of the research conducted with Lasalocid does not compare the effects of the ionophore comparing corn to barley in finishing lamb diets.

Objective

To determine the effects of lasalocid in barley or corn diets on feedlot lamb performance and carcass characteristics.

Procedure

Diets were formulated to contain equal levels of protein (15%), energy (71% TDN) based on NRC values for the feedstuffs and .65 and .42% calcium and phosphorus respectively. All diets contained 12% alfalfa, .5% TM salt and ammonium chloride, vitamins and minerals slightly above NRC requirement for rapid gaining lambs and antibiotics (Table 1). Treatments with Lasalocid contained the recommended level of 30 g/T. Diets were rolled in a complete mix and fed ad lib. One hundred and twelve lambs average 61 pounds were allotted by weight, breed and sex and randomly assigned to one of the four dietary treatments (4 replications), corn or barley with or without Lasalocid. Lambs were weighed and feed intake was recorded every 14 days. Diet samples were taken from each batch (1,000 lbs) of diet processed and analyzed for nutritional composition. Rumen fluid samples were collected on weeks 3, 5 and 7 of the trial at six hours after morning feeding from three lambs in each lot by suction strainer and immediately analyzed for pH and then frozen for subsequent volatile fatty acid analysis. Lambs were taken off the experiment after 56 days and averaged about 110 pounds. A representative group of lambs were slaughtered for measuring several carcass characteristics (Table 3). Coccidia levels were determined by counting the number of oocyst/g in the feces from samples from each of the 16 lots (Table 4). Oocyst were determined using a flotation test which turned out to be variable and accuracy of the test is questionable.

Results and Discussion

Lambs fed the corn diets had heavier (P<.05) final weights and gained faster (P<.05) than lambs fed barley. Feed intakes were similar (P>.05) among treatments. Lambs on corn diets were more (P<.05) efficient 3.73 compared to 4.30 for barley. Lasalocid improved efficiency (P<.10) in the barley diet (Table 2). Rumen fluid of barley fed lambs had a pH of 6.2 compared to pH 6.0 (P<.01) for corn fed lambs. Horton et al., (1980), reported that as they increased the level of barley in the diets from 30% to 70%, pH decreased from 5.77 to 5.42. Lasalocid increased the pH (P<.01) which agrees with Horton et al. Since live weights were different at the end of the trial, live weight was used as a co-variant for carcass characteristic adjustment. Hot carcass weights of lambs on the corn diets were heavier (P<.01) and lambs fed corn with Lasalocid had higher (P<.05) dressing percentage. All other carcass measurements taken were similar (P>.05) among treatments (Table 3). This experiment indicates that sheep producers can utilize barley in a lamb finishing diet to some extent help to reduce feed costs without altering the feedlot performance or carcass value. Even though lamb performance was more desirable with corn diets, barley resulted in very acceptable lamb performance and carcass characteristics. In many previous studies the lamb on barley were equal in efficiency to those on corn but did not gain as fast.

Acknowledgement

To the North Dakota Barley Council for partial support of this research.

TABLE 1. DIETARY TREATMENTS AND SELECTED CALCULATED NUTRITIONAL COMPOSITION

	1	2	3	4
Corn	73	73	--	--
Barley	--	--	78	78
Alfalfa	12	12	12	12
SBM	11.5	11.5	6	6
Lasalocid	30 g/T		30 g/T	

Diets contained approximately 15% protein, 71% TDN, Ca .65% and P .41%

All diets contained (%) TM salt and ammonium chloride .5, sun oil .7, antibiotics .025 and Vitamin A, D and E .030.

TABLE 2. LAMB PERFORMANCE OF LAMBS FED CORN OR BARLEY DIETS WITH OR WITHOUT LASALOCID

	Corn		Barley	
	+		+	
Fin. wt.	112[a]	113[a]	106[b]	104[b]
DG	.91[a]	.93[a]	.82[b]	.76[b]
DF	3.35	3.41	3.42	3.41
F/G	3.76[a]	3.69[a]	4.29[b]	4.41[b]

+ = lasalocid
[a,b]P<.07
Initial weight 61 pounds

TABLE 3. CARCASS CHARACTERISTICS OF LAMBS FED CORN OR BARLEY DIETS WITH OR WITHOUT LASALOCID

	Corn		Barley	
	+		+	
Carc. wt.	64.2[a]	63.0[a]	56.3[b]	57[b]
Dress %	61[c]	58.5[d]	56[d]	56.6[d]
Back fat	.23	.23	.16	.10
Kid fat %	.96	1.46	.92	.91
Loin area	2.38	2.40	2.27	2.56
Leg score	10.7	10.8	10.8	11.2
YG	2.91	3.06	2.58	1.95

+ = lasalocid
[a,b]P<0.5
[c,d]P<.01
Quality grades all > 10.7

TABLE 4. OOCYST/G* COUNT BY WEEK FOR EACH TREATMENT

Treatment	Week 3	Week 5	Week 7
1 (las)	18.5	19.75	2
2	TNTC	10	(8)+
3 (las)	13.75	(9.75)+	20.5
4	(12.6)+	21.21	(12.6)+

*Average of each Rep consisting of four lots + one lot consisted of TNTC (remaining three lot average).
TNTC = Too numerous to count.

Literature Cited

Berger, Werner G. and Douglas B. Bates. 1984. Ionophores: Their effect on production efficiency and mode of action. J. Anim. Sci. 58:1465.

Dennis, S.M., T.G. Nagaraja and E.E. Bartley. 1981. Effect of lasalocid or moensin on lactate producing or using rumen bacteria. J. Anim. Sci. 52:418.

Horton, G.M.J., K.A. Bassendowki and E.H. Keeler. 1980. Digestion and metabolism in lambs and steers fed monensin with different levels of barley. J. Anim. Sci. 50:997.

LOW INPUT CROP-LIVESTOCK PRODUCTION

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. 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.

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. 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.

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 8. 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. There was a measureable difference in mean ewe body weights between (HI) and (LI) diets, however, they were non-significant. 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

	INITIAL & BREEDING		LAMBING		WEANING	
TREATMENT	WT	COND	WT	COND	WT	COND
1 (HI)	168	3.1	188	3.4^{a}	159	2.6^{a}
2 (LIC)	163	3.0	176	2.6^{b}	142	2.2^{b}
3 (LIW)	161	2.9	173	2.8^{b}	145	2.4^{b}

^{ab} means with different superscript in the same column differ (P<.05) from (HI).

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

TABLE 2

TREATMENT EFFECT ON REPRODUCTIVE PERFORMANCE AND WOOL PRODUCTION

TREATMENT	WOOL WT*	LAMBING DATE (JULIAN)	LAMBS BORN PER EWE LAMBING	LAMBS WEANED PER EWE LAMBING	PERCENT EWES LAMBING
(HI)	8.4	117	1.77	1.16	90
(LIC)	7.6	117	1.84	.94	90
(LIW)	7.9	119	1.77	.73	67

* Grease fleece weights adjusted to 365 day production.

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 WEANING WT	56 DAY ADJ INT	56 DAY ADJ WT OF LAMB PER EWE EXPOSED
(HI)	10.1	35.9	38.4	44.54
(LIC)	9.5	34.5	36.4	34.22
(LIW)	11.6	40.2	43.5	29.15

Tables 4 through 7 indicate differences in the amounts of feed fed, feed costs and manure production for the trial. 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 & LIW diets indicate the value of straw & 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 management applied.

TABLE 4

ANNUAL FEED AND BEDDING CONSUMPTION PER EWE (335 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*	1536.73	598.3	586.8	1391.4	591.7	588.2
WHEAT STRAW	----	----	1173.6	----	----	1176.3
CORN STALKS	----	1196.5	----	----	1183.5	----
GRAIN	76.4	76.4	76.4	76.4	76.4	76.4
BEDDING	110.9	106.9	107.1	110.6	110.8	108.1
CONSUMPTION AS % BODY WT	2.82%	3.27%	3.21%	2.56%	3.23%	3.21%

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

TABLE 5

ANNUAL FEED AND BEDDING COSTS* PER EWE (335 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	46.10	17.95	17.60	41.74	17.75	17.65
WHEAT STRAW	----	----	17.60	----	----	17.64
CORN STALKS	----	17.95	----	----	17.75	----
GRAIN	3.82	3.82	3.82	3.82	3.82	3.82
BEDDING	1.66	1.60	1.61	1.66	1.66	1.62
TOTAL	51.58	41.32	40.63	47.22	40.98	40.73

*Costs are based on assuming: Hay $60/T, Straw $30/T, Corn Stalks $30/t, and Grain $100/T.

To evaluate the input of feeding regime on economic returns two different units of production are considered in Table 6 & 7. Both methods correct for fertility. It would appear there is a slight advantage for the (HI) fed ewes, however, it is not significant. The impact of selling the salvage crops to the sheep operation has not been evaluated as a component of the total farm enterprise.

TABLE 6

FEED AND BEDDING COSTS PER LAMB WEANED

	ANNUAL[1] FEED & BEDDING COSTS PER EWE (335 DA)	LAMBS WEANED PER EWE EXPOSED	EWE FEED COST($)[2] PER WEANED LAMBS
(HI)	49.40	1.16	44.47
(LIC)	41.15	.94	43.78
(LIW)	40.68	.73	55.73

[1]Combination of Rep 1 and 2.
[2]Only includes feed and bedding expenses.

TABLE 7

FEED AND BEDDING COST PER POUND OF WEANED LAMB

	ANNUAL[1] FEED & BEDDING COSTS PER EWE (335 DA)	56 DAY ADJ WT OF LAMB PER EWE EXPOSED	FEED COST[2] PER LB OF LAMB WEANED($)
(HI)	49.40	44.54	1.11
(LIC)	41.15	34.22	1.20
(LIW)	40.68	29.15	1.40

[1]Combination of Rep 1 and 2.
[2]Only includes feed and bedding expenses.

TABLE 8

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)	1664.3	1550.0	1384.7	1830.5	1515.0	1544.0

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

EWE REPRODUCTION AND OFFSPRING PERFORMANCE OF F1 BOOROOLA MERINO X RAMBOUILLET, F1 FINNISH LANDRACE X RAMBOUILLET, F1 SUFFOLK X RAMBOUILLET, 1/4 FINNISH LANDRACE X 1/4 BORDER LEICESTER X 1/2 RAMBOUILLET AND RAMBOUILLET UNDER SEMI-RANGE, CONFINEMENT AND SEMI-CONFINEMENT MANAGEMENT SYSTEMS

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

INTRODUCTION

Prolificacy, the number of lambs a ewe produces, has been a limiting factor in the sheep business. Sheep producers have utilized Rambouillet or Rambouillet type sheep and have had to rely on selection to increase the reproductive capacity of their flocks. Selection for increased reproduction has been a very slow process, and since the Rambouillet sheep does not provide much variation in reproductive capacity, little improvement has been made over the years. Two options have been introduced to the sheep industry that may improve the productive capacity of sheep. The first is a change from traditional management regimes to greater confinement and the second is the incorporation of breeds of sheep that are known to increase prolificacy. Over the last ten years at the Hettinger Research Center, two trials have been conducted to evaluate different breeds of sheep with various levels of prolificacy under confinement and range conditions. The following is a summary of both of those trials.

PROCEDURE

TRIAL ONE EXPERIMENTAL PROCEDURE. Reproductive performance, growth, wool production and attrition of Rambouillet x Suffolk, Rambouillet x Finnish Landrace and Rambouillet x Finnish Landrace x Border Leicester ewes under total confinement versus semi-range management were evaluated. The effects of warm barn confinement on longevity, health, lamb production and breed cross suitability were monitored on two hundred thirty two crossbred ewes composed of 81 1/4 Finn x 1/4 Border Leicester x 1/2 Rambouillet (1/4 Finn), 76 1/2 Suffolk x 1/2 Rambouillet (1/2 Suff), and 81 1/2 Finn x 1/2 Rambouillet (1/2 Finn). Crosses to obtain these ewes were made in 1980 and 1981 utilizing a group of Wyoming white-faced range ewes and Finn, Suffolk or 1/2 Finn X 1/2 Border Leicester rams.

The trial was initiated the fall of 1982 when the ewes were 18 or 30 months of age. The ewes in total confinement were fed 75% of the nutritional requirements of sheep during maintenance (established by the National Research Council, referred to as NRC) and 100 percent of NRC requirements at other stages of production. The ewes under semi-range were placed on native or tame grass pastures each spring and wintered in drylot. Range ewes were fed the same ration as confined ewes during gestation and lactation. All groups were allowed free access to a mineral mix of equal parts trace mineral salt, dicalcium phosphate and iodized salt. All ewes were mated to Suffolk rams with lambing starting about January 1 for confined groups and semi-range management ewes started lambing in April. Confinement lambs were weaned at 56 days of age and range lambs were weaned at approximately 100 days of age. All lambs were finished to a market weight of 120 pounds.

TRIAL TWO EXPERIMENTAL PROCEDURE. Reproductive performance, growth, wool production, and attrition were evaluated for F1 Booroola Merino x Rambouillet (BxR), F1 Finnish Landrace x Rambouillet (FxR) and Rambouillet (Rambouillet) ewes under semi-confinement versus semi-range management. Crosses to obtain these ewes were made in 1984 and 1985 utilizing a group of Wyoming Rambouillet range ewes and Finnish Landrace or Booroola Merino rams loaned from USDA-Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska. The Rambouillet control ewes were purchased from the same source as the ewes utilized in making the F1 crosses. In the falls of 1986 and 1987, a minimum of 36 BxR ewes, 36 FxR ewes, and 36 Rambouillet ewes were randomly selected from those lambs born during 1985 and 1986. These ewes were managed similarly until the fall of 1987 when the surviving ewes were assigned to semi-confinement or semi-range management groups. The ewes were either 18 or 30 months of age at the start of the trial.

Ewes and lambs were fed by current NRC requirements for sheep with the exception that no increase in nutrition was given at breeding. Confinement lambs were raised under total confinement and went to the feedlot following weaning at 56 days of age. Under the semi-range system, lambs were weighed the same time as the confinement group for weaning, but were returned to range for the rest of the summer with their dams. Both groups of ewes were combined from breeding to just prior to lambing and allowed to stubble graze until winter and were fed under drylot conditions. Starting in mid November, Rambouillet rams were used during the first 17 days of the breeding season and Suffolk or Columbia rams were used the last 17 days of the breeding season.

RESULTS AND DISCUSSION

Confinement versus Range

TRIAL ONE RESULTS - Reproductive performance is presented in table 1 for trial one. Confinement sheep production significantly (P<.05) decreased the number of ewes lambing per ewe exposed. Overall, range sheep averaged 88% versus 81.9% for those sheep kept in confinement. However, the 1/4 Finn sheep averaged a 2% greater number of ewes lambing in confinement than on the range system. As expected, the November bred ewes had a greater percentage of ewes lamb to the first cycle than did the confinement ewes which were bred in August. The only exception to this was in 1983, when the August bred ewes actually had a greater first cycle conception rate. Lambs born per ewe lambed was greater (P<.05) for those ewes maintained under the range system.

Lamb and ewe survival are presented in table 2. The two rearing systems were similar in lamb survival. The range ewes had a greater (P<.05) number of lambs weaned per ewe lambed overall, however the 1/2 Finn ewes weaned more lambs in confinement than under the range system. Annual attrition rate was greater (P<.05) for the confinement system, with the exception of 1984. Overall, attrition was almost twice as great in confinement versus range. Growth traits are presented in table 3. The prebreeding weight was greater (P<.05) for the ewes maintained on range and the range ewes sheared slightly more grease wool. Lamb growth was greater (P<.05) for those lambs raised in confinement.

TRIAL TWO RESULTS - Reproductive performance is presented in table 4. A similar number of ewes lambed per ewe exposed under semi-confinement and semi-range. First cycle conception and lambing date was also similar between treatments. The semi-range ewes had a greater (P<.05) number of lambs born per ewe lambed. The survival data is presented in table 5. As with trial one, survival and bumming rate were similar between management types, however, range ewes weaned a greater (P<.05) number of lambs per ewe lambed than the confinement ewes. Ewe attrition was similar between management systems.

Table 6 presents lamb and wool growth. The ewes within the range system were heavier (P<.05) prior to breeding than the confinement ewes two out of the three years. Birth weight, 63 day weight, and five month weight were similar for the lambs produced between the two management systems. Total lamb weight and wool production were greater (P<.05) for the range system.

Ewe Breed Comparisons

TRIAL ONE RESULTS - Reproductive data are presented in table 7. Percentage of ewes lambing, first cycle conception and average lambing date were similar for the 1/2 Suffolk, 1/2 Finn and 1/4 Finn. Both Finn crossbred types had greater (P<.05) lambs born per ewe lambed than did the Suffolk crossbred ewes. Lamb and ewe survival are presented in table 8. The 1/2 Finn ewe had the greatest (P<.05) bumming rate, however, lamb death loss was similar between the ewe types. There was no significant difference between ewe types in respect to lambs weaned per ewe lambed or ewe attrition rate. Growth and wool data are presented in table 9. Pre-breeding weight was greater (P<.05) for the 1/2 Suffolk ewe versus either of the ewe types with Finn breeding. The same was true for lamb growth. Birth weight, 58 day, 75 day and 93 day lamb weights were greater (P<.05) for the 1/2 Suffolk ewe's lambs than with the ewe types with Finn breeding. There was no real difference in wool weight.

TRIAL TWO RESULTS - Reproductive data are presented in table 10. Percentage of ewes lambing was similar between ewe types, however first cycle conception was greater (P<.05) for the BXR and FXR ewe types versus the straight Rambouillet. Lambs born per ewe lambed was greatest (P<.05) for the BXR, followed by the FXR and lowest (P<.05) for the Rambouillet ewe. Average lambing date was similar between ewe types. Lamb and ewe survival is presented in table 11. A greater (P<.05) percentage of lambs were bummed from the BXR and FXR ewes than the Rambouillet ewes and the BXR ewes had a significantly greater percentage of lamb death loss than either the FXR or Rambouillet ewe. Lambs weaned per ewe lambed was greatest for the FXR ewe followed by the BXR ewe and than the Rambouillet ewe. Feeder lambs marketed per ewe exposed was greatest (P<.05) for the FXR ewe, followed by the Rambouillet ewe, and lowest (P<.05) for the BXR ewe. Ewe attrition was similar for all ewe types.

The FXR ewe was the heaviest (P<.05) ewe type, followed by the Rambouillet and than the BXR ewe (table 12). Birth weight was greatest (P<.05) for lambs produced by the Rambouillet ewe, followed by the FXR ewe and than the BXR ewe. The Rambouillet and FXR ewe produced lambs with similar 63 day and five month weights, however the BXR ewe produced lambs that were significantly lighter at both weights. The FXR ewe produced the most marketable weight per ewe exposed, followed by the Rambouillet and than the BXR ewe. The reverse trend was evident in wool production.

Conclusions

In conclusion, total estimated annual lamb production based on weaning information was evaluated for confinement and range systems of sheep production. Under confinement, 56 lbs of weaned lamb was produced in trial one, and 48.9 lbs of weaned lamb in trial two per ewe exposed. Under semi-range conditions, 59.3 lbs of weaned lamb was produced in trial one, and 55.4 lbs of weaned lamb in trial two per ewe exposed. Therefore, the range system of sheep production produced 5 lbs additional weaned lamb per every ewe exposed than did the confinement systems. Plus the range ewes produced approximately one additional pound of wool with a 5% lower replacement rate.

Prolific breed types were involved in both trials. In trial one, the 1/4 Finn produced 61.4 lbs of weaned lamb per ewe exposed with a 14.9% ewe replacement rate; the 1/2 Suffolk produced 61.3 lbs of weaned lamb per ewe exposed with a 15.2% ewe replacement rate; and the 1/2 Finn produced 52.7 lbs of weaned lamb with 18.2% ewe replacement rate. In trial two, the Booroola X Rambouillet produced 44.5 lbs of weaned lamb per ewe exposed with a 7.4% ewe replacement rate; the Finn X Rambouillet ewe produced 60.5 lbs of weaned lamb per ewe exposed with a 7.5% replacement rate; and the Rambouillet ewe produced 49.7 lbs of weaned lamb per ewe exposed with a 5.6% replacement rate. These data suggest that replacing existing breeding stock with those breeds that increase the percentage of lambs born, do not assure an increase in marketable product.

TABLE 1

REPRODUCTIVE PERFORMANCE OF SUFFOLK X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND FINNISH LANDRACE X BORDER LEICESTER X RAMBOUILLET EWES BORN DURING 1980 AND 1981 MAINTAINED UNDER CONFINEMENT OR RANGE MANAGEMENT

	Confinement management	Semi-range management
Ewes lambing per ewe exposed (%)	82[a]	88[b]
Ewes lambing per ewe exposed (%)[c]		
Suffolk x Rambouillet	77	93
Finn. Landrace x Border Leicester x Ramb.	88	86
Finnish Landrace x Rambouillet	81	85
First cycle conception (%)[d]	23[a]	80[b]
First cycle conception[c] (%)		
1983	48	27
1984	16	98
1985	18	98
1986	9	98
Lambs born per ewe lambed (%)	178[a]	202[b]
Average julian lambing date[e]	41[a] (February 10)	131[b] (May 11)

[ab] Means in the same row with different superscripts differ (P<.05).
[c] Significant (P<.05) interaction with different rank are listed.
[d] End of the first cycle calculated on a 150 day gestation length.
[e] Lambing dates were adjusted to a constant ram turn out date (Confinement August 20 and Range December 2).

TABLE 2

LAMB AND EWE SURVIVAL OF SUFFOLK X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND FINNISH LANDRACE X BORDER LEICESTER X RAMBOUILLET EWES BORN DURING 1980 AND 1981 MAINTAINED UNDER CONFINEMENT OR RANGE MANAGEMENT

	Confinement management	Semi-range management
Lambs bummed per lambs born (%)	11.2	12.5
Lambs bummed per lambs born[a]		
1983	4.2	6.7
1984	5.5	18.2
1985	18.9	12.8
1986	16.2	12.5
Lambs dead per lambs born (%)	15.3	17.0
Lambs weaned per ewe lambed (%)	130[b]	142[c]
Lambs weaned per ewe lambed[a]		
Suffolk x Rambouillet	128	142
Finn. Landrace x Border Leicester x Ramb.	123	156
Finnish Landrace x Rambouillet	139	126
Annual ewe attrition[d] (%)	20.4[b]	11.8[c]
Annual ewe attrition[a]		
1983	10.2	3.6
1984	9.3	6.6
1985	22.2	24.5
1986	39.9	12.3

[a] Significant (P<.05) interaction with different rank are listed.
[bc] Means in the same row with different superscripts differ (P<.05).
[d] Final ewe inventory at the termination of the project, fall 1986.

TABLE 3

LAMB AND WOOL GROWTH OF SUFFOLK X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND FINNISH LANDRACE X BORDER LEICESTER X RAMBOUILLET EWES BORN DURING 1980 AND 1981 MAINTAINED UNDER CONFINEMENT OR RANGE MANAGEMENT[a]

	Confinement management	Semi-range management
Pre-breeding weight (lbs)[b]	137[c]	142[d]
Pre-breeding weight by year[e]		
Suffolk x Rambouillet	152	150
Finn. Landrace x Border Leicester x Ramb.	133	139
Finnish Landrace x Rambouillet	127	137
Average birth weight (lbs)	11.0	11.3
Average 58 day weight (lbs)[f]	40.0	----
Average 75 day weight (lbs)[g]	51.7[c]	46.7[d]
Average 75 day weight (lbs)[e]		
1983	51.9	39.6
1984	51.1	51.5
1985	56.0	47.4
1986	48.0	48.3
Average 93 day weight (lbs)[h]	----	57.6
Average annual wool weight (lbs)[i]	9.6	9.8
Average annual wool weight (lbs)[e]		
1983	10.5	10.7
1984	10.3	8.5
1985	7.6	10.0
1986	10.0	10.0

a All lambs are Suffolk sired except in 1983 the range ewes were exposed to Columbia rams for 17 days.
b Pre-breeding weight does not include 1986 weights.
cd Means in the same row with different superscripts differ (P<.05).
e Significant (P<.05) interaction with different rank are listed.
f Confinement born lambs were adjusted to 58 day weight.
g All lambs were adjusted to 75 day weight.
h Range born lambs were adjusted to 93 day weight.
i Average grease wool weight adjusted to 365 days.

TABLE 4

APRIL REPRODUCTIVE PERFORMANCE OF EWES BORN DURING 1985 AND 1986 AND MAINTAINED UNDER SEMI-CONFINEMENT OR SEMI-RANGE MANAGEMENT

	Semi-confinement management	Semi-range management
Ewes lambing per ewe exposed (%)	91.6	90.2
First cycle conception[ab] (%)	80.0	83.2
Lambs born per ewe lambed (%)	203[c]	233[d]
Average julian lambing date[b]	114 (April 24)	112 (April 22)

[a] End of the first cycle calculated on a 150 day gestation length.
[b] First cycle conception and average julian lambing date only include 1988 and 1989 data.
[cd] Means in the same row with different superscripts differ ($P<.05$).

TABLE 5

APRIL LAMB AND EWE SURVIVAL OF EWES BORN DURING 1985 AND 1986 AND MAINTAINED UNDER SEMI-CONFINEMENT OR SEMI-RANGE MANAGEMENT

	Semi-confinement management	Semi-range management
Lambs bummed per lambs born (%)	11.5	12.2
Lambs dead per lambs born (%)	22.4	21.9
Lambs weaned per ewe lambed (%)	131[a]	149[b]
Feeder lambs per ewe exposed (%)	108[a]	127[b]
Annual ewe attrition[c] (%)	6.8	6.9

[ab] Means in the same row with different superscripts differ ($P<.05$).
[c] Final ewe inventory at the termination of the project, fall 1990.

TABLE 6

LAMB AND WOOL GROWTH OF EWES BORN DURING 1985 AND 1986 AND MAINTAINED UNDER SEMI-CONFINEMENT OR SEMI-RANGE MANAGEMENT

	Semi-confinement management	Semi-range management
Pre-breeding weight (lbs)	134[a]	147[b]
Pre-breeding weight by year[c]		
1987	140	138
1988	146	153
1989	116	151
Average birth weight (lbs)	9.5	9.3
Average birth weight by year[c]		
1987	8.5	9.0
1988	9.6	9.4
1989	10.4	9.4
Average 63 day weight (lbs)[d]	39.9	41.2
Average 63 day weight by year[c]		
1987	42.9	39.3
1988	40.0	45.9
1989	36.7	38.3
Average 5 month weight (lbs)[e]	71.1	71.8
Average 5 month weight by year[c]		
1987	67.8	59.1
1988	77.0	82.2
1989	68.6	74.1
Total 5 month weight marketed per ewe exposed (lbs)	76.9[a]	92.6[b]
Average annual wool weight (lbs)[f]	10.1[a]	11.7[b]

ab Means in the same row with different superscripts differ ($P<.05$).
c Significant ($P<.05$) interaction with different rank are listed.
d Average wean weight adjusted to 63 days.
e Average 5 month weight is adjusted to 129 days.
f Average grease wool weight adjusted to 365 days.

TABLE 7

REPRODUCTIVE PERFORMANCE OF SUFFOLK X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND FINNISH LANDRACE X BORDER LEICESTER X RAMBOUILLET EWES BORN DURING 1980 AND 1981

	Suffolk x Rambouillet	Finn x BL x Rambouillet	Finn x Rambouillet
Ewes lambing per ewe exposed (%)	85	87	83
Ewes lambing per ewe exposed (%)[a]			
Confinement	77	88	81
Range	93	86	85
First cycle conception (%)[b]	54	49	52
Lambs born per ewe lambed (%)	175[c]	185[d]	211[d]

[a] Significant (P<.05) interaction with different rank are listed.
[b] End of the first cycle calculated on a 150 day gestation length.
[cd] Means in the same row with different superscripts differ (P<.05).

TABLE 8

LAMB AND EWE SURVIVAL OF SUFFOLK X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND FINNISH LANDRACE X BORDER LEICESTER X RAMBOUILLET EWES BORN DURING 1980 AND 1981

	Suffolk x Rambouillet	Finn x BL x Rambouillet	Finn x Rambouillet
Lambs bummed per lambs born (%)	7.0[a]	11.6[a]	17.0[b]
Lambs dead per lambs born (%)[a]	15.9	13.5	19.1
Lambs weaned per ewe lambed (%)	135	139	133
Lambs weaned per ewe lambed[c]			
Confinement	128	123	139
Range	142	156	126
Annual ewe attrition[d] (%)	15.2	14.9	18.2

[ab] Means in the same row with different superscripts differ (P<.05).
[c] Significant (P<.05) interaction with different rank are listed.
[d] Final ewe inventory at the termination of the project, fall 1986.

TABLE 9

LAMB AND WOOL GROWTH OF SUFFOLK X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND FINNISH LANDRACE X BORDER LEICESTER X RAMBOUILLET EWES BORN DURING 1980 AND 1981[a]

	Suffolk x Rambouillet	Finn x BL x Rambouillet	Finn x Rambouillet
Pre-breeding weight (lbs)[b]	151[c]	136[d]	132[d]
Pre-breeding weight (lbs)[e]			
Confinement	152	133	127
Range	150	139	137
Average birth weight (lbs)	12.5[c]	11.3[d]	9.7[d]
Average 58 day weight (lbs)[f]	43.4[c]	40.5[d]	36.1[d]
Average 75 day weight by year[g]	52.6[c]	49.1[d]	46.0[d]
Average 93 day weight (lbs)[h]	60.5[c]	56.6[d]	56.2[d]
Average annual wool weight (lbs)[i]	9.5	9.8	9.9

a All lambs are Suffolk sired except in 1983 the range ewes were exposed to Columbia rams for 17 days.
b Pre-breeding weight does not include 1986 weights.
cd Means in the same row with different superscripts differ (P<.05) Finnish Landrace versus non Finnish Landrace comparison.
e Significant (P<.05) interaction with different rank are listed.
f Confinement born lambs were adjusted to 58 day weight.
g All lambs were adjusted to 75 day weight.
h Range born lambs were adjusted to 93 day weight.
i Average grease wool weight adjusted to 365 days.

TABLE 10

APRIL REPRODUCTIVE PERFORMANCE OF BOOROOLA MERINO X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND RAMBOUILLET X RAMBOUILLET EWES BORN DURING 1985 AND 1986

	Booroola Merino x Rambouillet	Finnish Landrace x Rambouillet	Rambouillet
Ewes lambing per ewe exposed (%)	89.6	94.5	88.6
First cycle conception[ab] (%)	80.9[c]	91.5[c]	72.4[d]
Lambs born per ewe lambed (%)	260[ce]	229[cf]	166[d]
Average julian lambing date[b]	113 (April 23)	111 (April 21)	114 (April 24)

[a] End of the first cycle calculated on a 150 day gestation length.
[b] First cycle conception and average julian lambing date only include 1988 and 1989 data.
[cd] Means in the same row with different superscripts differ ($P<.05$).
[ef] Means in the same row with different superscripts differ ($P<.05$).

TABLE 11

APRIL LAMB AND EWE SURVIVAL OF BOOROOLA MERINO X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND RAMBOUILLET X RAMBOUILLET EWES BORN DURING 1985 AND 1986

	Booroola Merino x Rambouillet	Finnish Landrace x Rambouillet	Rambouillet
Lambs bummed per lambs born (%)	18.3[a]	14.8[a]	2.5[b]
Lambs dead per lambs born (%)	30.2[a]	16.6[b]	19.7
Lambs weaned per ewe lambed (%)	134[a]	157[b]	129
Feeder lambs per ewe exposed (%)	103[ac]	141[bc]	109[d]
Feeder lambs per ewe exposed by year[e]			
1987	95	149	94
1988	116	142	103
1989	99	131	129
Annual ewe attrition (%)	7.4	7.5	5.6

[ab] Means in the same row with different superscripts differ ($P<.05$).
[cd] Means in the same row with different superscripts differ ($P<.05$).
[e] Significant ($P<.05$) interaction with different rank are listed.
[f] Final ewe inventory at the termination of the project, fall 1990.

TABLE 12

LAMB AND WOOL GROWTH OF BOOROOLA MERINO X RAMBOUILLET, FINNISH LANDRACE X RAMBOUILLET AND RAMBOUILLET X RAMBOUILLET EWES BORN DURING 1985 AND 1986

	Booroola Merino x Rambouillet	Finnish Landrace x Rambouillet	Rambouillet
Pre-breeding weight (lbs)	127^{ac}	150^{bc}	145^{d}
Average birth weight (lbs)	7.6^{ac}	9.0^{bc}	11.6^{d}
Average 63 day weight (lbs)[e]	37.3^{ac}	40.8^{bc}	43.5^{d}
Average 5 month weight (lbs)[f]	65.9^{ac}	74.3^{bc}	74.3^{d}
Total 5 month weight marketed per ewe exposed (lbs)	68.8^{a}	104.4^{b}	81.0
Average annual wool weight (lbs)[g]	11.8^{ac}	9.7^{bc}	11.3^{d}

[ab] Means in the same row with different superscripts differ (P<.05).
[cd] Means in the same row with different superscripts differ (P<.05).
[e] Average wean weight adjusted to 63 days.
[f] Average 5 month weight is adjusted to 129 days.
[g] Average grease wool weight adjusted to 365 days.

The Development of a Liquid Nutritional Supplement to Enhance Weak and Unsteady Ewes Prior to Lambing

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

Summary

The purpose of this project was to develop and test a high energy supplement for late term gestation in prolific ewes. This product, referred to as weak ewe solution (WES), was designed to provide added energy, protein, vitamins and minerals needed by weak and unsteady ewes which have a reduced rumen capacity due to multiple fetuses. The conclusions were as follows:

1. Weak Ewe Solution inhibited nutritional induced lipolysis and subsequent ketosis in late term pregnant ewes when in moderate body condition and administered at the first onset of urine ketones. The WES solution had a 90% success rate in terminating ketone production.

2. Weak Ewe Solution aided in the cessation of debilitating ketotic episodes when administered to under conditioned or moderately conditioned ewes during late term pregnancy. Timely administration of WES terminated 63.3% of ketone production during nutritional induced lipolysis.

3. Weak Ewe Solution failed to terminate ketone production, once emaciated ewes initiated lipolysis. Since severely emaciated ewes do not adequately respond to WES, WES is not a substitute for poor management.

4. Weak Ewe Solution must be administered only during a ketotic episode since excessive administration of WES can lead to potentially fatal metabolic disturbances within individual ewes.

In conclusion, the extra effort required to include WES as a managerial input within prolific sheep operations is promising and further research encouraged.

Introduction

The current sheep industry needs prolific ewes to function under the present world price structure in which market lambs require a $.40 breakeven price. The only way this can be done is to limit inputs, and simultaneously, maximize growth and the number of lambs born per ewe. Unfortunately, the combination of increased output with limited inputs inevitably results in debilitating the more productive ewes.

The technical term for this phenomenon is ketosis or pregnancy disease and is actually caused by reduced rumen capacity due to multiple fetuses. As the number of fetuses increase, the total fetal demand for glucose increases. In response to this increased demand, the placenta transports additional glucose from the ewe's plasma to fetal plasma. Eventually the ewe's system is depleted of glucose and the ewe's body fat is utilized (lipolysis) to over come hypoglycemia. During lipolysis, long chain fatty acids are released in the ewe's plasma and these long chain fatty acids are converted to ketones by the liver, thus the name ketosis.

The purpose of this project was to develop and test a nutritional product that would provide the added energy, protein, vitamins and minerals needed by exceptionally productive ewes prior to the onset of pregnancy disease.

Procedure

Weak Ewe Solution (WES) was developed at the Hettinger Research Center for the treatment of weak pregnant ewes. The solution is formulated to be easily administered and meet one-half of a ewe's late gestation NRC daily requirements. The ingredients include beet molasses, distiller's byproduct (concentrated steffen filtrate), propylene glycol, phosphoric acid, urea, salt, vitamin A supplement, D-activated animal sterol (source of vitamin D3), alpha tocopherol (source of vitamin E), zinc sulfate, manganese sulfate, copper sulfate, iron and cobalt sulfate. The analysis is as follows:

Crude protein not less than (This includes not more than 5% equivalent crude protein from non-protein nitrogen)	11.000%
Crude fat, not less than	0.030
Crude fiber, not more than	0.500
Calcium, not more than	1.000
Calcium, not less than	0.010
Phosphorus, not less than	0.600
Potassium, not less than	1.600
Copper, not more than	0.006
Vitamin A, minimum	25,000 USP Units/lb.
Vitamin D, minimum	6,000 USP Units/lb.
Vitamin E, minimum	5 USP Units/lb.

The solution is administered as a prelambing supplement at a rate of 25 ounces per 150 pound ewe. The oral drench is prepared by mixing one quart of water with 25 ounces of WES solution and administered via stomach tube into the rumen, according to protocols developed within each treatment. Ewes utilized for the following studies were Rambouillet, Rambouillet X Finnish Landrace and/or Rambouillet X Booroola Merino. Those ewes with either Finnish Landrace or Booroola Merino breeding have the capability to produce three lambs per ewe lambing routinely. Serum profiles of random ewes within each study are compiled in tables 1, 2 and 3. These profiles indicate that the incidence of ketosis is greater than 50% within this sample set of ewes. Therefore, these ewes serve as excellent experimental subjects to evaluate the positive and negative aspects of WES. The efficacy and safety of the product was tested during three trials. The objective of trial one was to test the safety of the product by drenching ewes every other day until lambing. Trial two evaluates weak ewe solution administered at the first indication of the onset of ketosis versus a self fed high energy supplement. Trial three evaluates weak ewe solution as a treatment at the onset of ketosis within an intensified lambing operation involving different breed types.

Trial 1 - Sixty F_1 Booroola ewes were mated to start lambing April 15. All ewes were diagnosed as pregnant through ultrasound examination and were weighed and body condition scored on April 1. Each ewe was assigned a prelambing body condition score on a scale of 1 to 5. Body condition scores ranged from one (extremely emaciated) to five (fat deposits over the lumbar vertebrae and ribs). Twelve condition score one ewes were selected from the 60 ewes and randomly assigned to one of two treatments. All ewes received a late gestation ration of 80% alfalfa haylage and 20% barley ad libitum (ADF = 27.8%, NDF = 43.7%, Protein = 14.7% and Ash = 12.1%) and six ewes, selected randomly, received the same ration plus drenched with 25 ounces of weak ewe solution with one quart of water every other day. Daily urine samples were collected and the amount of ketones present in the urine sample were quantified using Ames keto stixs for all ewes. Ewes were randomly selected for blood sampling on April 5, 8 or 10. Ewe reproductive data included lambing date, lambing percentage, and percentage lambs weaned. Lamb survival data included percentage mummified fetuses, percentage stillborn lambs, percentage bummed lambs, seven day live lamb inventory, fourteen day live lamb inventory as well as ewe attrition rate and date. Lamb growth data included birth weight and weaning weight. Ewe body condition was evaluated pre-lambing and at weaning and ewes were weighed at the start of the trial. Data were analyzed using general linear models and logistic regression.

Trial 2 - Those trial one ewes that had a body condition score of 2, 3 or 4 (42 ewes) were randomly allotted to one of three treatments. Fourteen ewes were allotted the control diet which was the trial one late gestation ration of 80% alfalfa haylage and 20% barley, fed ad libitum. The remaining 28 ewes received the same diet except, fourteen ewes received self fed corn starting on April 2 and fourteen ewes received 25 ounces of weak ewe solution whenever urine ketone concentrations were 15 mg or greater. Daily urine samples were collected and the amount of ketones present in the urine sample was quantified using Ames keto stixs for all ewes. Ewes were randomly selected for blood sampling on April 5, 8 or 10. Ewe reproductive data included lambing date, lambing percentage, and percentage lambs weaned. Lamb survival data included percentage mummified fetuses, percentage stillborn lambs, percentage bummed lambs, seven day live lamb inventory, fourteen day live lamb inventory as well as ewe attrition rate and date. Lamb growth data included birth weight and weaning weight. Ewe body condition was evaluated pre-lambing and at weaning and ewes were weighed at the start of the trial. Data were analyzed using general linear models and logistic regression.

Trial 3 - A flock of 10 F_1 Finnish Landrace x Rambouillet (FR), 10 F_1 Booroola Merino x Rambouillet (BR) and 10 Rambouillet (R) ewes were selected randomly from 60 ewes of each breed type. These ewes were synchronized with one mg of fenprostalene to lamb May 15 and each ewe was bred to a Columbia or Rambouillet ram and a Suffolk ram. Pregnancy was determined by laparoscopy. All ewes were fed the same prelambing ration as trails one and two. Starting April 23, daily urine samples were collected and the amount of ketones present in the urine sample was quantified using the Ames keto stixs for all ewes. All ewes that had urine ketone concentrations 15 mg or greater were drenched with 25 ounces of weak ewe solution. All ewes were randomly selected for blood sampling on May 9 or 10. Ewe reproductive data included percentage ewes pregnant, ovulation rate, lambing date, lambing percentage, and percentage lambs weaned. Lamb survival data included fetal survival 30 days post conception, percentage mummified fetuses, percentage stillborn lambs, percentage bummed lambs, seven day live lamb inventory, fourteen day live lamb inventory as well as ewe attrition rate and date. Lamb growth data included birth weight and weaning weight. Ewe body condition was evaluated pre-breeding, pre-lambing and at weaning and ewes were weighed at the start of the trial. Data were analyzed using general linear models and logistic regression.

Results

Trial 1 - The results of trial 1 are presented in tables 4 and 5. Prelambing weight and condition score were similar for the two groups of ewes. The ewes receiving WES every other day averaged 1.3 ketotic days per ewe during the last seven days of pregnancy, versus 2.2 for the control ewes. The control ewes had 17 more ketotic days throughout the total pregnancy than did the treated ewes. The minimum WES received by a treated ewe was 3 treatments and the maximum received was 15 treatments for an average of 8.2 treatments (205 ounces). Two of the six treated ewes died of pregnancy toxemia, while none of the control ewes died. Reproductive performance of the surviving ewes is presented in table 5. There was no significant difference between the treated and control ewes.

Trial 2 - The results of trial 2 are presented in tables 6 and 7, no statistical significance was obtained. Prelambing weight and body condition were similar for all three groups of ewes. Although during the last week of pregnancy, the three groups of ewes had a similar incidence of ketotic episodes, throughout pregnancy, the control ewes tended to have the greatest number of ewes ketotic and the ketotic episodes tended to repeat at a greater frequency (control = 3.50 ketotic days per ketotic ewe, corn = 3.00 days and ewes administered WES = 2.85 days). For control and corn ewes, 65.4% and 62.5% of the ketotic episodes would last greater than one day, respectively, while within the WES treated ewes, only 36.8% of the ketotic episodes lasted greater than one day. The maximum treatments of WES given per ewe was four. Reproductive performance is presented in table 7. The percentage of live lambs at birth tended to be greater for the control ewes and similar between the corn fed and WES ewes. The WES ewes however tended to have an increase in lamb survival after parturition and tended to wean a greater number of lambs. Birth weight and adjusted 56 day weights were similar, however.

Trial 3 - The results of trial 3 are presented in tables 8 and 9. Prelambing weights and body condition scores are similar between breeds, however the FR ewes tend to be heavier. All FR and BR ewes and 9 R ewes responded to synchronization. A greater (P<.05) percentage of FR and BR ewes conceived than R ewes. Ketotic episodes were more frequent within the FR ewes than BR or R ewes. The ability of WES to terminate the ketotic episodes was not dependent on breed type and the WES treatment successfully terminated ketone production 90% of the time. All breed groups responded to treatment. A summary of live lambing rates are presented (table 9) for the FR, BR and R ewes. All prelambing reproductive rates were greater (P<.05) for FR and BR ewes versus R ewes. Within the prolific lines of sheep, Booroola Merino crossbred ewes have the greatest (P<.05) conception failure and embryonic loss, while the Finnish Landrace crossbred has increased late term fetal loss. Both prolific ewe types have increased lamb death rates during parturition versus the Rambouillet. Total pre-parturition and parturition losses are of the magnitude of .67, 1.62 and .50 lambs for Finnish Landrace, Booroola Merino and Rambouillet sheep, respectively. During the first two weeks of life, despite extra ordinary managerial attempts to maintain lambs with the ewes in this study, decreases in reproductive percentages through lamb loss were of the magnitude of .33, .50 and .33 lambs for Finnish Landrace, Booroola Merino and Rambouillet sheep. After 14 days of age, with intense managerial input, no lamb loss occurred.

Discussion

The purpose of this trial was to evaluate the product called Weak Ewe Solution. Trial one demonstrated that WES must be administered only during a ketotic episode since excessive administration of WES can lead to potentially fatal metabolic disturbances within individual ewes. When administering WES to ewes that are severely emaciated, WES appears to have no benefits. The WES solution failed to terminate ketone production, once the ewe initiated lipolysis.

Trial two demonstrated the value of WES when given to a sample of very prolific ewes that are under conditioned to moderately conditioned. The product aided in the cessation of debilitating ketotic episodes. Timely administration of WES terminated 63.3% of ketone production during a ketotic episode. Subsequently, the data indicated trends towards an increase in lambs weaned per ewe. The mechanism for this response remains unclear. A similar response was not obtained from the self fed corn ration.

The third trial demonstrated the ability of WES to successfully halt ketosis in a normal conditioned set of prolific ewes when administered at the first onset of urine ketones. The WES solution had a 90% success rate in terminating ketone production and the prolific ewes within this trial weaned a 190% lamb crop in comparison of traditional figures of 130% to 160% for the same type of ewes maintained under similar conditions over the years at the Hettinger Research Center. In conclusion, the extra effort required to include WES as a managerial input within prolific sheep operations, regardless of Finnish Landrace or Booroola breeding is promising and further research encouraged.

TABLE 1

OVINE LATE GESTATION SERUM PROFILES

TESTS	UNITS	OPEN[a]	OVERALL[b]	NO STRESS[c]	STRESS[d]
SODIUM	MEQ/L	151.57(7)	150.40(60)	149.69(26)	150.94(34)
POTASIUM	MEQ/L	4.70(7)	4.65(60)	4.58(26)	4.70(34)
CHLORIDE	MEQ/L	116.00(7)	117.20(60)	116.81(26)	117.50(34)
BICARBONATE	MEQ/L	25.29(7)	25.58(60)	26.04(26)	25.24(34)
CREATININE	MG/DL	0.73(7)	0.87(60)	0.82(26)	0.91(34)
GLUCOSE	MG/DL	63.71(7)	54.48(60)	57.12(26)	52.47(34)
CALCIUM	MG/DL	9.26(7)	8.97(60)	9.17(26)	8.83(34)
PHOSPHORUS	MG/DL	5.97(7)	4.67(60)	5.00(26)	4.42(34)
LDH	IU/L	585.57(7)	456.78(60)	449.77(26)	462.15(34)
AST-GOT	IU/L	92.71(7)	112.32(60)	99.73(26)	121.94(34)
ALT-GPT	IU/L	19.71(7)	16.95(60)	19.69(26)	14.85(34)
ALK PHOS	IU/L	108.00(7)	115.70(60)	122.96(26)	110.15(34)
TOTAL BILI	MG/DL	0.03(7)	0.30(60)	0.23(26)	0.36(34)
DIRECT BILI	MG/DL	0.02(7)	0.19(59)	0.16(25)	0.21(34)
INDIRECT BILI	-CALC	0.01(7)	0.12(59)	0.08(25)	0.15(34)
CHOLESTEROL	MG/DL	56.71(7)	79.85(60)	74.46(26)	83.97(34)
TRIGLYCERIDE	MG/DL	27.43(7)	46.63(60)	43.50(26)	49.03(34)
TOTAL PROTEIN	G/DL	6.74(7)	6.16(60)	6.27(26)	6.06(34)
ALBUMIN	G/DL	1.09(7)	0.92(60)	0.93(26)	0.91(34)
GLOBULIN-CALC	GM/L	5.64(7)	5.23(60)	5.34(26)	5.15(34)
A/G	RATIO	0.20(7)	0.19(60)	0.18(26)	0.19(34)
URIC ACID	MG/DL	0.24(7)	0.18(59)	0.08(25)	0.25(34)
WBC		25.27(7)	13.26(56)	12.85(25)	13.59(31)
LY		70.00(1)	66.59(16)	69.23 (6)	65.01(10)
MO		19.70(1)	20.11(14)	19.14 (5)	20.66 (9)
GR		7.55(2)	14.88(19)	12.49 (9)	17.03(10)
LY #		4.50(1)	4.78 (5)	.	4.78 (5)
MO #		1.30(1)	2.04 (5)	.	2.04 (5)
GR #		0.50(2)	1.56 (5)	.	1.56 (5)
RBC		5.19(7)	4.95(60)	4.94(26)	4.97(34)
HGB		11.29(7)	9.13(60)	9.38(26)	8.94(34)
HCT		22.96(7)	21.41(60)	21.42(26)	21.40(34)
MCV		44.27(7)	43.32(60)	43.54(26)	43.15(34)
MCH		21.77(7)	18.52(60)	19.05(26)	18.11(34)
MCHC		49.10(7)	42.76(60)	43.75(26)	41.99(34)
RDW		34.44(7)	33.34(60)	33.47(26)	33.24(34)
PLT		371.43(7)	404.45(60)	352.23(26)	444.38(34)
MPV		4.50(7)	4.73(60)	4.77(26)	4.69(34)

[a] Non pregnant ewes.

[b] Mean of stressed and no stress ewes

[c] No stress ewes were defined as those ewes with less than 15 mg urine ketones the last 7 days of gestation.

[d] Stress ewes were defined as those ewes with 15 mg or greater urine ketones the last 7 days of gestation.

TABLE 2

OVINE LATE GESTATION SERUM PROFILES OF STRESSED EWES[a]

TESTS	UNITS	OVERALL[b]	STRESS 1 - 2[c]	STRESS 3 - 4[d]	STRESS OVER 4[e]
SODIUM	MEQ/L	150.94(34)	150.17(18)	153.09(11)	149.00(5)
POTASIUM	MEQ/L	4.70(34)	4.85(18)	4.61(11)	4.34(5)
CHLORIDE	MEQ/L	117.50(34)	117.78(18)	118.18(11)	115.00(5)
BICARBONATE	MEQ/L	25.24(34)	25.39(18)	25.18(11)	24.80(5)
CREATININE	MG/DL	0.91(34)	0.93(18)	0.92(11)	0.84(5)
GLUCOSE	MG/DL	52.47(34)	56.28(18)	51.45(11)	41.00(5)
CALCIUM	MG/DL	8.83(34)	9.11(18)	8.18(11)	9.22(5)
PHOSPHORUS	MG/DL	4.42(34)	4.28(18)	5.12(11)	3.36(5)
LDH	IU/L	462.15(34)	417.44(18)	533.82(11)	465.40(5)
AST-GOT	IU/L	121.94(34)	101.33(18)	162.45(11)	107.00(5)
ALT-GPT	IU/L	14.85(34)	16.33(18)	14.55(11)	10.20(5)
ALK PHOS	IU/L	110.15(34)	124.00(18)	97.82(11)	87.40(5)
TOTAL BILI	MG/DL	0.36(34)	0.24(18)	0.58(11)	0.32(5)
DIRECT BILI	MG/DL	0.21(34)	0.15(18)	0.32(11)	0.19(5)
INDIRECT BILI	-CALC	0.15(34)	0.09(18)	0.26(11)	0.13(5)
CHOLESTEROL	MG/DL	83.97(34)	80.89(18)	87.73(11)	86.80(5)
TRIGLYCERIDE	MG/DL	49.03(34)	51.50(18)	46.09(11)	46.60(5)
TOTAL PROTEIN	G/DL	6.06(34)	6.07(18)	6.10(11)	5.98(5)
ALBUMIN	G/DL	0.91(34)	0.93(18)	0.88(11)	0.92(5)
GLOBULIN-CALC	GM/L	5.15(34)	5.13(18)	5.23(11)	5.04(5)
A/G	RATIO	0.19(34)	0.19(18)	0.18(11)	0.20(5)
URIC ACID	MG/DL	0.25(34)	0.19(18)	0.41(11)	0.10(5)
WBC		13.59(31)	14.61(17)	13.04(11)	9.90(3)
LY		65.01(10)	63.43 (6)	68.33 (3)	64.50(1)
MO		20.66 (9)	22.62 (5)	16.27 (3)	24.00(1)
GR		17.03(10)	20.32 (5)	14.30 (4)	11.50(1)
LY #		4.78 (5)	4.20 (3)	5.70 (1)	5.60(1)
MO #		2.04 (5)	2.17 (3)	1.60 (1)	2.10(1)
GR #		1.56 (5)	1.70 (3)	1.70 (1)	1.00(1)
RBC		4.97(34)	4.91(18)	5.21(11)	4.63(5)
HGB		8.94(34)	9.31(18)	8.39(11)	8.80(5)
HCT		21.40(34)	21.11(18)	22.65(11)	19.68(5)
MCV		43.15(34)	43.00(18)	43.65(11)	42.58(5)
MCH		18.11(34)	18.96(18)	16.27(11)	19.08(5)
MCHC		41.99(34)	44.06(18)	37.33(11)	44.84(5)
RDW		33.24(34)	34.14(18)	31.25(11)	34.38(5)
PLT		444.38(34)	406.78(18)	549.82(11)	347.80(5)
MPV		4.69(34)	4.67(18)	4.81(11)	4.54(5)

[a] Stress ewes were defined as those ewes with 15 mg or greater urine ketones the last 7 days of gestation.
[b] Overall mean of all stressed ewes from Table 1.
[c] Stress ewes with 1-2 days of urine ketones 15 mg or greater the last 7 days of gestation.
[d] Stress ewes with 3-4 days of urine ketones 15 mg or greater the last 7 days of gestation.
[e] Stress ewes with over 4 days of urine ketones 15 mg or greater the last 7 days of gestation.

TABLE 3

OVINE LATE GESTATION SERUM PROFILES BY FETAL NUMBER DURING PREGNANCY

TESTS	UNITS	OPEN	SINGLE	TWINS	TRIPLETS	QUADS	QUINTS
MEAN KETOTIC DAYS[a]		0.0	0.0	0.53	1.03	1.13	2.25
SODIUM	MEQ/L	151.57(7)	146.75(4)	149.75(12)	150.41(22)	151.20(20)	153.50(2)
POTASIUM	MEQ/L	4.70(7)	4.65(4)	4.76(12)	4.70(22)	4.57(20)	4.20(2)
CHLORIDE	MEQ/L	116.00(7)	113.50(4)	117.00(12)	117.55(22)	117.60(20)	118.00(2)
BICARBONATE	MEQ/L	25.29(7)	27.00(4)	26.42(12)	26.09(22)	24.10(20)	27.00(2)
CREATININE	MG/DL	0.73(7)	0.88(4)	0.88(12)	0.81(22)	0.95(20)	0.75(2)
GLUCOSE	MG/DL	63.71(7)	65.75(4)	58.08(12)	53.82(22)	51.75(20)	45.00(2)
CALCIUM	MG/DL	9.26(7)	9.08(4)	9.20(12)	9.31(22)	8.43(20)	9.15(2)
PHOSPHORUS	MG/DL	5.97(7)	5.65(4)	5.76(12)	4.34(22)	4.39(20)	2.60(2)
LDH	IU/L	585.57(7)	470.50(4)	426.75(12)	454.00(22)	440.70(20)	801.00(2)
AST-GOT	IU/L	92.71(7)	87.50(4)	110.25(12)	120.73(22)	103.35(20)	171.50(2)
ALT-GPT	IU/L	19.71(7)	24.50(4)	20.50(12)	19.18(22)	10.55(20)	20.00(2)
ALK PHOS	IU/L	108.00(7)	85.50(4)	140.75(12)	107.68(22)	117.50(20)	96.00(2)
TOTAL BILI	MG/DL	0.03(7)	0.33(4)	0.20(12)	0.37(22)	0.28(20)	0.39(2)
DIRECT BILI	MG/DL	0.02(7)	0.21(4)	0.13(12)	0.22(21)	0.18(20)	0.26(2)
INDIRECT BILI	-CALC	0.01(7)	0.12(4)	0.07(12)	0.17(21)	0.10(20)	0.13(2)
CHOLESTEROL	MG/DL	56.71(7)	73.75(4)	77.08(12)	79.77(22)	82.65(20)	81.50(2)
TRIGLYCERIDE	MG/DL	27.43(7)	43.75(4)	51.42(12)	44.14(22)	48.10(20)	36.50(2)
TOTAL PROTEIN	G/DL	6.74(7)	6.50(4)	6.38(12)	6.06(22)	6.07(20)	6.05(2)
ALBUMIN	G/DL	1.09(7)	0.83(4)	0.95(12)	0.91(22)	0.95(20)	0.80(2)
GLOBULIN-CALC	GM/L	5.64(7)	5.65(4)	5.42(12)	5.15(22)	5.12(20)	5.25(2)
A/G	RATIO	0.20(7)	0.13(4)	0.20(12)	0.18(22)	0.20(20)	0.15(2)
URIC ACID	MG/DL	0.24(7)	0.03(4)	0.00(12)	0.32(21)	0.09(20)	0.90(2)
WBC		25.27 (7)	12.58(4)	17.00(12)	12.11(20)	11.27(18)	21.65(2)
LY		70.00 (1)	70.70(1)	63.14 (5)	72.46 (5)	63.36 (5)	
MO		19.70 (1)	14.40(1)	21.80 (4)	15.00 (5)	26.25 (4)	
GR		7.55 (2)	12.30(2)	16.03 (6)	12.28 (6)	17.64 (5)	
LY #		4.50 (1)			5.70 (1)	4.55 (4)	
MO #		1.30 (1)			1.60 (1)	2.15 (4)	
GR #		0.50 (2)			1.70 (1)	1.53 (4)	
RBC		5.19 (7)	4.81(4)	5.32(12)	4.71(22)	5.01(20)	5.25(2)
HGB		11.29 (7)	8.83(4)	10.28(12)	8.64(22)	9.01(20)	9.40(2)
HCT		22.96 (7)	21.05(4)	23.09(12)	20.31(22)	21.56(20)	22.50(2)
MCV		44.27 (7)	44.23(4)	43.45(12)	43.27(22)	43.16(20)	42.90(2)
MCH		21.77 (7)	18.28(4)	19.43(12)	18.39(22)	18.22(20)	17.95(2)
MCHC		49.10 (7)	41.48(4)	44.65(12)	42.55(22)	42.20(20)	41.75(2)
RDW		34.44 (7)	32.50(4)	34.57(12)	32.32(22)	33.75(20)	34.85(2)
PLT		371.43 (7)	483.75(4)	339.08(12)	443.41(22)	384.30(20)	411.00(2)
MPV		4.50 (7)	4.55(4)	4.89(12)	4.75(22)	4.65(20)	4.60(2)

[a] Urine samples were analyzed daily for ketones using Ames Ketostix. Mean ketotic days equals the total number of ewe days with urine ketones 15 mg or greater divided by total ewe numbers. A ewe day is one when an individual ewe's urine ketones are 15 mg or greater.

TABLE 4

INITIAL EWE NUMBERS, PRE-LAMBING WEIGHT, PRE-LAMBING AND LACTATION CONDITION, ATTRITION RATE, KETOTIC EWES, DAYS KETOTIC, REPEAT KETOTIC DAYS AND TREATMENTS OF WEAK EWE SOLUTION OF LATE GESTATION CONDITION SCORE ONE EWES

	Control	WES[a]
Number of ewes	6	6
Pre-lambing weight	152	151
Pre-lambing condition	1.0	1.0
Lactation condition	.3	.3
Ewe Attrition[b]	0[c]	2[d]
Number of ewes ketotic[e]		
Last 7 d gestation	4	3
Total	5	3
Ketotic days per ewe[f]		
Last 7 d gestation	2.2	1.3
Total	4.8	0.8
Repeat high ketones[g]		
Last 7 d gestation		
H -> H	6	3
H -> L	5	4
Total		
H -> H	12	5
H -> L	15	5
WES treatments per ewe	0	8.2 min. = 3 max. = 15

[a] Treatment of 25 ounces of weak ewe solution every 48 hours until parturition.

[b] WES ewe 5-1095, dead 4-9-91, pregnancy disease, 3 treatments of WES.
WES ewe 6-655, dead 4-11-91, pregnancy disease, 4 treatments of WES.

[cd] Means with different superscripts differ ($P<.05$).

[e] Urine samples were analyzed daily for ketones using Ames Ketostix.

[f] Ketotic day is any day a ewe has 15 mg or greater urine ketones.

[g] Repeat high ketones is a measure of the repeatability of ketones in the urine. H -> H means a ewe had high ketones two days in a row. H -> L means a ewe had high ketones one day followed by no urine ketones the next day.

TABLE 5

REPRODUCTIVE PERFORMANCE, LAMB SURVIVAL, AND LAMB GROWTH OF LATE GESTATION CONDITION SCORE ONE EWES

	Control	WES[a][b]
Lambing date	April 23	April 25
Lambing percentage	350	325
Born Alive	267	225
Percentage mummified	0	75
Percentage born dead	83	25
Day 0 inventory[c]	267	225
Percentage dead	50	75
Percentage bummed	67	25
Day 7 inventory	150	125
Percentage dead	0	0
Percentage bummed	0	0
Day 14 inventory	150	125
Percentage dead	0	0
Percentage bummed	0	0
Day 56 inventory	150	125
Birth weight	7.0	8.4
Adjusted 56 day Wt.[d]	44.1	43.4

[a] Weak Ewe Solution.
[b] Excludes two ewes dead prior to parturition (5-1095 and 6-655).
[c] Day 0 is parturition (lambing) day.
[d] Lamb weaning weight adjusted for age, sex and rearing type.

TABLE 6

INITIAL EWE NUMBERS, PRE-LAMBING WEIGHT, PRE-LAMBING AND LACTATION CONDITION, ATTRITION RATE, KETOTIC EWES, DAYS KETOTIC, REPEAT KETOTIC DAYS AND TREATMENTS OF WEAK EWE SOLUTION OF PROLIFIC SHEEP FED NRC[a], NRC PLUS SELF-FED CORN AND NRC PLUS WEAK EWE SOLUTION

	Control	Corn	WES[b]
Number of ewes	14	14	14
Pre-lambing weight	143	148	142
Pre-lambing condition	2.0	2.1	2.1
Lactation condition	1.6	1.4	1.4
Ewe Attrition[c]	1	1	2
Number of ewes ketotic[d]			
Last 7 d gestation	3	4	2
Total	8	6	7
Ketotic days[e]			
Last 7 d gestation	0.6	0.6	0.4
Total	2.0	1.3	1.4
Repeat high ketones[f]			
Last 7 d gestation			
H -> H	6	4	1
H -> L	2	2	4
Total			
H -> H	17	10	7
H -> L	9	6	12
WES treatments per ewe			0.9 min. = 0 max. = 4

[a] Nutrient Requirements of Sheep Sixth Revised Edition, 1985.
[b] Weak Ewe Solution.
[c] Control ewe 7-163, dead 7-3-91, reason unknown, 0 treatments of WES.
Corn ewe 8-74, dead 4-17-91, pregnancy disease, 0 treatments of WES.
WES ewe 8-28, dead 4-20-91, parturition complications, 1 treatment of WES.
WES ewe 5-727, dead 4-18-91, pregnancy disease, 4 treatments of WES.
[d] Urine samples were analyzed daily for ketones using Ames Ketostix.
[e] Ketotic day is any day a ewe has 15 mg or greater urine ketones.
[f] Repeat high ketones is a measure of the repeatability of ketones in the urine. H -> H means a ewe had high ketones two days in a row. H -> L means a ewe had high ketones one day followed by no urine ketones the next day.

TABLE 7

REPRODUCTIVE PERFORMANCE, LAMB SURVIVAL, AND LAMB GROWTH OF PROLIFIC SHEEP FED NRC[a], NRC PLUS SELF-FED CORN AND NRC PLUS WEAK EWE SOLUTION

	Control	Corn	WES[b]
Lambing date	April 23	April 21	April 24
Lambing percentage	278	336	300
Lambs born alive	200	186	178
Percentage mummified	14	79	22
Born Dead	64	71	100
Day 0 inventory[c]	200	186	178
Percentage dead	14	14	14
Percentage bummed	57	36	14
Day 7 inventory	129	136	150
Percentage dead	15	29	0
Percentage bummed	0	0	0
Day 14 inventory	114	107	150
Percentage dead	7	0	7
Percentage bummed	0	0	0
Day 56 inventory	107	107	143
Birth weight	8.0	7.6	6.5
Adjusted 56 day Wt.[d]	41.6	40.7	40.7

[a] Nutrient Requirements of Sheep Sixth Revised Edition, 1985.
[b] Weak Ewe Solution, Treatment of 25 ounces of weak ewe solution administered when ewe had elevated urine ketones.
[c] Day 0 is parturition (lambing) day.
[d] Lamb weaning weight adjusted for age, sex and rearing type.

TABLE 8

INITIAL EWE NUMBERS, EWE WEIGHT, EWE CONDITION, ATTRITION RATE, REPRODUCTIVE ANALYSIS, DAYS KETOTIC[a], KETOTIC EWES, REPEAT KETOTIC DAYS AND TREATMENTS OF WEAK EWE SOLUTION OF FINNISH LANDRACE X RAMBOUILLET, BOOROOLA MERINO X RAMBOUILLET AND RAMBOUILLET EWES

	Finnish Landrace	Booroola Merino	Rambouillet
Number of ewes	10	10	10
Pre-lambing wt			
(12-21-90)	149	141	144
(01-23-91)	158	147	152
(04-22-91)	181	161	163
(05-09-91)	184	162	165
Weaning weight	144	127	139
Pre-lambing condition			
(12-21-90)	2.7	2.4	2.2
(01-23-91)	2.4	2.1	2.3
(04-22-91)	2.2	2.1	2.2
(05-09-91)	1.8	1.8	1.8
Weaning condition	1.6	1.5	1.8
Ewe Attrition[b]	1[c]	1[c]	0[d]
Reproductive Analysis			
Ewes synchronized[e]	10[c]	10[c]	9[d]
Pregnant ewes (1-17-91)	9	9	6
Induced response[f]	9[c]	8[c]	5[d]
Ewes lambing	9	8	6
Number of ewes ketotic			
Last 7 days gestation	6	2	3
Total	6	2	3
Ketotic days per ewe			
Last 7 d gestation	1.3	0.6	1.2
Total	1.3	1.5	2.2
Repeat high ketones			
H -> H	1	1	0
H -> L	10	4	5
WES treatments per ewe	1.3 min. = 0 max. = 3	1.5 min. = 0 max. = 8	2.2 min. = 0 max. = 9

[a] Urine samples were analyzed daily for ketones using Ames Ketostix.
[b] Finnish Landrace ewe 6-395, dead 5-16-91, parturition complications, 2 treatments of WES, Booroola Merino ewe 6-331, dead 6-18-91 reason unknown, 0 treatments of WES.
[cd] Means with different superscripts differ ($P<.05$).
[e] Ewes were synchronized with .5 mg fenprostalene and 200 mg of oxytetracycline.
[f] Induced all ewes May 11, 1991, with 2 mg of flumethasone (Flucort).

TABLE 9

REPRODUCTIVE PERFORMANCE, LAMB SURVIVAL, AND LAMB GROWTH OF FINNISH LANDRACE X RAMBOUILLET, BOOROOLA MERINO X RAMBOUILLET AND RAMBOUILLET EWES

	Finnish Landrace	Booroola Merino[a]	Rambouillet
Lambing date[b]	May 12[c]	May 13[cd]	May 14[d]
Day -147 ovulation rate[e]	289[c]	400[d]	217[c]
Conception failure[f]	0	57	17
Day -117 uterus count[g]	289[c]	314[c]	200[d]
Total embryonic mortality	22[c]	156[d]	50[d]
Day -1 inventory[h]	244[c]	263[c]	167[d]
Parturition mortality	22	25	0
Lambing percentage	267[c]	275[c]	167[d]
Fetal mortality[i]	23	12	0
Day 0 inventory	222	238	167
Percentage dead[j]	22	0	0
Percentage bummed[k]	0	0	33
Day 7 inventory	200	238	134
Percentage dead	0	0	0
Percentage bummed[k]	11	50	0
Day 14 inventory	189	188	134
Percentage dead	0	0	0
Day 56 inventory	189	188	134
Birth weight	9.7[cd]	8.6[c]	11.5[d]
Adjusted 56 day Wt.[l]	42.4	38.5	38.5

[a] Three means include less than 8 Booroola ewes which lambed.
[b] Parturition is day 0 and all other evaluations deviate from that date.
[cd] Means in the same row with different superscripts differ (P<.05).
[e] Corpora lutea count 31 days after mating, laparoscopic observation.
[f] Difference between corpora lutea count and uterus count on 1-17-91.
[g] Visual evaluation of uterus (laparoscopic observation).
[h] Realtime ultrasound evaluation of fetus one day prior to lambing.
[i] Fetus with no heart beat one day prior to lambing.
[j] Lambs born alive but died prior to 7 day inventory.
[k] Lambs were bummed based on ewes ability to raise lambs. Ewes were evaluated at birth and 7 days inventory.
[l] Lamb weaning weight adjusted for age, sex and rearing type.

Multi-Species Grazing of Native Range In Western North Dakota

by

J.L.Nelson, D.G. Landblom,
Steve Silky and T.J. Conlon

Introduction:

Grazing two or more species of livestock together or separately on the same land unit in a single growing season is known as common use, dual use, or multispecies grazing. Multispecies grazing is an important concept in range management because range ecosystems contain a variety of vegetation types. Different animal species have evolved that efficiently use the various plant species. Grazing a mix of domestic and wild animals can often result in more efficient use of forage and browse, more total animal gains, and a more vigorous plant community.

Cattle do not graze the range uniformly but rather, select desirable grass species and avoid plants like fringed sage (Artemisia frigida) and green sage (Artemesia dracunculus) except for short periods of time in early spring. Due to selective grazing, plants that are less palatable to cattle gain a competitive advantage over desirable plant species.

Some introduced weedy plants like leafy spurge (Euphorbia esula and E. pseudovirgata) may be completely avoided by grazing cattle. These weedy species increase in number and area occupied in cattle pastures because of less competition due to selective grazing by the cattle.

The addition of livestock species that have a diet preference different than that of cattle could improve the biological efficiency and use of the native range ecosystem. That portion of the herbage production that cattle avoid could convert into added profit without increasing the acreage of the land base by adding livestock species that select it for forage. An added ecological benefit of multispecies grazing, in addition to natural weed control, would be that some of the natural resources used for plant growth, like water, nutrients and sunlight, could be diverted from the less desirable species to the more desirable plants.

The diets of sheep, goats, and wild ungulates are different in some proportions from cattle diets and overlap in other components (Glimp, 1988). The diet selected by livestock species varies with seasonal changes as the plants grow and mature and also with the percent of the preferred plants available.

The average composition of cattle diets for a two year period (1982-1983) as reported by Kirby et al. (1988) was 86.3% grass, 11.4% forbs, and 2.4% shrubs while the average composition of sheep diets (1983-1984) was 49.4% grass, 48.9% forbs, and 1.8% shrubs. They also reported a 30% dietary overlap between cattle and sheep in early summer and a 64% dietary overlap in late summer in western North Dakota.

Multispecies stocking rates and the ratio of one livestock species to another can not be set from dietary selection data alone because of the variability over time. Therefore, we need to know and compare the percent available for each livestock species or combination of livestock in one pasture.

Objectives:

The objective is to determine whether multispecies grazing can be an economically profitable and environmentally sustainable option for managing pasture and rangeland in western North Dakota.

This research will try to determine the ratio of available grasses, forbs, and shrubs on a monthly basis in relation to the percent used by cattle alone, and two levels of cattle and sheep mixed. The first hypotheses to be tested is that multispecies grazing on native range is additive compared to grazing cattle alone. A second hypotheses is that the ratio of available grasses and forbs can be used to determine the ratio of cattle and sheep that can be stocked in an area without causing the range to deteriorate.

The data collected will be used to develop guidelines for initial stocking ratios of cattle and sheep in relation to the ratio of available grasses and forbs. The increase in stocking rate that can be attributed to multispecies grazing will be determined as will the overall economics of the practice.

Procedure:

A 640 acre native pasture described as Sec. 16-Township 143 North Range 96 West will be utilized for this trial. This pasture is part of the Dickinson Research Center Ranch Headquarters.

On June 24th, 1991, forty-eight pair Angus X Hereford crossbred cows and their Charolais sired calves were weighed and allotted to either the west half (Control) or the east half (Multispecies) of Sec.16. Each herd also included a Charolais bull during the breeding period. The herd grazing the east pasture was joined by a flock of 24 head of non-lactating white faced ewes, provided by the Hettinger Research Center, Hettinger, North Dakota.

In 1991, the second year of the trial, grazing started on June 24th and ended 101 days later on October 3rd. At the close of grazing season, the cows, calves and ewes were individually weighed and removed from the pastures. Animal gains were calculated as the difference between the initial weights and final weights. Gain per acre was calculated by dividing the total animal gain by 320 acres. The bull weight changes were not utilized in the calculations.

Prior to the start of the trial, each pasture had been mapped by soil type. Permanent exclosures were constructed on each of the soil types which represented Clay, Clay Pan, Silt, Sand, and Shallow soil types. Small exclosure cages located on each soil type allowed herbage production estimates to be made by hand clipping 1/4 meter squared frames both inside (ungrazed) and outside (grazed) of the cages. Pastures were sampled at both the start and the end of the grazing season. Three samples representing both grazed and ungrazed herbage were collected at each of the soil types sites. (nine in all) The samples were sorted into a grass or a forb component while clipping. A permanent transect was established at each site to monitor changes in species composition during the trial.

Stocking rate for both 1990 and 1991 was 70% of normal due to dry conditions existing at the start of the trial. Adding the extra 24 ewes on the east pasture increased the stocking rate by twenty percent.

Results:

The 1991 growing season started with marginal precipitation in February and March. Precipation in April averaged 1.97 inches with another 1.16 inches falling in May. During June, precipitation was recorded on 10 days with a total of 3.95 inches measured. However, July and August were dry with only 1.98 inches of moisture recorded. This was 1.95 inches below the long term average at the Dickinson Research Center.

Cow and calf gains were better than expected considering the dry conditions during the last half of the 101 day grazing season. (see Table 1) The ewes gained on average 0.25 pounds per day and were in excellent condition for rebreeding at the close of the trial.

Estimation of total herbage production per pasture was 683.3 lbs. / acre on the control pasture and 698.2 lbs./ acre the Multispecies pasture. Total grass production was 642.6 lbs./ acre on the Multispecies pasture and 635.9 lbs./ acre on the control pasture. Forb production was 55.6 vs. 47.4 lbs./ acre for the MS and Control pastures respectively. Utilization of the grass was 51.3% in MS pasture and 48.9% in the Control pasture. Utilization of forbs was 60.8% in the MS pasture and 70.2% in the Control pastures.

It became obvious in 1990 that a five strand barb wire fence was not adequate to control the movement of the sheep. In 1991, an electric wire located 5-6 inches above the ground was added and proved to be effective in keeping the sheep in the pasture. A small water tank was installed in 1990 in order to allow the sheep easy access to clean, drinking water.

Although coyotes were known to be in the area and could be heard almost every night, there were no losses due to predation.

Summary:

Two years of grazing sheep and cow-calf pairs on native range from late June to early October has indicated that both species were able to make normal growth without noticeably affecting either pasture quantity or quality. Savings in ewe feed could be estimated to average $2.50 per month or approximately $8.50 for a 101 day grazing period. The control of weedy forbs may prove to be an additional benefit. An electric fence 5-7 inches off the ground in addition to a normal barbed wire cattle fence provided adequate control of the sheep. To date, no predation losses have occurred in the sheep flock. This could be the result of the protective nature of the cows with calves. The trial is scheduled to continue for several more years in order to build reliable data on changes in species composition, yields, etc.

Literature Cited

Glimp, H.A. 1988. Multi-Species grazing and marketing. Rangelands 10(6):275-278

Kirby, D., M. Parman, M. Pessin and M. Humann. 1988. Dietary overlap of cattle and sheep on rotationally grazed rangeland. SID Research Journal 4(3): 6-11f

Table 1. Results of Multispecies grazing on native pastures in 1990 and 1991.

	East		**West**	
	Sheep and Cows		Cow-Calf	
Year	1990	1991	1990	1991
Acres grazed	320	320	320	320
Days grazed	96	101	96	101
No. of head				
Cow-calf pr.	24	24	24	24
Dry ewes	24	24		
Bulls	1	1	1	1
Weight gain (lbs)				
24 Sheep	301.5	600		
Ave. / hd.	12.6	25.0		
24 Cows	565.5	1331	244	761
Ave./ hd.	23.6	55.5	10.2	31.7
24 Calves	5802	5978	5588	5944
Ave./ calf	241.8	249.1	232.8	247.7
Ave. gain per head per day				
Sheep	.13	.25		
Cows	.25	.55	.11	.31
Calves	2.52	2.47	2.43	2.45

SECTION II
MANAGEMENT SECTION

TIMOTHY C. FALLER
SUPERINTENDENT
HETTINGER RESEARCH AND EXTENSION CENTER

DR. KRIS RINGWALL
EXTENSION LIVESTOCK SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

DAN NUDELL
RESEARCH SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

33RD ANNUAL SHEEP DAY

HETTINGER RESEARCH AND EXTENSION CENTER
HETTINGER, NORTH DAKOTA

FEBRUARY 12, 1992

A SHED MADE FROM STRAW USED FOR A SHEEP SHELTER

MAINTENANCE IN THE SECOND YEAR

Dan Nudell, Tim Faller, Don Stecher

ABSTRACT: In 1989 a shed was constructed of flax straw walls with a roof made of 2" X 4" rafters covered with a plastic tarp. Total usable inside space is 765 square feet. Total cost of materials was $892.00. Total labor to construct was approximately three man days. Excluding labor charge the cost of the structure is $1.17 per square foot. Approximate cost of traditional pole structures is $2.50 - $3.00 per square foot.

During the second winter of use (1990 - 1991) the shed was used as the sole shelter for a group of approximately 300 ewe lambs. As in the first year of use maintaining the building took a considerable amount of time and money. However we feel we have learned some valuable lessons and have modified the basic building to a point where early problems have been solved and yearly maintenance will now decrease to a more reasonable level.

The two largest problems with this building design continue to be consumption of the straw by the sheep and in this year, an early failure of the replacement tarp resulting in the need to purchase two tarps in one year. This years tarp failed on October 13 during a severe wind storm. Average wind speeds were 22 mph with gusts to near 60 mph.

To address these problems two major changes have been made. First the snow fence has been removed from around the outside perimeter of the building and replaced with a standard woven wire fence placed about three feet from the straw walls. This has stopped the livestock damage to the outside of the walls. The snow fence is still used on the inside of the shed but only as a means of holding the plywood sheets that are placed against the straw inside. If we were to construct this building new we would fasten the plywood directly to posts or the straw and would eliminate the snow fence entirely. Adding woven wire on the outside and plywood and eliminating the snow fence on the inside in the initial construction would add $30 to $50 to the initial construction cost. This change appears to have stopped the consumption of straw and would thus save a great deal of maintenance. Yearly cost of the building would then be much more reasonable. The second major change was the addition of four ropes (5/16 nylon) running over the top of the tarp and fastened to the ground. These ropes are making a significant change in the amount of wind movement seen in the tarp and are expected to increase the life of a tarp.

SUMMARY OF SECOND YEAR MAINTENANCE EXPENSE

$90	tarp
$110	tarp (different source)
$36	6 wood post
$70	1 roll woven wire
$12	4 ropes
$4	1 rafter 2x4 x 14
$322	Total expenditure this year.

Note: Many of these expense should have been incurred as the building was constructed, their expense would have been offset to a large degree by the savings gained as a result of not needing snow fence.

Dexter Johnson, Retired NDSU Extension Agricultural Engineer, has studied many of the straw sheds that are presently in use as well as the historical accounts of this type of structure. He feels that a farmer should consider the following points when constructing a straw shed: a.

1. Use even, well-packed flaxstraw (or more durable material) bales that are securely tied with plastic twine or netting.

2. Construct the building on a leveled , well-drained site; setting large round bales on end, rectangular bales on their sides. Snug bales tightly together when placed.

3. Slope the roof to drain; use rafters capable of supporting wet straw and snow weight of 30 plus lbs. per sq. ft. and netting that doesn't sag down between the rafters.

4. Provide regular(2-3 times/year) maintenance plugging bird holes, sagged spots, blown off roughage, leaks and livestock damage.

5. Protect bales with boards, panels, metal sheeting, meshwire or electric wire securely held in place so livestock won't damage.

6. Expect a building to last 1 to 5 years.

In summary Johnson says a baled roughage building could be an alternative to consider when a quick fix is needed at minimum out-of-pocket expense. Recycling on hand material and using existing farm labor and equipment are the major advantages of straw sheds. The straw shed experience at the Hettinger Research and Extension Center mirrors Dr Johnson's conclusions. Consider a straw building if you need a shelter for a short time at a low cost and if you have labor and materials available to construct such a shelter for a low out of pocket expense.

a. Personal correspondence, Johnson is currently Extension Agricultural Engineer at SDSU, Brookings

ALL SPURGE IN NOT CREATED EQUAL
(Preliminary Data)

Anecdotal evidence suggests that livestock preference for leafy spurge (euphorbia esula) varies among populations of this plant. Chromatographic analysis, DNA sequences and morphological differences support the observation that large variation exist among accessions of leafy spurge. Reports from Montana and North Dakota (ND) indicate that sheep will readily eat large amounts of leafy spurge on range and pasture land. In contrast, we observe that sheep in southeast Idaho (ID) are reluctant consumers of the weed. We conducted an experiment to determine if spurge palatability differed between ND and ID and if characteristics that separated palatable from unpalatable accessions could be identified. This information could be used to identify leafy spurge populations that would be susceptible to control by sheep grazing. The objective of this project was to determine if differences in preference and utilization of leafy spurge growing in different locations could be demonstrated and if the plants could be differentiated by gas chromatography.

Ten sheep from each state were placed on small, spurge-infested pastures in southeast ID and central ND. The trials were conducted in early- and mid-June in ID and ND, respectively. The alternative forages were primarily crested wheatgrass (Agropyron cristatum) in ID and smooth brome (Bromus inermis) in ND. Standing crop, number of grazed and ungrazed spurge stems and diet composition was recorded at the beginning, middle and end of each trial. At the start of the trials, the percent grass in the SC was 61 and 74 in ID and ND, respectively, while the percent spurge was 30 and 24 in ID and ND, respectively. Sheep grazed pastures until approximately 50% of the initial standing crop was removed.

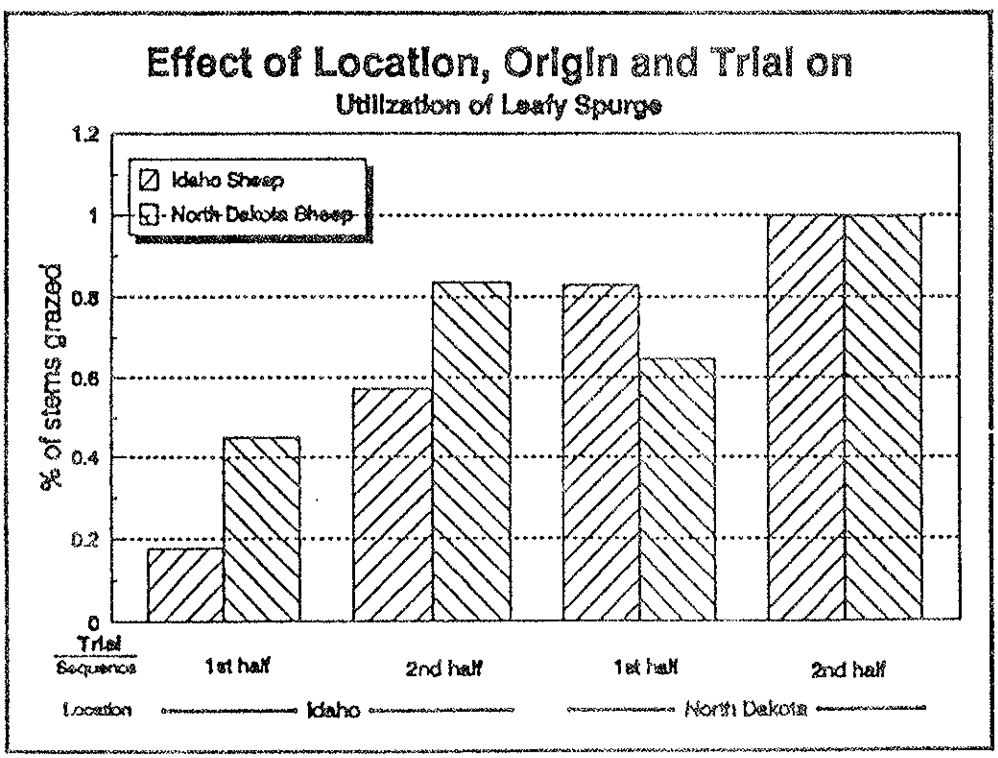

Figure 1

Sheep grazed a greater percent of spurge stems in ND compared to ID ($P<0.001$) but utilization of spurge stems was not affected ($P>0.30$) by the origin of the sheep (Fig. 1). By the end of a trial sheep grazed 99% of the spurge stems in North Dakota compared to 70% in Idaho. In Idaho, sheep did not consume large amounts of leafy spurge until the second half of a trial. This indicates that at this location significant utilization will not occur until other forages have been consumed.

Relative preference for leafy spurge further demonstrated the importance of location ($P<0.003$) on palatability of spurge. With one exception, sheep avoided spurge in Idaho but in North Dakota the contribution to the diet was about equal to its availability in the standing crop (Fig. 2). The interaction of location x origin x trial ($P<0.04$) for relative preference substatiated previous work at the Sheep Station that showed how experience can affect preference for leafy spurge. North Dakota sheep showed a strong preference for leafy spurge during the first half of the ID trial. We hypothesize this may have been caused by their familiarity with spurge and unfamiliarity with crested wheatgrass, which was the primary alternative forage in this trial.

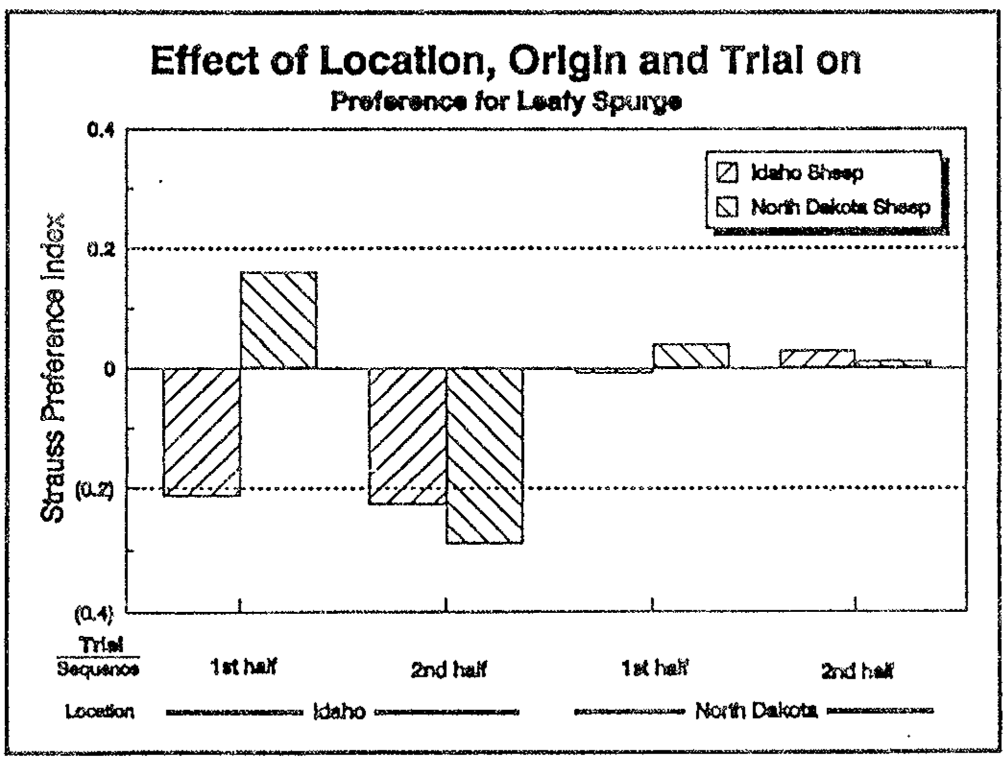

Figure 2

We conclude that differential grazing of leafy spurge by sheep on sites in Idaho and North Dakota is a result of differences in palatability or post ingestive consequences of spurge growing on these sites. Gas chromatography of latex from these two accessions showed differences (P<0.05) between peaks at 3.15, 33.43 and 36.98 min. (Fig. 3). This suggests that this procedure can be used to differentiate among spurge accessions of different palatability.

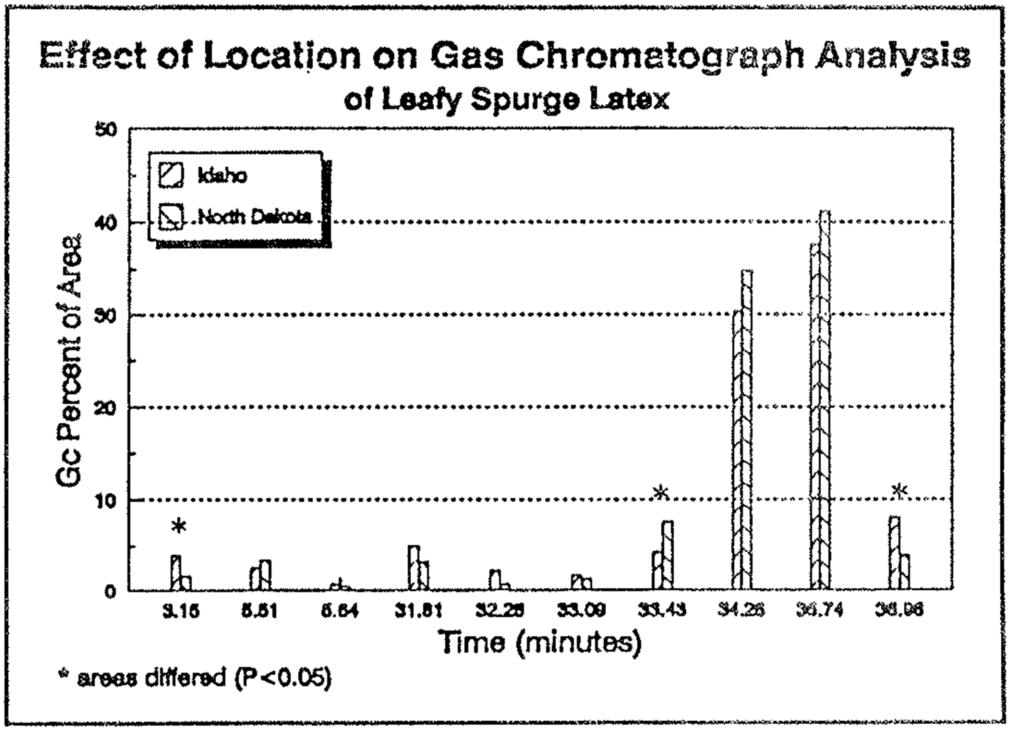

Figure 3

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.

END OF LAMBING TO WEANING

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

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

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

WEANING

1. Wean ewes from lambs, not lambs from the ewes. If possible, remove ewes from pen out of sight and sound of lambs. If lambs have to be

moved to new quarters, leave a couple of ewes with them for a few days to lead the lambs to feed and water locations.

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

3. Grain should be removed from the 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