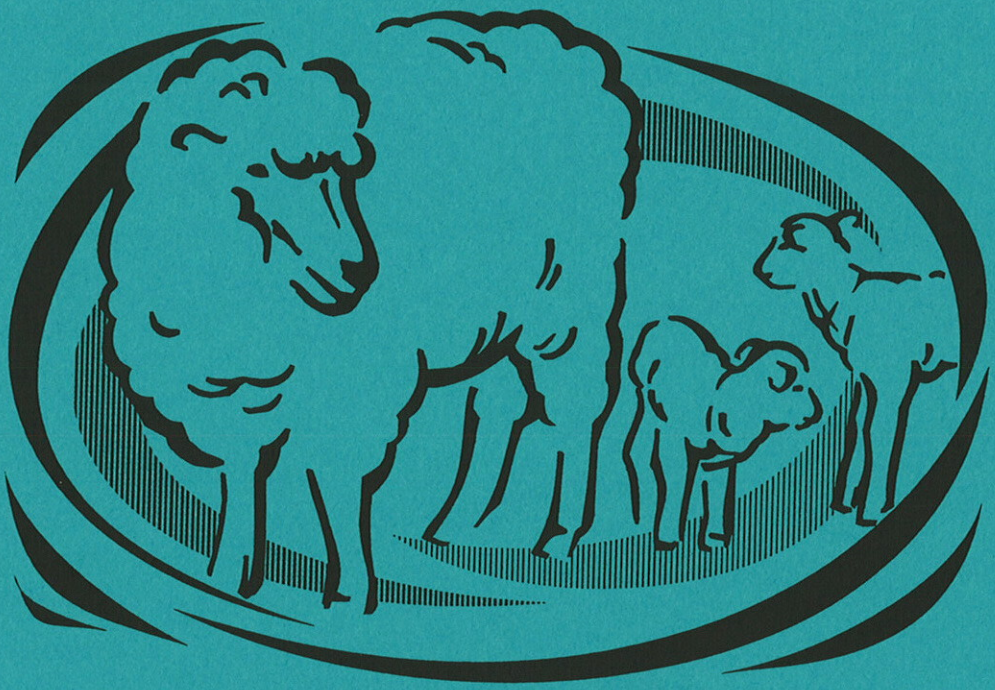
REPORT NO. 36



WESTERN DAKOTA SHEEP DAY

February 8, 1995

HETTINGER ARMORY

Hettinger Research Extension Center
and
Department of Animal and Range Sciences
North Dakota State University

February 8, 1995

Dear Sheep Producer:

On behalf of the Hettinger Research Extension Center and the Department of Animal and Range Sciences, let us welcome you to "Sheep Day". This report collectively represents North Dakota State University's efforts at both locations to provide information for the support of the sheep industry. We welcome your comments as grassroots users of the efforts of both Extension and Experiment Station resources. Your constructive comments assist us to participate meaningfully in the future of your industry.

A collective, positive and participatory attitude by producers and caretakers of their land grant resources will go far to solve problems confronting the sheep industry.

Best wishes for a day of sharing and learning.

Timothy C. Faller
Director
Hettinger Res. Ext. Ctr.
NDSU, Hettinger, ND
(701) 567-4323

Jerrold Dodd
Chair
Dept. of Animal & Range Sci.
NDSU, Fargo, ND
(701) 231-7641

PROGRAM

9:45 AM (MST)	Sheep Equipment Display and Coffee at the Hettinger Armory
10:00 AM	Early Bird Door Prize Drawing
10:05 AM	DEMONSTRATION on application and use of electronic animal identification for prevention of animal theft, loss, or for record keeping. Jerry Lindseth, Rapid City, South Dakota
10:30 AM	HETTINGER & FARGO STATION REPORTS Dr. Kris Ringwall Dr. Paul Berg Mr. Roger Haugen Dr. Bill Barker Mr. Timothy Faller
12:00 NOON	LUNCH: AMERICAN LAMB DINNER
1:00 PM	WELCOME Dr. Robert Todd Director, North Dakota Ag. Experiment Station North Dakota State University
1:15 PM	"NATURAL RESOURCE MANAGEMENT UTILIZING GRAZING ANIMALS" Panel participants: Paul Haroldson, Sheep Producer, Coteau, ND Dr. Bill Barker, ARS, NDSU, Fargo, ND Dean Swenson, Goat Producer, Walcott, ND
2:30 PM	"FEEDING YOUR LAMBS TO A HEAVIER WEIGHT WILL BE A PART OF FUTURE SUCCESS AS A SHEEP PRODUCER" Dr. Jeff Held, Sheep Specialist South Dakota State University Brookings, South Dakota
3:15 PM	"CLOSING REMARKS" Wyman Sheetz, Vice President North Dakota Lamb & Wool Producers Assoc. Hensler, North Dakota

*There will be a spouse program in the afternoon beginning at 1:15 PM. Presentations at this program will focus on "SPEED CLEANING" and "GAMBLING ADDICTION"

SHEEP DAY DIGEST

by
Timothy C. Faller, Director
Hettinger Research Extension Center
North Dakota State University

SECTION I
REPORTS OF RESEARCH IN PROGRESS
AT THE
HETTINGER RESEARCH AND EXTENSION CENTER
AND MAIN STATION

MR. ROGER HAUGEN
EXTENSION LIVESTOCK SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

DR. PAUL BERG
DEPT. OF ANIMAL & RANGE SCIENCES
NORTH DAKOTA STATE UNIVERSITY

TIMOTHY C. FALLER
DIRECTOR
HETTINGER RESEARCH EXTENSION CENTER

DR. KRIS RINGWALL
EXTENSION LIVESTOCK SPECIALIST
NORTH DAKOTA STATE UNIVERSITY

DR. BILL BARKER
DEPT. OF ANIMAL & RANGE SCIENCES
NORTH DAKOTA STATE UNIVERSITY

AT THE

36TH ANNUAL SHEEP DAY

HETTINGER RESEARCH EXTENSION CENTER
HETTINGER, NORTH DAKOTA

FEBRUARY 8, 1995

REPRODUCTIVE CHARACTERISTICS OF MATURE AND YEARLING RAMBOUILLET EWES WHEN EXPOSED DURING APRIL AND JULY TO PRODUCE SEPTEMBER AND JANUARY LAMBS

K.A. Ringwall, K.J. Helmuth and T.C. Faller

INTRODUCTION

Seasonal infertility continues to be a biological puzzle. Previous studies have helped to isolate some of the components of seasonal infertility, but sheep as a whole continue to be very seasonal in their reproduction. The interactions of management with various types of sheep make predictable solutions difficult. Hopefully a long term genetic solution would be found that would aid sheep producers in obtaining a predictable lamb crop at different times of the year. The purpose of this project is to provide additional information regarding the potential of maintaining a closed fall lambing system with a December/January cleanup lambing through the selection of fall born ewes and rams.

PROCEDURE

Starting in 1986, Rambouillet ewes were randomly mated to Rambouillet rams and evaluated in a lambing system that expected the ewes to lamb three times in a two year period. Starting the spring of 1992 the flock was closed and these ewes are being evaluated in an April breeding season, with only a July clean up. Ewes were group mated to fall born Rambouillet rams during April (April 1 plus 36 days) and re-exposed in July (July 15 plus 36 days) to Suffolk/Columbia rams for a cleanup breeding season. Ewes and rams were mixed several times on the first day of breeding to assure good ram exposure. A random set of November bred ewes will be maintained as a control for future comparison.

The top 80% of the fall born ewe lambs and top 10% of the fall born ram lambs for growth (weaning weight and structural correctness) will be available as replacements. Mature ewes will be classified as either only lambing in the fall, lambing both fall and winter, lambing only in the winter, or failing to lamb as a three year old or older ewe. Ewes that failed to lamb as a three year old or older ewe, or were found to be unsound were culled from the trial.

RESULTS AND DISCUSSION

The influence of fall born ewe lambs is not known yet, early observations (table 1) would suggest that a fall lambing system with a January clean-up lambing will work in North Dakota. Currently, 94% of the mature ewes involved within the system are lambing on an annual basis. Approximately, two-thirds of the flock are lambing in the fall (table 1).

A continual concern is reduced body condition of the ewes following winter feeding or lactation. However, table 2 indicates that fall lambing tends to improve with age. Yearling ewes do not breed well in April (table 2) and ewes that are at or close to a condition score two also do not seem to breed well. The fall ewe lambs are first exposed at 10 months of age in July and the majority are lambing in December/January (table 3).

Table 3 indicates that the flock is improving in the ability to fall lamb. The flock started in 1992 with only one-third of the ewes lambing in the fall, and has increased to over 85% of the ewes lambing in the fall of 1994. This trial will be continued to obtain production information on at least three more generations of fall born ewes. After three generations, ewes will be co-mingled with the control ewes and all ewes will be evaluated in different lambing systems.

Table 1

ESTIMATED FLOCK PERFORMANCE FOR MATURE RAMBOUILLET EWES WHEN EXPOSED FOR SEPTEMBER LAMBING FOLLOWED WITH A CLEAN UP EXPOSURE IN JULY

	April Exposure	July Exposure	Percentage Failing To Breed
Pregnancy Percentage[a]	63.5	30.7	5.8
Lambing Percentage[b]	1.31	1.52	-.-

[a] Diagnosed pregnant by means of ultrasound evaluations.
[b] Lambing percentage equals the number of lambs born divided by the number of ewes lambing.

Table 2

REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS AND CONDITION SCORES FOR RAMBOUILLET EWES DURING APRIL AND JULY WHEN EXPOSED AT MATURE, OR YEARLING AGES FOR THREE ESTROUS CYCLES AS LACTATING OR NON-LACTATING EWES[a] FOR 1992, 1993, and 1994

BREEDING PERIOD	AGE	LACTATING COND	NUMBER EXPOSED	PRE-BREEDING WEIGHT	PRE-BREEDING COND[b]	PERCENT DIAGNOSED PREGNANT	LAMBING PERCENT
APRIL	1	DRY	304	112	2.8	15	1.18
	2	WET	213	120	2.5	53	1.03
		DRY	151	124	2.5	54	1.16
	3	WET	106	137	2.9	70	1.17
		DRY	126	140	3.0	83	1.32
	4	WET	62	136	2.6	69	1.31
		DRY	98	149	3.1	77	1.47
	5	WET	24	146	3.0	67	1.50
		DRY	48	143	3.0	90	1.47
	6	WET	4	137	2.5	100	1.33
		DRY	2	146	3.5	50	1.00
JULY	1	DRY	261	---	-.-	72	1.41
	2	DRY	176	---	-.-	81	1.48
	3	DRY	66	---	-.-	89	1.67
	4	DRY	49	---	-.-	86	1.67
	5	DRY	17	---	-.-	71	1.40
	6	DRY	1	---	-.-	100	1.00

[a] Lambing information from July 1994 breeding is not included.
[b] Ewe body condition score scale: 1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.

Table 3

YEARLY REPRODUCTIVE PROLIFICACY AND PRE-BREEDING WEIGHTS AND CONDITION SCORES FOR RAMBOUILLET EWES DURING APRIL AND JULY WHEN EXPOSED AT MATURE, OR YEARLING AGES FOR THREE ESTROUS CYCLES[a] AS LACTATING OR NON-LACTATING EWES

TRIAL YEAR	BREEDING PERIOD	LACTATING CONDITION	NUMBER EXPOSED	PRE-BREEDING WEIGHT	PRE-BREEDING COND[b]	PERCENT DIAGNOSED PREGNANT	LAMBING PERCENT
1992							
	MATURE						
	APRIL	WET	98	120	2.1	35	1.30
		DRY	93	125	2.4	38	1.52
	JULY	DRY	215	---	-.-	87	1.49
	YEARLING						
	APRIL	DRY	140	97	2.3	9	1.00
	JULY	DRY	37	--	-.-	84	1.29
1993							
	MATURE						
	APRIL	WET	164	129	2.9	59	1.05
		DRY	104	140	2.8	76	2.32
	JULY	DRY	114	---	-.-	82	1.55
	YEARLING						
	APRIL	DRY	164	124	3.2	20	1.24
	JULY	DRY	133	---	-.-	58	1.45
1994							
	MATURE						
	APRIL	WET	74	140	2.9	85	1.29
		DRY	158	147	3.3	88	1.38
	JULY	DRY	71	---	-.-	83	N/A[c]
	YEARLING						
	APRIL	WET[d]	73	127	2.6	78	1.13
		DRY	70	125	2.8	74	1.13

[a] All ewe were exposed March 20, 1992; July 17, 1992; March 25, 1993; July 14, 1993; April 14, 1994; and July 19, 1994.

[b] Ewe body condition score scale: 1=extremely thin, 2=thin, 3=moderate, 4=fat, 5=extremely fat.

[c] Lambing information from July 1994 breeding is not included.

[d] These ewes had previously lambed in January at a year of age and are still classed as a yearling though these ewes are approximately 19 months of age.

MID-GESTATION AND LATE GESTATION PROTEIN SUPPLEMENTATION OF RAMBOUILLET EWES FED LOW QUALITY ROUGHAGE DIETS

K.A. Ringwall, K.J. Helmuth, J.S. Caton and T.C. Faller

INTRODUCTION

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

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

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

PROCEDURE

Low quality forage was fed to Rambouillet ewes in 1993 and will be in 1994. The basal forage fed included mature CRP hay in 1993 (7.5% crude protein), and 60% straw/corn stover (3.5% crude protein) blended with 40% alfalfa hay (15.4% crude protein) in 1994. All diets were formulated to meet the Nutritional Research Councils (NRC) requirements for gestation and late gestation in 1993. In 1994, the sheep diets were calculated at 115% of NRC requirements due to excessive death loss in 1993.

Protein requirements were met utilizing the following supplements. Three protein supplements were formulated based on NRC requirements for sheep to provide increasing levels of escape protein (UDP). All supplements were formulated to provide 1.76 Mcal/Kg net energy for maintenance, 20.0% rumen degradable protein, 1.08% Calcium and 1.06% Phosphorus. The control supplement was formulated to provide 5.0% escape protein for a total of 25% crude protein, step one supplement was formulated to provide 20.0% escape protein for a total of 40% crude protein, and step two supplement was formulated to provide 35% escape protein for a total of 55% crude protein. Sheep mineral requirements were met by including limestone, trace mineral salt and dicalcium phosphate in the total mixed ration. Throughout the trial, the low quality forage was fed ad libitum. Supplementation was started mid gestation, following the acclimation to low quality grass hay. Mid gestation supplement levels were 100 and 140 grams of each supplement for the sheep in 1993 and 1994, respectively. Late gestation supplement levels were 190 and 311 grams for the sheep in 1993 and 1994.

In 1992, 131 mature Rambouillet ewes were synchronized with 0.5 mg fenprostalene on November 7. Ninety ewes expressed estrus (based on mating data), mated to Columbia rams and 89 ewes were diagnosed pregnant. Ewes were sheared November 24. Seventy-two pregnant ewes were allotted to six pens based on condition score and fetal numbers and acclimated to the low quality forage. Mid-gestation supplementation was started on February 1 and the late gestation ration was started on March 8. Ewes were induced (to lamb) on April 4 with 2 mg of flumethasone. Ewes were weighed periodically through out the trial and condition score monitored. Eight ewes within each pen were side sampled when the supplementation started, prior to lambing and the following fall prior to shearing on September 24, 1993.

The trial was repeated in 1993 and 136 different mature Rambouillet ewes were synchronized with 0.5 mg fenprostalene on November 8. Eighty one ewes expressed estrus (based on ovulation data) and were mated to Suffolk rams. Eight ewes were removed from the ninety-two ewes because of triplet ovulations and three ewes were removed because of ovulation failure. Of the seventy ewes that ovulated, ten ewes were open. Ewes were sheared November 18. Sixty ewes were allotted, based on condition score and fetal numbers, to six pens and acclimated to the low quality forage. Mid gestation ration was started January 10, 1994 and the late gestation ration was started on March 2. The eight ewes in each pen were side sampled similar to 1993. Ewes were weighed and condition scored the same as 1993. The trial finished November 18, 1994.

RESULTS

Ewe results are presented in tables 1-6. Table 1 indicates the consumption of low quality hay. There was no significant difference between treatments. There was no significant differences in body weight (table 2) between the treated groups, although all the ewes increased in body weight throughout the duration of the protein supplementation period. This increase in body weight would be normal weight gain for a pregnant ewe. All groups lost weight following lambing.

All ewes were freshly shorn, and there was no difference between treatment groups at the start of the trial as shown in table 3 for wool production. The step one and step two supplementation increased wool production. There was a significant response to both supplements and wool growth increased in proportion to the percentage of the protein that was escape protein within the treatment period. As the level of escape protein increased, so did wool growth. The protein supplements were stopped when the ewes lambed and returned to pasture. The treatment trend carried over after the supplement was ended and total wool clip (table 3) tended to be greater as escape protein increased in the diet.

Table 4 indicates there was no influence of supplements fed during pregnancy on individual lamb growth performance. When lamb weight is adjusted to a total 60 day lamb weight per ewe lambed, total weight per ewe lambed tended to increase as escape protein increased. Table 5 presents the lamb survival by treatment group. Of the lambs that survived (table 5), very few lambs gained weight the first two weeks of life (table 4). The ewes did not milk well after lambing, even though the ration was changed to meet the NRC requirement for lactation with no low quality forage. The majority of lambs that died following birth were under nourished, resulting in predisposition too many post natal problems. The treatments did not substantially influence pregnancy loss (table 6).

The poor performance levels and tremendous mortality obtained from feeding the low quality hay was unacceptable. All ewes, regardless of treatment started to lose condition shortly after the start of feeding low quality hay. By the end of supplementation, the ewes had lost approximately one/half of a condition score, while increasing in weight due to pregnancy. Although the treatments demonstrated that escape protein can enhance wool production and perhaps increase lamb production slightly under nutritional stress, the problems associated with the low quality hay off set any benefit.

Table 1

MEAN DAILY LOW QUALITY FORAGE AD LIBITUM INTAKE (lb) OF MATURE RAMBOUILLET EWES FED THREE LEVELS OF SUPPLEMENTAL ESCAPE PROTEIN DURING 1993 and 1994

Treatments	Control	Step 1	Step 2
Acclimation[a]	5.75	5.78	5.66
Mid-Gestation[b]	5.17	5.12	5.15
Late Gestation[c]	5.43	5.46	5.48

[a] Ewes were acclimated to forage.

[b] Ewes were fed supplement for 35 days in 1993 and 49 days in 1994. Supplement fed per ewe was 7.7 lbs in 1993 and 15.3 lbs in 1994.

[c] Ewes were fed supplement for 28 days in 1993 and 30 days in 1994. Supplement fed per ewe was 11.8 lbs in 1993 and 20.4 lbs in 1994.

Table 2

LEAST SQUARE MEAN BODY WEIGHT (lbs) AND CONDITION SCORE[a] OF PREGNANT MATURE RAMBOUILLET EWES FED THREE LEVELS OF SUPPLEMENTAL ESCAPE PROTEIN DURING 1993 and 1994

	Control		Step 1		Step 2	
treatment	weight	condition	weight	condition	weight	condition
Initial	148	2.6	150	2.5	150	2.7
Interim	156	2.5	159	2.7	163	2.7
Final[b]	173	2.3	180	2.2	182	2.4
Weaning[c]	143	-.-	159	-.-	166	-.-

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

[b] Pre-lambing weight taken at end of protein supplementation.

[c] No condition score was taken at weaning.

Table 3

LEAST SQUARE MEAN SIDE SAMPLE WOOL WEIGHT AND ADJUSTED 365 DAY WOOL WEIGHT OF PREGNANT AND LACTATING MATURE RAMBOUILLET EWES FED THREE LEVELS OF SUPPLEMENTAL ESCAPE PROTEIN DURING 1993 and 1994

	Control	Step 1	Step 2
SIDE SAMPLES[a](grams)			
Initial	4.7	4.9	4.7
Interim	2.3[c]	2.7[d]	2.8[d]
Final	11.0	11.0	11.2
Total side sample	18.1	18.7	18.5
Adjusted[b](lbs)			
Fleece weight	7.4[e]	7.8[ef]	8.0[f]

[a] Wool side sample taken 4 inches ventral from the last thoracic vertebra (4x3 inches^2). Ewes were sheared November 24, 1992 and November 18, 1994.
[b] Wool fleece weight adjusted to 365 days growth.
[cd] Means in the same row with unlike superscripts differ ($p<.05$).
[ef] Means in the same row with unlike superscripts differ ($p<.05$).

Table 4

LEAST SQUARE MEAN BIRTH WEIGHT ADJUSTED[a] 9, 16, 30, 48 AND 60 DAY WEIGHT FROM LAMBS PRODUCED FROM MATURE RAMBOUILLET EWES FED THREE LEVELS OF ESCAPE PROTEIN DURING 1993 and 1994

Weight	Control	Step 1	Step 2
Individual lamb weight			
Birth Weight (lbs)	11.9	12.4	12.2
Adjusted 9 day (lbs)	13.6	14.7	14.5
Adjusted 16 day (lbs)	17.4	18.1	18.2
Adjusted 30 day (lbs)	23.3	23.4	25.1
Adjusted 48 day (lbs)	32.0	31.4	33.1
Adjusted 60 day (lbs)	35.8	35.1	36.1
Lamb weight per pregnant ewe			
Adjusted 60 day (lbs)	32.7	37.3	41.4

[a] Weight adjusted for age of lamb.

Table 5

REPRODUCTIVE PERFORMANCE AND LAMB SURVIVAL[a] OF MATURE RAMBOUILLET EWES FED THREE LEVELS OF ESCAPE PROTEIN DURING 1993 and 1994

	Control	Step 1	Step 2
Birth Type	1.53	1.62	1.59
Born Dead	.13	.22	.16
Birth day inventory	1.40	1.40	1.43
Dead	.22	.14	.09
Grafted[b]	.11	.14	.07
Nine day inventory	1.07	1.12	1.27
Dead	0	.05	0
Sixteen day inventory	1.07	1.07	1.27
Dead	.09	0	.07
Thirty day inventory	.98	1.07	1.20
Dead	.03	0	.06
Forty eight day inventory	.95	1.07	1.14
Dead	.02	.02	0
Sixty day inventory	.93	1.05	1.14

[a] Reproductive performance and lamb survival based on the number of ewes lambing.

[b] Lambs were grafted based on ewes ability to raise. Ewes were evaluated at birth. All grafted lambs were removed from the inventory for analysis.

Table 6

REPRODUCTIVE PERFORMANCE AND EWE ATTRITION OF MATURE RAMBOUILLET EWES[a] FED THREE LEVELS OF ESCAPE PROTEIN DURING 1993 and 1994

	Control	Step 1	Step 2
Diagnosed pregnant[b]	44	44	44
Full term pregnancy	44	44	41
Pregnancy loss[c]	0	0	3
Ewe attrition[d]	1	7	1

[a] Initial ewes selected from a mature flock (131 in 1993) and (136 in 1994) which were synchronized with 0.5 mg fenprostalene.

[b] Diagnosed pregnant by means of ultrasound evaluations.

[c] Pregnancy loss equal ewes diagnosed pregnant minus full term pregnancy and indicates the pregnancy loss during the feeding of the treatments.

[d] Control: 88-415, dead 5/6/93, unknown.
Step 1: 86-609, dead 3/29/93, pregnancy toxemia; 89-1404, dead 4/25/93, parturition mortality; 89-1475, dead 4/7/93, parturition mortality; 87-468, dead 5/13/93, unknown; 88-354, dead, unknown; 88-494, dead 5/13/93, pneumonia; 89-343, dead 4/5/94, pregnancy toxemia.
Step 2: ewe 89-1374, dead 6/8/93, mastitis.

LEAN LAMB PRODUCTION
1994 UPDATE
PRELIMINARY DATA

P.T. Berg, T.C. Faller, W.R. Limesand, B.L. Moore, D.W. Zaeske and T.J. Schmaltz

Introduction

Since late 1993, lambs with known sires which were slaughtered in the NDSU Meat Laboratory have been further processed to allow the gathering of data for identification of factors to aid producers in the production of lean, rapidly growing lambs. This data-base is extensive in both numbers and diversity. We are still collecting this type of data; the target number of lambs in this base information pool is 200. As of December 31, we have processed 191 lamb carcasses. Purebred lambs of Columbia, Hampshire, Rambioullette and Suffolk breeding comprise this data set. Analysis by breed and sire within breed will be begun at a later date.

Procedure

The first priority of data collection was to establish the dependent variable; in this data set, the weight of closely trimmed retail product. All carcasses were sold through local retail outlets to keep costs in line. The meat department personnel at the various stores have been very cooperative in allowing us to fabricate these lambs to wholesale cuts denuded of subcutaneous fat so that muscle is exposed for over 85% of the surface. This allows us to sum the trimmed weights of the major trimmed wholesale cuts. This sum is fully equivalent to the weight of trimmed retail product for each carcass. All the measures and weights which are recorded during the breakdown of a lamb carcass could be used as a predictor of Trimmed Retail Product (TRP). Our purpose in this data-base is to find the most accurate predictor of TRP and to balance accuracy with efficiency. It will do the sheep industry little good to find an extremely accurate prediction equation if the effort required to gather the data for the prediction formula is not compatible with a high volume processing line. The industry simply will not use the method.

Part of this project is an evaluation of an electronic instrument which has the potential of predicting fat free mass in the live animal and its carcass. This instrument is a Bioelectric Impedance Analyzer. In theory, lean tissue conducts an electrical current differently than does fat. The BIA machine measures the amount of a low energy current which is absorbed and dispersed in the body and a mathematical formula can then be developed which will predict fat free mass. All the Columbia lambs which are assigned to this project have BIA readings at 4 and 6 months of age in a effort to evaluate BIA as a selection tool for the production of lambs with a high proportion of muscle to fat and bone.

Discussion and Results

The cutout data and analysis are summarized in tables 1 through 5. The tables show the averages, ranges and standard deviations for various measurements. It is apparent from these tables that not only are the weight ranges extreme but that on the average, these were large lambs. Several individual measures and combinations of measures were evaluated as predictors of trimmed retail product both as pounds of TRP and as a percent of carcass weight. Selected evaluations are presented in table 6. To check all possible combinations of measures as predictors of TRP would require millions of calculations. Only a few are practical.

Historically, carcasses have been bought strictly on a weight basis. How good is weight as a predictor of total lean? The assumption is made that as an animal increases in weight there is an accelerated increase in proportion of fat as compared to muscle. A typical growth curve confirms that as animals approach maturity their rate of gain begins slowing and additional weight eventually comes in the form of fat only. This is the basis of the traditional discount on heavy lambs. This also suggests that carcass weight by itself is a relatively good indicator of muscle at light weights but not so good at heavier weights. In our data set, we have an extreme variation in live or carcass weight. It stands to reason that a 80 pound lamb carcass should have more pound of lean than a 60 pound carcass.

How accurate a predictor or prediction formula is can be measured statistically by a value called R-square (R^2). The explanation of R^2 states that the R^2 number is the proportion of the variation in one variable which explained by the predictor. If a predictor were perfect in its estimation of the dependant variable the R^2 would be 1.00 or 100%. If a predictor generates an R^2 in excess of 90%, it is generally considered quite acceptable (the 90% value says that the predictor accounts for 90% of the variation in the dependent variable). Because of the vast range in weight, our data set produces an R^2 value for carcass weight as a predictor of pounds of retail product of 88%. In other words, carcass weight alone accounts for 88% of variation in trimmed retail product; simply the heavier the carcass the more the weight of trimmed retail product. When retail product is expressed as a percent of carcass weight the R^2 for carcass weight as the predictor is .11. The low R^2 indicates differences in degree of fatness are relatively independent of weight. Some of the fat carcasses are light weight and some are heavy. It should be obvious that within a narrow range, carcass weight would be of no value in the prediction of differences in fat free mass.

If carcass weight is combined with fat or conformation measures, the R^2 increases slightly. The small increase in accuracy is important from the standpoint that most drafts of livestock are selected for uniformity of type and/or weight, therefore an evaluation of degree of fatness becomes relatively more important than weight. Generally speaking, fat measurements add more accuracy to combination predictions than do conformation. Wholesale cut weights are good predictors of pounds of TRP but are of no value in predicting percent TRP. Conversely, the percent of trimmed weight of each wholesale cut is a good predictor of percent TRP but not of pounds of TRP. In our data, the trimmed leg is a better predictor of TRP than is the traditional trimmed shoulder. It is possible the trimmed shoulder became the cut of choice as predictor for TRP or of chemical lean because of its lower value and resultant cost saving rather than its accuracy. All trimmed wholesale cut weights as predictors are simply too labor intensive to have practical application. While an R^2 of .92 for trimmed leg as a TRP predictor is impressive, the processing involved and the reduction in product acceptability precludes its use as a method of predicting TRP.

Multiple component prediction formulas are generally more accurate than single or two component predictors. Two BIA formulas and one based on anatomical measures give excellent accuracy, are relatively quick and do not reduce either carcass value or acceptability. The first BIA formula utilizes anatomical electrical terminal placement. The carcass weight, BIA resistance, BIA reactance, length between BIA terminals and carcass temperature produce a formula which predicts pounds of TRP with 91% accuracy. BIA terminal placement can be easily adapted to robotics. To do this affectively, the terminals would always be a given distance

apart, thus length is not a variable in the robot formula. This constant distance formula also produced an R^2 of 91%. The most accurate formula developed thus far in data analysis uses carcass weight, ribeye area, 12th rib fat and body wall thickness. These components have been suggested for carcass evaluation in several other publications. This formula produces an R^2 value of 94%. It is relatively quick, uses objective measures and does not reduce the value of the carcass. From a high speed processing plant stand point, the reduction in accuracy of 94% for the anatomical measures vs 91% for the BIA formula is more than offset by the simplicity of BIA.

Prospectives

The project will continue to gather data. After the 200 head base number is reached, prediction of TRP will depend on the most practical formula. Data analysis will concentrate on breed and sire component comparisons. Given sufficient numbers, calculations of breeding values will become possible for selected progeny groups.

Table 1. Whole Animal Weights/Carcass Measures

	Live Wt	Cold Carcass Wt	Dressing %	Rib Eye Area	Lean Color	Marbling	Flank Streaking	Leg Score	Conf Score
Average	135	69.95	53.48	2.42	3.22	402	396	10.92	10.77
Range	196-89	112-46	60.3-42.4	3.5-1.6	3.7-2.9	650/210	710/220	14-9	14-9
Std. Dev.	17.8	10.68	3.09	.37	.13	88	80	.91	.82

Lean Color 1 - Very Pale, 2 - Pale, 3 - Ideal Pinkish Red, 4 - Red, 5 - Dark Red

Marbling and Flank Streaking 1 - Practically Devoid, 2 - Traces, 3 - Slight, 4 - Small, 5 - Modest, 6 - Moderate, 7 - Slightly Abundant, 8 - Moderately Abundant, 9 - Abundant

Leg Score and Conformation Score 9 - Good, 10 - Low Choice, 11 - Average Choice, 12 - High Choice 13 - Low Prime, 14 - Average Prime

Table 2. Fat Measures

	12th Rib Fat/Adj.	Body Wall Th	Body Wall Fat	Shoulder Rib Fat	Seam Fat Ratio	Leg/ Loin Fat	Sum of Fat Meas.	Kidney Fat #	Kidney Fat %
Average	.17/.19	.73	.49	.32	.17	.36	1.53	1.98	2.83
Range	.47/.52-.04/.06	1.2-.35	1.1-.12	.75-.10	.35/.04	.9-.12	2.87-.59	6.0-.8	7.41-0.85
Std. Dev.	.09	.17	.17	.13	.06	.14	.48	.84	1.02

Table 3. NAMPS Cut Weights

	Rear Shank Wt	Neck, Breast, Flank, Plate Wt	207 Shoulder	204 Rib Rack	232 Loin	233 Leg	4 Major NAMP Cut
# Untrim							
Average	1.22	16.48	15.18	6.79	6.22	21.77	49.96
Range	1.8-.8	28.35-9.8	22.35-9.3	12.0-4.5	10.85-4.25	33-15.35	78.2-33.4
Std. Deviation	.20	3.04	2.48	1.32	1.13	3.08	8.01
% of C Wt							
Average	1.76	23.61	21.80	9.74	8.92	31.33	71.81
Range	2.6-1.2	27.1-19.4	24.8-16.2	12.0-7.5	11.2-6.7	34.2-26.6	76.9-68.2
Std. Deviation	.24	1.54	1.49	1.04	.79	2.49	6.12
# Trim							
Average	NA	NA	13.83	5.55	4.69	18.81	43.15
Range			20.0-7.7	9.8-3.7	8.1-3.6	26.9-12.8	64.6-28.9
Std. Deviation			2.3	1.04	.80	2.49	6.12
% Trim/Untrim							
Average	NA	NA	91.10	82.02	80.27	86.62	86.52
Range			98.7-73.1	96.9-68.8	93.0-65.6	97.0-75.9	94.6-78.0
Std. Deviation			3.25	5.25	5.77	4.25	3.81

Table 4. Dependant Variable			
	Actual Pounds Retail Product	Retail Product as % of Live Wt	Retail Product as % of Cold Carcass Wt
Average	43.15	31.97	61.85
Range	64.56-28.9	39.7-26.5	70.5-53.7
Standard Deviation	6.12	1.86	3.21

Table 5. Prediction Formulas			
	Pounds BIA Predicted Retail Product	% BIA Predicted Retail Product	# Anatomically Predicted Retail Product
Average	43.05	61.92	43.15
Range	66.15-27.9	67.25-58.22	66.7-30.13
Standard Deviation	5.91	1.93	5.93

Table 6. Accuracy of Selected Trimmed Retail Product (TRP) Predictors

Single Predictor	Accuracy (R^2) for # TRP	Accuracy (R^2) for % TRP
Carcass Wt alone	.88	.11
12th Rib Fat alone	.02	.48
Sum of Fat Measures	.02	.60
Dressing %	.08	.23
Conformation Score	.08	.08
Trim Shoulder (207) Wt	.89	01
% Trim Shoulder/Untrim Shoulder	.01	.36
Trim Rack (204) Wt	.69	.00
% Trim Rack/Untrim Rack	01	.56
Trim Loin (232) Wt	.76	.01
% Trim Loin/Untrim Loin	.00	.63
Trim Leg (233) Wt	.92	.00
% Trim Leg/Untrim Leg	.00	.67
Combination Predictors		
Carcass Wt & 12th Rib Fat	.93	.49
Carcass Wt & Sum of Fat Measures	.94	.55
Carcass Wt & Conformation Score	.89	.14
Common Multiple Item Prediction Formula		
Carc Wt, Ribeye, 12th Rib Fat Body Wall Th	.94	.55
Carc Wt, $_{A}$Res, $_{A}R_{x}$, Length, Temp	.91	.33
Carc Wt, $_{P}$Res, $_{P}R_{x}$, Temp	.91	.32

THE EFFECTS OF VOMITOXIN (DON) FROM SCAB INFESTED BARLEY ON REPRODUCTIVE PERFORMANCE WHEN FED TO EWE LAMBS

R.G. Haugen, T.C. Faller, E.W. Boland,
H.H. Casper, and D.V. Dhuyvetter

INTRODUCTION

Vomitoxin (DON, deoxynivalenol) is a mycotoxin produced by fungi in scab infected grain. Under certain growing conditions (moisture and temperature), grain contamination occurs in the northern great plains region. The question becomes how can the vomitoxin contaminated grain be used in livestock rations. For many producers, the choice will be to use the contaminated grain in some fashion by feeding it to livestock.

Research on the tolerable levels that sheep can consume of vomitoxin grain while not effecting performance is limited. This is especially true when investigating reproductive performance. The objective of this study was to investigate the effect of high levels of vomitoxin (greater than 20 ppm of the total ration) fed to ewe lambs during the flushing, breeding and gestation periods.

PROCEDURE

One hundred twenty speckle-faced ewe lambs born in April and May, 1994, were divided into 8 pens (15 ewes/pen) on November 9, 1994, ten days before breeding (flushing period). Four pens served as controls and four pens received contaminated barley. The ewe lambs were self fed rations with an expected feed consumption of 3.5 pounds per head per day on an as fed basis.

Feeds were tested for moisture, protein, and vomitoxin levels. Rations were balanced to an equal protein and calculated energy content. On an as-fed basis, both diets were approximately 15% protein and had a TDN value of 65%.

Treated pens received barley that tested greater than 47 ppm vomitoxin (eight samples were collected with a range of 36.2 ppm to 74.8 ppm). The control pens received barley that tested less than 0.2 ppm. Hay used in the diets also tested less than 0.2 ppm vomitoxin. The expected level in the total ration of the treated pens after mixing was 25 ppm vomitoxin. Samples were collected from each pen every time the feeders were filled and tested for vomitoxin at the Veterinary Diagnostic Laboratory at NDSU.

Two rams were put into each pen on November 19, 1994, following the flushing period. Rams were removed on December 20, 1994.

One hundred thirteen ewe lambs were pregnancy tested using real time ultrasound on January 20, 1995, approximately 30 days after the rams were removed. Those ewe lambs determined pregnant will be further tested in the experiment. Open ewe lambs were removed from the experiment. Seven lambs were removed during the early part of the experiment due to injuries, etc.

Weights were recorded on each ewe lamb when the experiment began, when rams were removed, when ewe lambs were ultrasound, and during midgestation (approximately 80 days). Lamb weights are recorded in Table 1.

Table 1. Mean Weights of Ewe Lambs at Different Times

Pen	Beginning	Rams Removed	Ultrasound	# lambs
		Control Pens, lbs.		
1C	98.1	116.5	129.5	15 lambs
3C	97.5	118.2	131.5	15 lambs
5C	100.0	120.9	136.1	13 lambs
7C	104.6	126.1	142.7	14 lambs
Mean	100.0	120.3	134.8	57 lambs
Std Dev	15.0	18.1	19.0	
		Treated Pens, lbs.		
2T	94.9	114.9	128.1	15 lambs
4T	99.5	119.3	131.9	14 lambs
6T	98.3	118.1	133.5	13 lambs
8T	100.2	120.6	133.6	14 lambs
Mean	98.2	118.2	131.7	56 lambs
Std Dev	13.1	14.7	16.4	
		Totals, lbs.		
Mean	99.1	119.2	133.3	113 lambs
Std Dev	14.1	16.5	17.8	

Vomitoxin effects on pregnancy will be determined during the gestation period. Lambing rates, death losses, and birth weights of lambs will be recorded. Analysis will be performed to determine the effect of vomitoxin on these reproductive related traits.

Weight data were analyzed by analysis of variance using the General Linear Models Procedure of SAS (SAS 1990). Pen was used as the experimental unit and pen within treatment was used as the error term to test for treatment effects. Pregnancy data were analyzed using Chi-Square.

PRELIMINARY RESULTS

Preliminary results are shown in Tables 2 and 3. Performance data indicates no significant differences (P>.46) between controls and vomitoxin treated lambs for any weigh periods (Table 2). Average daily gain (ADG) from the beginning of the

experiment to the time they were ultrasound was also not affected (P>.53) by treatment. No significant difference (P=.81) was found in pregnancy rate between the controls and the treated group (table 3).

Table 2. Ewe Lamb Weights and Gains Between Controls and Treated

Item, lbs.	Controls	Treated	SE
Initial WT	100.5	97.8	2.17
End of Breeding WT	121.1	117.8	2.89
Ultrasound WT	135.9	131.2	3.91
ADG (61 days)	0.58	0.55	0.030

Table 3. Pregnancy Diagnosis with Ultrasound

Pen	Pregnant	Open	% Pregnant
1C	12	3	80.0
3C	12	3	80.0
5C	12	1	92.3
7C	13	1	92.9
Control Totals	49	8	86.0
2T	13	2	86.7
4T	14	0	100.0
6T	11	2	84.6
8T	11	3	78.6
Treated Totals	49	7	87.5
Overall Totals	98	15	86.7

These preliminary results indicate that no differences were found as a result of feeding high levels of vomitoxin grain to ewe lambs in their early reproductive life. The next step will be to follow the pregnant ewe lambs thru gestation and at lambing time to see if any differences occur.

SAFFLOWER MEAL AS A FEEDSTUFF FOR FINISHING LAMBS

T.C. Faller and N.R. Riveland
Hettinger Research Center 1995

SUMMARY

Safflower oil meal (SFM) was utilized at four levels (0, 20, 40, and 60%) in lamb finishing diets. The diets were composed of barley, alfalfa, SFM, straw, and all were balanced for vitamins and minerals to meet or exceed NRC needs for finishing lambs. Soybean oil meal (SBOM) was used as a protein source for the 0% SFM diet. All diets were fed ad libitum. There appeared to be a palatability problem in the highest level SFM diet that was not measurable due to the dirt floor in the feeding area. The purpose of the trial was to provide preliminary data and further work is warranted to fully investigate the potential of SFM as a feedstuff in lamb finishing rations.

INTRODUCTION AND JUSTIFICATION

SFM is a processing byproduct of the emerging crop, safflower, in western North Dakota. In years when production is high meal is often times available at very attractive prices as compared to other protein sources and feedstuffs.

There is limited information concerning the nutritional value of safflower meal. Work conducted in the early 1930's (Christensen 1935) in North Dakota using steers that were fed 1.25 lbs. of SFM or linseed oil meal (LSM) a day showed that palatability was similar but gains were less for steers on SFM. The digestibility of SFM (21% protein) is 49.8% (Lucas et al. 1971) which is similar to the NRC (1969) value of 50% for cattle and Morrison (1959) of 52.6%. SFM is high in crude fiber and will vary from 26.9% to 32.3% reported by Morrison (1959) and NRC (1969) respectively.

Experimental Procedure

An experiment utilizing 152 January born lambs in late spring was conducted. Average initial weights of the lambs was 85.4 pounds. The design was 2x4 with 4 dietary treatments. Lambs were allotted by weight and sex. The dietary treatments were 0, 20, 40, 60% SFM with the balance barley alfalfa and barley straw (table 1). The nutritional composition of the feedstuffs were analyzed (table 2) before the diets were calculated. Vitamins and minerals were supplemented to meet or exceed NRC requirements. The diets were sampled during the course of the trial with samples awaiting analysis. Lamb weights were recorded initially and at the conclusion of the trial when they averaged 99.1 pounds. Any lambs that died were to be weighed and dated.

TABLE 1. DIETS AND CALCULATED NUTRITIONAL COMPOSITION

	DIET			
Feedstuff	1	2	3	4
	PERCENT			
Alfalfa	5	5	5	5
Straw	7	7	7	7
Barley	80	66	46	26
SFM	0	20	40	60
SBM	6	--	--	--
Additives	2	2	2	2
Calculated				
% Protein	14.2	14.6	16.6	18.1
% TDN	73.0	68.2	64.2	88.2
% Ca	.95	1.1	1.5	1.7
% P	1.75	2.38	3.1	3.7

TABLE 2. FEED COMPOSITION

	Percent 90% Dry Matter			
	Protein[a]	TDN	Ca.	P.
Alfalfa	18.0	52	1.12[a]	.20[a]
Straw	4.1	40	.30[a]	.08[a]
Barley	13.0	80	.08[t]	.42[t]
SFM	22.5	50	.35[a]	1.01[a]
SBOM	44.0	60	.27[t]	.63[t]

[a]Analyzed
[t]Table Value

All diets contained 1% Grd Limestone, .5% TM Salt, .5% $AMC1_4$ and .05 ADE Supplement.

Results and Discussion

Performance of all lamb lots were less than desirable. The only explanations of the poor performance was the increasing percent of fiber in the diet coinciding with an increasing plane of protein in the diets. The best performing diet was 40% SAF in terms of growth rate and cost of gain (table 3). A calculation error in diet formulation made the data difficult to analyze properly. Adequate supplies of SAF became unavailable during the course of the trial which resulted in a premature conclusion of the trial. This preliminary data will be included in the analysis as two more trials are conducted to better understand the feed value of SAF for feeding lambs. They will include a 0, 10, 20 and 30% safflower diets study and again a 0, 20, 40 and 60% study to backup this preliminary data.

There appeared to be a palatability problem with the 60 percent safflower meal diet as lambs seemed to sort and waste feed as they nosed it out of the self feeders.

TABLE 3. LAMB PERFORMANCE UTILIZING SAFFLOWER OIL MEAL AS A FEEDSTUFF

	Dietary Treatments in % of Safflower Oil Meal			
	0	20	40	60
Initial wt #	92.18	94.42	89.7	91.66
Final wt #	107	108.21	104.55	103.21
Total Gain #	14.82	13.79	14.85	11.55
ADG #	.42	.39	.43	.33
#Feed/#Gain	9.9	10.5	9.7	14.2
Death loss %	0	0	0	0
Feed Cost Cents/#Gain	40.7	36.7	34.3	48.4

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MANAGEMENT STRATEGIES TO EFFECTIVELY CONTROL LEAFY SPURGE IN RANGELAND BY GRAZING SHEEP

Timothy C. Faller, Paul Berg, Kris Ringwall, Dan Nudell

Introduction and Justification

North Dakota has in excess of one million acres of rangeland that is impacted by the presence of leafy spurge. Most of the land is controlled (owned or rented) by producers of beef cattle. Severity of infestation is impacted by waterways, overhead electrical transmission lines, railways and roadways. Presence of trees, high water tables, waterways and environmentally protected plant and animal species are constraints to the usage of many herbicides as useful control methods. Increasing leafy spurge populations has negatively impacted economic well-being of many livestock producers in North Dakota.

The opportunity to reduce variable costs and increase cash flow while adequately controlling leafy spurge in an environmentally friendly manner is attractive for many North Dakota livestock producers. Cattle are a poor utilizer of leafy spurge plants as components of the range composition while many species of wildlife and small grazing ruminants are a very good utilizer of leafy spurge as a component of the range setting. Many livestock producers truly do not want to get heavily involved in the production of alternative species of livestock (primarily sheep and goats). Management strategies that will allow them to integrate with existing sheep producers, or potentially establish profitable associated enterprises that will reduce the presence of leafy spurge are attractive to many North Dakota livestock producers. To do so they need a smorgasbord of alternatives and hard numbers to represent the income and outgo of such proposed arrangements.

The North Dakota sheep industry provides in excess of $10,000,000 new wealth annually (1993 ND Ag Statistics). Loss to the North Dakota Ag Economy is estimated to be in excess of 70 million annually from the impact and costs associated with controlling leafy spurge (Leistritz, 1991). The loss of the Federal Wool Incentive program will negatively impact the future of sheep producers in North Dakota. The potential exists to reduce costs for sheep producers by providing no-cost or low cost summer grazing and in turn improving range production for the sake of enhancing impacted beef producer's incomes.

The Sheepbud Shepherd IMS enterprise analysis was developed to assist sheep producers evaluate the economics of their operation (Nudell, 1994). Sheepbud Shepherd IMS is presently being S.P.A. tested and will be available to be used as a method of cross referencing the different strategies developed to control leafy spurge in the rangeland.

Experimental Procedure

Actual production associated with a variety of research trials at Hettinger Research Center will be evaluated economically to provide numerous strategies to be presented to industry for application. The strategies will address three different primary approaches to incorporating small ruminant animals in grazing plans focused on controlling leafy spurge. The strategies will be categorized on the basis of intensity of sheep production. Primary focuses will be: High Intensity (HI), Traditional Approaches (TI) and Low Intensity (LI).

High Intensity Approach

Rambouillet ewes and rams will be utilized to increase the incidence of out of season mating. The attempt will be to select all replacements from fall born lambs of a closed flock of 500 ewes. Ewes will be mated and allowed to lamb in January and September as often as possible. Presently this flock of ewes is lambing at 1.4 lambings annually and presenting 1.5 lambs per lambing. This provides in excess of two lambs born per ewe annually. A 56 day weaning strategy will allow ewes to graze leafy spurge infested rangeland without the presence of lambs to reduce losses to predators under both lambing times. Both sets (January lambing and September lambing ewes) will summer graze leafy spurge at the Missouri River Correctional Center (MRCC), Bismarck, North Dakota.

Traditional Approach (TI)

Rambouillet and Rambouillet cross ewes that lamb in January and are exposed to lamb once annually with resulting production to be weaned at 56 days of age and put in the feedlot will be compared to genetically similar ewes that will lamb in April-May and spend the summer nurturing their progeny. Both groups will summer graze leafy spurge at the MRCC.

Low Intensity Approach (LI)

Rambouillet and Rambouillet cross ewes of similar genetic background to the TI group will be mated to begin lambing mid-may. The intent is to begin lambing on the range at the onset of the time ewes begin grazing leafy spurge. The intent of this group is to measure if the sheep operation can support itself with the primary interest being to improve the range resource for the benefit of the beef cow. Also of interest will be observing the bonding mechanism as described at the Jornada Experiment Range site in New Mexico. Bonding of sheep to cattle would be of advantage to sustaining the sheep component of this strategy.

A January lambing sub-set will be imposed on a multi-species grazing trial in a heavily spurge infested range site to measure effectiveness of spurge control. Also measured will be the change in species composition over time.

Economic Procedure

The approach will be to measure actual production figures and imply sound economics using the Sheepbud Shepherd IMS financial analysis program to cross reference comparisons.

Duration

The data accumulated from five lambing years for each of the strategies will be utilized to evaluate economic viability of the treatments. Data from the multi-species trial will be utilized to measure effectiveness of leafy spurge control and the impact on species composition at the site. (Economic impact should be known in five years, however, it may take longer to acquire full knowledge of impact on the range site.)

Summary

Environmentally the need is to control leafy spurge with reduced reliance on herbicides. This research is needed to preserve the role of the sheep industry in North Dakota agriculture and to improve the economic viability of impacted beef producers.

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COMPARING BOVATEC (BVT) AND CHLORTETRACYCLINE (CTC) AS ADDITIVES FOR HIGH-FIBER AND HIGH ENERGY BABY LAMB CREEP FEEDS

T.C. Faller and W.D. Slanger

Introduction

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

Research recently conducted at Hettinger Research Center demonstrated some positive effects of lamb creep feeds containing highly digestible fiber vs grain-based creep feeds. In that study, ADG and creep feed intake was increased with high fiber creep feeds, but F/G was slightly higher (5%) compared to grain based creep feeds. The feed additive used in that study was chlortetracycline (CTC) at 50 g/ton. This has been the traditional feed additive in lamb creep feeds because it helps prevent overeating disease. Several reviews of ionophore research have shown that the improvement in performance due to an ionophore is greater in high fiber-based diets. Bovatec (BVT) has been shown to stimulate rumen development in calf starter rations. There is potential for an interaction between the formulation type (grain vs fiber) and the feed additive (CTC or BVT). It is possible that performance of a high fiber creep feed is enhanced more with BVT than CTC.

Objective

To evaluate the performance of lambs creep fed a high fiber or a grain-based creep feed with either CTC or BVT and potential interactions.

Procedure:

Treatments: There will be 4 treatments in a 2 x 2 factorial arrangement. Factors will be formulation type (grain vs fiber) and feed additive (CTC vs BVT):

1) Fiber based creep pellets BVT 45 (code 00/25483)
2) " " " " CTC 25 (code 00/25482)
3) Grain based creep pellets BVT 45 (code 00/25481)
4) " " " " CTC 25 (code 00/25480)

A flock of 320 western white faced ewes were diagnosed pregnant by means of ultrasound evaluation and 256 were randomly assigned to 16 pens of 16 ewes. Ewes were lambed and maintained in place until the conclusion of the trial.

Pens were randomly assigned one of the four treatments. Creep feed was provided from the onset of the trial until weaning. Weights collected included: birth weight, intermediate weight, weaning weight and weight of all creep feeds consumed.

Results and Discussion

The results of the trial are shown in tables 1-3. Table 1 is a comparison of analysis of the four diets. The high energy based diets are higher in crude protein and percent T.D.N. when compared to the high fiber based diets.

TABLE 1. DIET ANALYSIS

DIET	CRUDE PROTEIN(%)	TDN%	CRUDE FIBER%	CA%	P%	BVT mg/#	CTC mg/#
High Energy CTC	18.2	70.0	4.7	.8	.4	0	25
High Energy BVT	18.2	70.0	4.7	.8	.4	45	0
High Fiber CTC	18.2	67.4	15.0	.8	.4	0	25
High Fiber BVT	18.2	67.4	15.0	.8	.4	45	0

As indicated in tables 2 and 3 lambs did gain faster on the high energy CTC diet however they also consumed a higher level of feed. When analyzed based on feed efficiency there was no difference. There was not an analyzable difference in death loss once those lambs that died in the first five days after birth were eliminated. Their death occurred prior to the onset of creep feed consumption.

TABLE 2. FEED CONSUMPTION

DIET	FEED PERIOD 1 #FEED/LAMB 34 DAYS	FEED PERIOD 2 #FEED/LAMB 22 DAYS	TOTAL CONSUMPTION #FEED/LAMB 56 DAYS
High Energy CTC	17.4	45.39	62.8
High Energy BVT	14.4	35.9	50.3
High Fiber CTC	15.2	36.7	51.9
High Fiber BVT	17.5	42.8	60.3

TABLE 3. LAMB GROWTH AND DEATH LOSS

DIET	LAMBS DIED DURING FEED PERIOD	FEED PERIOD 1 LBS OF GAIN 34 DAYS	FEED PERIOD 2 LBS OF GAIN 22 DAYS	TOTAL LBS OF GAIN 56 DAYS
High Energy CTC	4	17.6	30.7	48.3
High Energy BVT	4	15.4	27.7	43.1
High Fiber CTC	2	11.4	21.7	33.1
High Fiber BVT	4	14.7	25.8	40.5

From a producer point of view, price would be the most important factor in selecting a creep feed based on the diets studied. Advantage would be given to the high energy CTC diet if an accelerated growth rate better matched an anticipated market time.

North Dakota Conservation Reserve Program (CRP) Study

By William Barker, Paul Nyren, Bob Patton, Charles Lura, Brian Kreft, Kevin Sedivec, Dennis Whitted, Tim Faller, Joseph Gross, Don Stecher, Jim Nelson, Anne Nyren, Arnold Kruse, Jeff Printz and Cole Gustafson

Introduction

The Conservation Reserve Program (CRP) is the land retirement provision of the 1985 Farm Bill. Nationwide, over 36 million acres of cropland have been enrolled in the CRP. Crop bases on these lands have been retired for 10 years and permanent vegetative cover has been established. The CRP was instituted to 1) curb production of farm commodities and 2) provide for badly needed soil conservation on highly erodible lands.

But taxpayers are receiving additional benefits and at no net cost. In fact, it has been shown that with the CRP, a net savings in Farm Bill expenditures has occurred in the Northern Great Plains Region of the United States. When potential expenses associated with crop bases temporarily retired in the CRP are compared with actual costs of CRP payments to producers, total cost of the farm program would have been higher if the CRP would not have been in place.

In order for the CRP to continue, it must be provided for in the 1995 Farm Bill. As CRP goes, so goes the many natural resource benefits it has provided.

CRP Benefits

- Higher commodity prices resulting in lower deficiency payments to farmers. If just 38% of the CRP is put back into crop production, Economic Research Service estimates a 9% drop in wheat and a 5% drop in corn prices.
- Reduced soil erosion. Almost 700 million tons each year nationwide. Over 400 million tons annually in the Great Plains states.
- Improved water quality resulting from watershed protection. Reduced erosion means less sediment, pesticide, and plant nutrient movement into waterways and wetlands, thus improving the quality of water for human consumption and use, agricultural production, fish habitat and recreation.
- Increased wildlife habitat (game and non-game). CRP is capable of providing an additional million ducks annually to the fall flight. Studies indicate CRP is important to game, non-game and neotropical birds as well as deer and small mammals. Fisheries benefit from reduced sedimentation, pesticides, etc. thereby improving water quality.
- Emergency forage reserve for livestock in times of drought or flood.
- Wetland protection, restoration and enhancement. In North Dakota alone 114,000 wetland watersheds are being protected by CRP and over 2,000 wetlands have been restored in CRP.
- Provide income support for farmers. Current average CRP payments are higher than cash crop rent in most of the country, therefore, CRP provides a reliable income regardless of drought or flood for the length of the contract.

In addition, according to the Economic Research Service these states receive over $124 million in natural resource benefits from CRP, whereas neither deficiency nor Export Enhancement Program (EEP) payments give the American public any of these benefits.

Current estimates indicate that 14%-26% of landowners participating in CRP contracts in North Dakota intend to use their CRP land for grazing purposes after their contracts expire, 25%-37% are undecided and 49% plan to return the land to crop production. If contract holders are to make informed decisions about the future use of their CRP acres, they will need information upon which to base their decisions.

In addition to landowners, policy makers also need information about what can be expected from grazing or haying CRP acres. The Environmental Protection Agency (EPA) and many environmental groups view CRP as a way to improve land that is degrading water quality to satisfy the non-point source pollution requirements of the Water Quality Act. Data collected in this study will give a better understanding of the economic returns to the landowner which can be expected from CRP lands and the environmental impact of grazing and haying on these lands.

The North Dakota CRP study will continue through 1996.

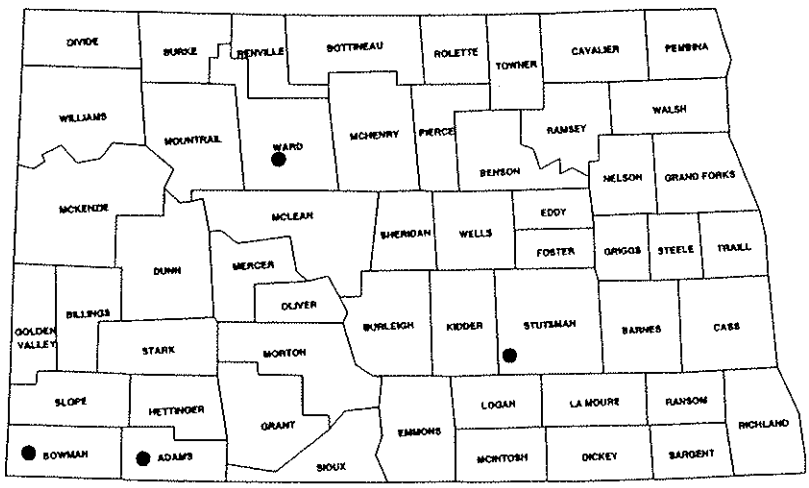

Figure 1. North Dakota CRP Study Sites.

Grazing and Haying On CRP Lands

Introduction

In 1991 due to efforts of Mr. Arnold Kruse, U.S. Fish and Wildlife Service (USFWS) and Mr. Jeff Printz, Soil Conservation Service (SCS), the Agricultural Stabilization and Conservation Service (ASCS) granted permission to conduct a 5-year haying and grazing study on four CRP acreages in North Dakota.

The objectives of this study are to determine:

1. The floristic composition and structure of CRP lands and to note changes in floristic composition and structure due to grazing and haying over 5 years.
2. The production and utilization of CRP land vegetation under seasonlong and twice-over grazing.
3. The production and quality of hay from CRP lands.
4. The economic returns from grazing and haying CRP lands (p. 5A).
5. The success of game and non-game wildlife species on CRP lands (p. 7A).

Procedure

The four study locations in North Dakota are in Stutsman, Ward, Adams and Bowman counties. In Stutsman, Ward and Bowman counties, there are three pastures in a twice-over rotation grazing system (TOR) and one pasture with a seasonlong grazing treatment (SL). Each of these three locations has an area that will be hayed each year. Exclosures have been set up on silty sites at each location that will be ungrazed and not hayed to serve as control areas. In Adams County there are four pastures. One pasture will be hayed each year in rotation with the other three which will be grazed using a twice-over rotation grazing system. Cow-calf pairs are used to graze the Stutsman and Ward counties locations, yearling heifers in Bowman County and yearling heifers and yearling ewes on the Adams County location.

Forage production and utilization are determined using exclosure cages and a paired plot clipping technique on each range site in each grazing treatment pasture.

Changes in the plant community are monitored by sampling percent frequency of occurrence and density per square meter, and percent basal cover of all plant species on each range site. Floristic composition and structure data is sampled using frequency quadrats and point frames. Frequency, basal cover and density are determined by these methods. Each year, 50 nested frequency frames are placed along permanent transects to determine species composition.

The amount of basal cover, litter and bare ground are sampled by using a 10-point frame. Fifty 10-point frames are read along each permanent transect. These data will indicate any changes in the amount of actual soil surface occupied by plants or covered by litter from previous years' growth. This is important when predicting the impact that haying or grazing might have on the vegetation's soil holding capacity. The data were checked for errors in plant identification and data entry by comparing the change in the abundance of each species between years for each site with Cochran's Corrected Chi Square Test and Fishers Exact Test using Calcfreq, a computer program which operates on Lotus 1-2-3. Analysis of variance was performed to detect changes in species abundance. An arcsine transformation was used to normalize frequency, and basal cover data.

Models Used

Abundance = year + treatment + (year x treatment) was used to test for interactions between years and treatments.

Abundance = year was used to test for differences in abundance of species between years.

(Abundance year 2 - abundance year 1) = treatment was used to test for differences in abundance of species due to treatments.

Fisher's least significant difference test was used to compare means. All tests were performed at a significance level of $p=0.05$.

The livestock are weighed at the beginning and end of the grazing season and the average daily gain and gain per acre are calculated for each grazing treatment.

Results

Table 1 shows the forage production on the overflow range sites in Stutsman, Bowman and Ward counties. Precipitation in 1994 was excellent at all these study locations as is indicated by total forage and grass production. Percent disappearance on these planted CRP acreages was very acceptable. Perhaps the seasonlong grazing treatments could have been stocked more heavily.

Table 2 gives forage production on the silty sites in Stutsman, Bowman and Ward counties. Again it appears from these data that the SL grazing treatment could be stocked more heavily.

Tables 1 and 2 give the forage production on overflow and silty range sites. In addition, the least significant difference (LSD) ($P \leq 0.05$) is also listed where applicable. These data show that some differences exist in the forage production and percent disappearance between the SL and TOR grazing systems. However, this may be a result of the sampling methods employed. Pastures are sampled before and after each rotation on the TOR and at the beginning, middle and end of the grazing season on the SL system.

Table 3 shows the forage production on the TOR on a clayey site in Adams County. This site received a hail storm that damaged the vegetation in late summer which reduced the total forage production. However, the percent disappearance is acceptable for this type of planted CRP vegetation. Table 4 shows the total and three-year average forage production since 1992, and combines production of all range sites at each location.

Table 5 shows the type of grazing system, the stocking rates, the number and type of animals, the average daily gain and the gains per acre. As you will note the weight gains were very good.

At the Adams County location, twelve-month-old ewe lambs were grazed with replacement beef heifers in 1993. Gains were 0.43 lb/head/day in a 128-day grazing period. Eight-month-old lambs grazing in the same

Table 1. Forage production on overflow range sites at three CRP locations in ND in 1994.

	Legumes lbs/A	% Disap[1]	Grass lbs/A	% Disap	Forbs lbs/A	% Disap	Total lbs/A	% Disap
Stutsman								
SL	696	54	5102	45	149	34	6148	48
TOR	2334	63	3277	54	426	46	6038	64
LSD ($P \leq 0.05$)	751	NS	NS	NS	NS	NS	NS	6
Bowman								
SL	2517	33	5833	23	19	28	6368	26
TOR	1582	51	3023	48	118	30	4723	53
LSD ($P \leq 0.05$)	NS	NS	631	NS	NS	NS	1610	NS
Ward								
SL	4782	59	4153	37	471	4	9406	48
TOR	2954	60	3031	62	405	62	6390	66
LSD ($P \leq 0.05$)	NS	NS	NS	NS	NS	36	NS	14

[1]*Disap = disappearance*
TOR = Twice-over rotation grazing
SL = Seasonlong grazing

Table 2. Forage production on silty range sites at three CRP locations in ND in 1994.

	Legumes lb/A	% Disap[1]	Grass lb/A	% Disap	Forbs lb/A	% Disap	Total lb/A	% Disap
Stutsman								
SL	1053	47	3916	32	83	41	5053	38
TOR	1836	59	1995	66	123	38	3953	64
LSD ($P \leq 0.05$)	NS	NS	1063	17	NS	NS	NS	24
Bowman								
SL	1578	31	5266	24	2	25	6847	26
TOR	1524	54	2335	41	2	17	3860	47
LSD ($P \leq 0.05$)	NS	NS	906	NS	NS	NS	1143	NS
Ward								
SL	2961	48	2006	35	409	1	5376	42
TOR	1911	76	1401	50	20	29	3332	65
LSD ($P \leq 0.05$)	NS	17	NS	NS	15	NS	1414	16

[1]*Disap = disappearance*
TOR = Twice-over rotation grazing
SL = Seasonlong grazing

Table 3. Forage production on a twice-over rotation grazing system on a clay site in Adams Co. in 1994.

	Production lbs/A	Percent Disappearance
Alfalfa	929	75
Other Forbs	30	65
Intermediate Wheatgrass	1242	68
Other Grasses	36	62
Total	2237	71

Table 4. Total Forage Production on 4 CRP study locations 1992-94.

Treatment	Location	1992	1993	1994	3-Year Avg.
TOR	Stutsman	2937	5685	4996	4539
	Bowman	3991	4140	4292	4141
	Ward	2408	5413	4861	4227
	Adams	3488	4009	2236	3244
SL	Stutsman	2902	5006	5601	4503
	Bowman	3600	6716	7607	5974
	Ward	2971	7907	7391	6090
Non-grazed	Stutsman	2076	1948	2658	2227
	Bowman	NA	3527	3008	3268
	Ward	1380	2944	2880	2401
	Adams	NA	NA	1886	1886

Table 5. Livestock production on four CRP locations in North Dakota in 1994.

Grazing System	AI Aum	No. of acres	Number and Type of Animals	Grazing Season Length (Days)	Cows ADG (lb)	Cows Gain/A (lb)	Calves ADG (lb)	Calves Gain/A (lb)
Stutsman								
TOR	1.0	235	55 cow-calf pr	127	1.08*	32.10	3.02	89.76
SL	1.0	135	32 cow-calf pr	127	1.22	36.73	3.11	93.62
Ward								
TOR	1.0	208	49 cow-calf pr	127	0.93	26.12	2.93	82.29
SL	1.0	70	16 cow-calf pr	127	0.75	21.77	2.99	86.80
Bowman								
TOR	1.2	225	56 bred heif.	127	1.47*	46.39		
SL	1.3	131	30 bred heif.	127	1.29	37.52		
Adams							Sheep	
TOR		232	59 yearling heif. 127 yearling ewes	100	0.80	20.34	0.38	20.80

*Means significantly different between treatments ($P \leq 0.05$)

Table 6. Changes in species composition on Stutsman Co. CRP sites since 1992.

	Silty Sites	Overflow Sites
Species seeded in 1987	tall wheatgrass intermediate wheatgrass smooth brome alfalfa yellow sweetclover	tall wheatgrass intermediate wheatgrass smooth brome alfalfa yellow sweetclover
Decreased since 1992	annual bromes Russian thistle slender wheatgrass tall wheatgrass	annual bromes prickly lettuce tall wheatgrass
Increased since 1992	common dandelion field sowthistle yellow sweetclover	bare ground common dandelion field sowthistle Kentucky bluegrass smooth brome yellow sweetclover
Fluctuated	charlock mustard intermediate wheatgrass and quackgrass narrow-leaved goosefoot wild buckwheat	charlock mustard intermediate wheatgrass and quackgrass narrow-leaved goosefoot Russian thistle wild buckwheat total plant basal cover
Increased on non-grazed	smooth brome	--
Increased on TOR	yellow sweetclover	narrow-leaved goosefoot smooth brome
Increased on SL	blue lettuce	--
Increased on hayed	litter wild buckwheat yellow sweetclover	field sowthistle
Decreased on non-grazed	tall wheatgrass yellow sweetclover	--
Decreased on TOR	tall wheatgrass	--
Decreased on SL	annual foxtails litter	--
Decreased on hayed	--	annual foxtails

SL=seasonlong grazing †TOR=twice-over rotation grazing

setting for 100 days in 1994 gained 0.38 lb/head/day. These gains are very good, and are excellent for preparation of either eight or twelve-month-old ewe lambs for fall breeding. By comparison, similar lambs in the feedlot gained 0.5-0.7 lbs/head/day.

This would indicate that these CRP grassland tracts can be used efficiently for livestock production. Options for utilizing CRP grass-legume plantings include grazing eight-month-old fall born lambs or twelve-month-old spring born lambs. Fall born lambs could be grazed for the lean lamb slaughter market. Ewe lambs 12-14 months old would be used as replacement breeding stock only. If not used as breeding stock, marketing for slaughter directly off pasture as premium quality lean lamb is a viable option.

More information and a complete management perspective on fall lambing systems, and on the use of sheep to control leafy spurge is available from the Hettinger Research-Extension Center.

A major concern for range managers and livestock producers concerning CRP plantings is how will these stands respond to grazing and haying. In other words, will the species composition remain desirable? Table 6, and tables 7, 8 and 9 on page 4A, show the species composition changes that have occurred since 1992 as determined by sampling with frequency quadrats each year. While the tables indicate changes in the seeded species, this may be due to natural succession. Total forage production and species composition changes have remained very acceptable and data indicates that these CRP tracts can be successfully grazed.

Table 10 gives the 1994 yield and nutritional quality of hay at each CRP location showing that quality hay can be harvested from North Dakota CRP vegetation. In terms of maintaining desirable vegetation the practice of haying is beneficial.

Most land managers would prefer to see these highly erodible land (HEL) acreages remain in grass to protect them from soil erosion. Economic returns are possible and at the same time water quality and wildlife benefits are realized (see reports on the following pages).

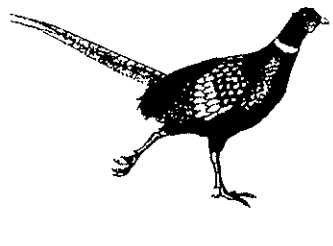

Table 7. Changes in species composition on Bowman Co. CRP sites since 1992.

	Silty Sites	Overflow Sites
Species seeded in 1988	crested wheatgrass intermediate wheatgrass alfalfa	crested wheatgrass intermediate wheatgrass alfalfa
Decreased since 1992	common dandelion crested wheatgrass yellow foxtail	crested wheatgrass yellow foxtail
Increased since 1992	wild buckwheat	western wheatgrass
Fluctuated	annual bromes Russian thistle smooth brome western wheatgrass yellow sweetclover	annual bromes yellow sweetclover
Increased on non-grazed	annual bromes	..
Increased on hayed	..	..
Increased on SL[1]	annual bromes Russian thistle yellow sweetclover	annual bromes
Increased on TOR[2]	..	intermediate wheatgrass
Decreased on non-grazed	..	..
Decreased on hayed	western wheatgrass	yellow sweetclover
Decreased on SL	..	common dandelion intermediate wheatgrass
Decreased on TOR	yellow sweetclover	..

[1]SL = seasonlong grazing [2]TOR = twice-over rotation grazing

Table 8. Changes in species composition on clayey sites in Adams Co. CRP since 1992.

Species seeded in 1987	intermediate wheatgrass western wheatgrass alfalfa
Decreased since 1992	annual bromes kochia rough pigweed Russian thistle yellow foxtail
Increased since 1992	alfalfa intermediate wheatgrass western wheatgrass yellow sweetclover
Fluctuated	crested wheatgrass
Increased on non-grazed	goat's beard

Table 9. Changes in species composition on Ward Co. CRP sites since 1992.

	Silty Sites	Overflow Sites
Species seeded in 1987	western wheatgrass slender wheatgrass alfalfa yellow sweetclover	western wheatgrass slender wheatgrass alfalfa yellow sweetclover
Decreased since 1992	alfalfa American vetch field milk-vetch goat's beard intermediate wheatgrass wild buckwheat	alfalfa kochia peppergrass wild buckwheat
Increased since 1992	yellow foxtail	curly dock intermediate wheatgrass and quackgrass panicled aster quackgrass yellow foxtail
Fluctuated	annual bromes Russian thistle wildoats	annual bromes
Increased on non-grazed	annual bromes	..
Increased on hayed	yellow foxtail	curly dock
Increased on SL[1]	quackgrass	alfalfa common dandelion flixweed wildoats yellow sweetclover
Increased on TOR[2]	quackgrass wild buckwheat yellow sweetclover	common dandelion flixweed foxtail barley goat's beard smooth brome wildoats
Decreased on non-grazed	western wheatgrass	..
Decreased on hayed	annual bromes	yellow sweetclover
Decreased on SL	western wheatgrass yellow sweetclover	..

[1]SL = seasonlong grazing [2]TOR = twice-over rotation grazing

Table 10. Nutritional quality of hay at 4 CRP locations in North Dakota in 1994.

Number of Cuttings	Location	Total Acres	Total Yield (Tons/ac)	Percent Crude Protein (CP)	Percent Acid Detergent Fiber (ADF)	Percent Neutral Detergent Fiber (NDF)
1	Adams Co.	59.0	0.72	10.11	44.97	71.35
1	Bowman Co.	34.5	0.80	11.67	39.39	42.96
1	Stutsman Co.	90.0	1.62	11.26	46.75	65.14
1	Ward Co.	67.0	1.05	15.15	36.27	49.98

FIELD EVALUATION PLANTING: TECHNICAL REPORT - 1992-1993

Project No.: 38A339X, North Dakota State University, Hettinger Experiment Station, Adams County, North Dakota.

Project Title: Field evaluation of cool-season grasses for pasture, rangeland, wildlife habitat, and protection of surface and ground water.

Introduction: The adaptation and performance of cool-season grasses for pasture, range, wildlife habitat, and water quality have been identified in the North Dakota Plant Materials Long Range Program as a high priority need. A field evaluation planting (FEP) site is needed in North Dakota representative of major land resource area (MLRA) 054. This site will be used to plant large assemblies of conservation plant materials to be evaluated under uniform culture and management. Information received will also be beneficial to MLRA 054 in South Dakota.

Objective: The objective is to conduct advanced evaluation studies to determine the adaptation and performance of selected species and varieties of native and tame cool-season grasses for pasture, range, wildlife habitat, and water quality concerns.

Cooperators: The USDA Soil Conservation Service (SCS) in cooperation with the North Dakota State University (NDSU), Hettinger Research and Extension Center (HREC); Adams County Soil Conservation District (ACSCD); and Mr. Joseph Clement, private landowner.

Location: The site is located approximately 2 miles south of Hettinger, North Dakota on land owned by Mr. Joseph Clement. Legal Description: SE1/4 sec. 24, T. 129, R. 96, Adams County, North Dakota.

Major Land Resource Area [1]: The site is located in Major Land Resource Area (MLRA) 54, Rolling Soft Shale Plain. Nearly all of the land in this MLRA is in farms and ranches. In most places agriculture is a combination of livestock production and cash grain farming. About three-fifths of the area is in native grasses and shrubs that are grazed. The less sloping soils, making up about one-third of the total area, are dry-farmed. Wheat, other small grains, feed grains, hay, silage corn, and flax are the principal crops. Small tracts on the bottom land along the Missouri River and a few of its larger tributaries are irrigated.

Elevation is 500 m in the east and gradually slopes to about 1,100 m in the west for MLRA 54. This moderately dissected rolling plain is underlain by soft calcareous shale, siltstone, and sandstone. Maximum local relief is about 100 m by is considerably less in most of the are. Buttes, badland, and moderately steep and steep slopes are adjacent to major valleys. The northern and eastern parts have a glacially modified topography and in some places are covered by thin layers of glacial drift.

Soils: Most of the soils of MLRA 54 are Borolls. They are deep to moderately deep, and moderately to well drained, loams and clays. The soil at the planting site is a Vebar-Flasher fine sandy loam complex, typical of the highly erosive areas that are being planted back to grassland. These gently sloping and moderately sloping soils are on uplands. The well drained, moderately deep Vebar soil generally has convex, moderately long, smooth slopes. It is on side slopes. The shallow, somewhat excessively drained Flasher soil has convex, short, smooth slopes. It is on knobs and ridges. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

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[1]Land Resource Regions and Major Land Resource Areas of the United States, USDA, SCS, Agric. Handbook 296, 156 pp., Rev. Dec. 1981.

Typically, the Vebar soil has a surface layer of grayish brown fine sandy loam about 8 inches thick. The subsoil is about 26 inches thick. It is brown fine sandy loam in the upper part, pale brown fine sandy loam in the next part, and light gray, calcareous loamy fine sand in the lower part. Light gray, soft sandstone bedrock is at a depth of about 34 inches.

Typically, the Flasher soil has a surface layer of grayish brown fine sandy loam about 6 inches thick. The substratum is very pale brown loamy fine sand about 11 inches thick. Light gray, soft sandstone bedrock is at a depth of about 17 inches. In some places the surface layer has been removed by soil blowing. In other places it is loamy fine sand.

Permeability is moderately rapid in the Vebar soil and rapid in the Flasher soil. Available water capacity is low in the Vebar soil and very low in the Flasher soil.

Organic matter content is low in the Flasher soil and moderately low in the Vebar soil. Runoff is slow on both soils. The rooting depth is restricted by the sandstone at a depth of about 34 inches in the Vebar soil and 17 inches in the Flasher soil. Tilth is good in both soils. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Climate: Adams County has a continental, semiarid climate. Summers are usually quite warm. They are characterized by frequent spells of hot weather and occasional cool days. The county is very cold in winter, when arctic air frequently surges over the area. Most precipitation falls during the warm period and is normally heaviest in late spring and early summer. Winter snowfall is normally not too heavy, and is blown into drifts, so that much of the ground is free of snow.

In winter the average temperature is 17 degrees F, and the average daily minimum temperature is 6 degrees. The lowest temperature on record, which occurred at Hettinger on January 29, 1966 is -37 degrees F. In summer the average temperature is 68 degrees F, and the average daily maximum temperature is 82 degrees F. The highest recorded temperature, which occurred on July 11, 1980, is 106 degrees F.

The average annual precipitation in MLRA 54 is 12.7 to 17.7 inches. The total annual precipitation in Adams County is about 16 inches. Of this, 13 inches, or about 80 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 10 inches. The heaviest 1-day rainfall during the period of record was 4.82 inches at Hettinger on June 6, 1967. Thunderstorms occur on about 34 days each year. Hail falls in scattered small areas during summer thunderstorms. Refer to Table HE-1 for 1992-1993 weather data. The average seasonal snowfall is about 29 inches.

Potential Natural Vegetation: This area supports natural prairie vegetation. Western wheatgrass, blue grama, needleandthread, and green needlegrass are dominant species. Prairie sandreed and little bluestem are important species on the very shallow soils. Buffaloberry, chokecherry, and prairie rose are common in draws and narrow valleys.

Methods and Materials

Assembly: One hundred and one accessions/cultivars of 33 different species are being evaluated. Refer to Tables CS-1 and CS-2 on pages __-___ for additional information on entries included in the evaluation.

Planting Plan: The experimental design is a randomized complete block with three replications plus an array. Each plot is 6 feet by 25 feet. The array includes 101 entries grouped by species (see Figure CS-1 on page ___). Each replication includes the same 81 entries which are randomized. The array includes an additional 20 entries which are not included in the replications, but are a

part of the planting primarily for demonstration purposes. The entire planting includes 344 plots.

Site Preparation: The site was planted to intermediate wheatgrass. It was disked twice in 1991 and also treated with glyphosate twice during the growing season. The site was cultivated early in the spring of 1992. The week of April 6 the area was harrowed twice and firmed with a packer in final preparation for seeding.

Planting Method: The plots were seeded with a 6-foot Truax/Kincaid small plot seeder. The drill was equipped with double-disc openers and a cone attachment for metering the seed for each row. The drill was enclosed with a tarp. Two operators worked inside the drill, filling the cones and monitoring seed flow. Row spacing was 8 inches. A separate packet of seed was prepared for each row of the planting to provide for exact seeding rates. A total of 2752 packets were used in the planting. Seed packets were prepared to plant each entry at the recommended seeding rate as specified in the North Dakota SCS Technical Guide. Generally a seeding rate allowing for 20-25 PLS per square foot was used for those entries not having an established seeding rate.

Planting Date: The plots were seeded April 6, 1992.

Fertilization: No fertilizer has been applied.

Weed Control/Plot Management:

Date	Treatment	Problem
1992	hand dig contaminants	smooth bromegrass intermediate wheatgrass
5/5/92	1.5 pt/A Bronate	
5/28/92	2 pt/A Hoelon + 1 pt/A Buctril+ 1.5 oz/A MCPE	oats and foxtail broadleaf (sweetclover) broadleaf (field bindweed)
6/9/92	0.33 oz/A Express + 0.25 pt/A Banvel SGF	broadleaf (sweetclover and field bindweed)
3/24/93	burn	Residue removal spread of contaminant grass seed
1993	hand dig contaminants	smooth bromegrass intermediate wheatgrass
1993	borders mowed twice during growing season	
5/3/93	1 pt/A 2,4-D LV6 + 0.25 oz/A Express	broadleaf (sweetclover and field bindweed)

Evaluations and Measurements:

See Table HE-2 for plant performance data.

Evaluation	Method	Date
Stand density	Five (1 ft^2) frames/plot were sampled. Estimated plant density as a percent of full rows in sample frames. 100% equals full row.	07/21/92 05/18/93
Emergence/uniformity	Rating: 1=full emergence, 9=no emergence. This is an indication of emergence and uniformity of stand within a plot.	05/21/92
Leaf stage	Count of leaves.	05/21/92
Plant height	Measurement of average plant height within a plot, including seed heads if present. Measurement is recorded in inches.	07/22/92 05/18/93 08/17/93
Weed competition	Rating: 1=none, 9=severe.	05/21/92 07/21/92 05/18/93
Disease	Rating: 1=no visible disease, 9= severe disease (primarily leaf and stem rust)	08/17/93
Seed production	Rating: 1=excellent, 9=poor. This is a rating of potential seed production based on number of culms produced.	08/17/93
Forage yield	2' x 10' sections are clipped within each plot using a REM forage harvester. Forage is sampled and oven dried to estimate percent dry matter. Yield is computed and reported as lbs/acre dry matter.	08/17/93

Evaluation Summary: Plant performance data for each entry is recorded in Table HE-2. The plots were off to a good start following seeding April 6, 1992. Moisture conditions were excellent for seed germination and seedling emergence. Weed competition was a major concern because of the

abundance of sweetclover, field bindweed, wild oats, pigeongrass, and kochia. Eric Eriksmoen, Agronomist at the NDSU Hettinger Research and Extension Center, monitored weeds during the growing seasons of 1992 and 1993 and did an excellent job of chemical weed control (seed Weed Control/Plot Management). Moisture conditions were near normal both years with adequate spring and summer precipitation for good growth on the cool-season grasses. Stand densities were generally excellent for all entries in 1992 and 1993. Paiute orchardgrass was the only entry to show significant winter injury. Disease was not a major problem in 1993 except for two of the basin wildrye entries which had abundant leaf and stem rust. Estimated seed production ratings varied by species and entry in 1993. Forage yield was first harvested in August 1993. Yields varied with some entries exceeding 4,000 lbs/A. Forage yields will be determined for five years, as one year results can often be misleading.

Fairway/Crested/Cross/Siberian Wheatgrass: Average forage yields of these 13 entries varied from about 2,000 lbs/A to 3,500 lbs/A. There were no significant differences. Emergence and stand densities were excellent for all entries except the Siberian wheatgrass which was slower to establish. Disease ratings were low and seed production ratings high for all entries.

Intermediate/Pubescent Wheatgrass: Nineteen entries were compared. Forage yields varied from about 3,500 lbs/A to a high of 5,526 lbs/A for SD-54 intermediate wheatgrass. The differences were not significant. There were no disease problems in 1993 and seed production ratings were high. Emergence and stand density in 1992 was good to excellent for all entries. Manska had the highest average forage yield, 4,300 lbs/A, compared to the other two pubescent wheatgrasses.

Tall Wheatgrass: Five entries were compared of which three were included in the replicated study. There were no significant differences in forage yield among the three. Alkar had the highest average yield of 4,664 lbs/A. Other performance characteristics were also quite similar.

Quackgrass/Bluebunch Cross: Three entries were evaluated and performance was very similar. Forage yields averaged approximately 3,500 lbs/A. All three had excellent stands.

Smooth/Cross/Meadow Bromegrass: Ten entries were compared. There were no significant differences in forage yields with values ranging from 2,684 lbs/A to 3,999 lbs/A. Seed production was rated higher for the smooth bromegrass compared to the meadow bromegrass.

Orchardgrass: Paiute was the only entry and although emergence and stand densities were good in 1992, half of the stand was lost in 1993 due to winter injury.

Russian Wildrye: Nine entries were evaluated. Forage yields were quite similar and there were no significant differences. Yields ranged from about 2,100 lbs/A to 2,600 lbs/A. Seed production ratings did vary considerably with Bozoisky Select having the highest rating.

Mammoth Wildrye/European Dunegrass: Three entries of mammoth wildrye and one entry of European dunegrass were compared.. The European dunegrass had the poorest emergence and lowest stand density. The mammoth wildrye entries all had good stands and forage production. PI-478832 had the highest forage yield (4,234 lbs/A). Seed production was rated low for all entries.

Altai/Beardless Wildrye: Four entries were evaluated. The altai wildrye entries were similar in stands and yields. Eejay had the highest yield, 3,507 lbs/A, but was not significantly greater than the other two. The Shoshone beardless wildrye had an excellent stand in 1993 and produced 2,238 lbs/A of forage. Seed production was rated low for all four entries.

Project No.: 38A339X North Dakota State University, Hettinger Experiment Station, Adams County, North Dakota

Table No. HE-1: 1992-1993 Weather Summary - Official Station - Hettinger, North Dakota

Month	Mean Temperature (degrees Fahrenheit)			Precipitation (inches)				
							Deviation from Normal	
	1992	1993	Normal	1992	1993	Normal	1992	1993
January	28.0	8.2	12.6	0.26	0.47	0.31	-0.05	0.16
February	30.2	11.2	19.4	0.00	0.25	0.33	-0.33	-0.08
March	37.0	32.7	27.8	0.82	0.45	0.49	0.33	-0.04
April	41.4	40.6	42.3	0.51	0.85	1.68	-1.17	-0.83
May	56.5	53.5	54	2.13	1.37	2.76	-0.63	-1.39
June	61.2	58.2	63.5	4.34*	4.39	3.64	0.70*	0.75
July	61.0	61.2	70.2	3.81	4.90	2.04	1.77	2.86
August	61.8	63.3	68.8	1.95	0.73	1.77	0.18	-1.04
September	56.1	51.0	57.2	0.33	0.19	1.43	-1.10	-1.24
October	44.8	43.1	46.4	0.36	0.17	0.85	-0.49	-0.68
November	27.9	26.0	30	1.58	0.87	0.42	1.16	0.45
December	15.4	22.2	19.5	0.30	0.52	0.27	0.03	0.25
Annual	43.4	39.3	42.6	16.39*	15.16	15.99	0.40*	-0.83

*Data missing

	1992	1993
Last Frost (28 degrees)	June 6	May 18
First Frost (28 degrees)	September 28	September 14
Frost Free Period	114 days	119 days

PROJECT: 38A339X Hettinger, North Dakota

PROJECT TITLE: Field evaluation of cool season grasses for pasture, rangeland, wildlife habitat, and protection of surface and ground water.

Table HE-2: Plant performance 1992-1993. The plots were seeded April 6, 1992.

SPECIES/ENTRY/NO.	(1) EMERGENCE 1992	WEED (2) COMPETITION 1992	1993	STAND (3) DENSITY 1992	1993	PLANT(4) HEIGHT 1993	(5) DISEASE 1993	SEED(6) PROD 1993	FORAGE(7) YIELD 1993
FAIRWAY WHEATGRASS									
1. Parkway	2.0	1.7	1.7	53	75	28	2.0	2.3	2260A
2. Kirk	3.3	2.7	2.0	52	68	31	2.0	1.3	2961A
3. SD-77	3.7	3.0	1.7	39	64	30	2.0	1.0	3187A
4. Ephraim	3.3	3.7	1.7	40	59	26	2.0	2.7	1957A
5. Ruff	3.7	3.3	1.7	48	69	29	2.0	1.7	2864A
6. NEAC1	3.7	2.3	2.7	46	56	24	2.0	2.0	1962A
7. NEAC2	3.7	2.3	2.3	48	66	29	2.0	1.7	3454A
CRESTED WHEATGRASS									
8. Summit	3.3	3.0	1.7	45	62	30	2.0	1.7	2777A
9. Nordan	4.0	4.3	2.7	41	66	31	2.0	2.0	3382A
10. NEAD1	3.0	3.7	1.7	45	72	31	2.0	1.7	2458A
FAIRWAY x CRESTED CROSS									
11. Hycrest	3.3	2.7	1.7	42	68	32	2.0	1.3	2688A
12. Hycrest #2	3.0	2.7	1.3	40	61	28	1.7	1.7	2475A
SIBERIAN WHEATGRASS									
13. P-27	5.3	4.7	3.0	38	51	33	2.0	1.3	2860A

(1) Rating of stand uniformity and emergence seven weeks after seeding: 1=excellent, 5=fair, 9=no emergence

(2) Weed competition rated 7/21/92 and 8/17/93; 1=none, 5=moderate, 9=severe

(3) Estimated density; percent of full rows in sample frames

(4) Plant height in inches, 8/17/93

(5) Rating of disease problems, mainly stem and leaf rust, 8/17/93; 1=none, 5=moderate, 9=severe

(6) Rating of potential seed production by the number of culms, 8/17/93; 1=excellent, 5=fair, 9=poor

(7) Student-Newman-Kuel's Multiple Range Test, means with same letter for each species grouping (separated by line) are not significantly different (P=.05), yield in lb/ac, oven dry matter

PROJECT: 38A339X Hettinger, North Dakota

SPECIES/ENTRY/NO.	(1) EMERGENCE 1992	WEED (2) COMPETITION 1992	1993	STAND (3) DENSITY 1992	1993	PLANT(4) HEIGHT 1993	(5) DISEASE 1993	SEED(6) PROD 1993	FORAGE(7) YIELD 1993
INTERMEDIATE WHEATGRASS									
14. Chief	3.0	4.7	1.7	52	60	42	2.0	1.3	4040A
15. Clarke	2.7	3.3	2.0	60	75	42	2.0	1.7	4806A
16. Reliant	2.0	1.3	1.0	58	77	44	2.0	1.3	4330A
17. Oahe	1.7	2.3	1.3	56	61	42	2.0	1.7	3919A
18. SD-54	2.0	1.3	1.0	47	66	44	2.0	1.7	5526A
19. *Tegmar	1.0	1.0	1.0	88	48	31	2.0	2.0	----
20. *Greenar	----	----	1.0	----	58	37	2.0	2.0	----
21. Slate	1.3	1.7	1.3	64	70	43	2.0	2.0	3510A
22. NETI1	2.7	3.7	2.0	64	64	45	2.0	1.3	3897A
23. NETI2	1.7	2.0	1.3	60	70	43	2.0	1.7	4081A
24. NETI3	2.0	2.0	1.7	58	60	44	2.0	1.3	4619A
25. NE50C3	3.0	2.7	2.0	48	70	42	2.0	2.0	4213A
26. NECASPIAN3	2.0	2.7	1.3	62	60	47	2.0	1.0	4592A
27. *Amur	----	1.0	1.0	41	40	43	2.0	2.0	----
PUBESCENT WHEATGRASS									
28. Greenleaf	3.0	3.3	2.0	56	67	44	2.0	2.0	3978A
29. MDN-759	2.7	2.0	1.0	55	64	42	2.0	2.0	3583A
30. Manska	2.0	2.3	1.3	44	63	41	2.0	1.7	4300A
31. *Topar	----	1.0	1.0	58	52	31	2.0	2.0	----
32. *Luna	----	1.0	1.0	60	50	39	2.0	2.0	----
TALL WHEATGRASS									
33. Orbit	3.3	5.3	1.7	49	61	48	2.0	2.0	4397A
34. Alkar	3.3	4.7	1.7	40	66	46	2.0	2.0	4664A
35. Platte	3.0	4.3	1.3	54	63	51	2.0	2.0	3536A
36. *Jose	----	1.0	1.0	82	70	53	2.0	2.0	----
37. *Largo	----	2.0	1.0	46	51	53	2.0	2.0	----
QUACKGRASS									
38. RS Hoffman	3.3	3.3	1.0	48	63	38	2.0	3.3	3454A

* Entries proceeded by an asterisk are not replicated, forage production data was not collected.

PROJECT: 38A339X Hettinger, North Dakota

SPECIES/ENTRY/NO.	(1) EMERGENCE 1992	WEED (2) COMPETITION 1992	1993	STAND (3) DENSITY 1992	1993	PLANT(4) HEIGHT 1993	(5) DISEASE 1993	SEED(6) PROD 1993	FORAGE(7) YIELD 1993
BLUEBUNCH x QUACK CROSS									
77. RS-1 Hybrid N	3.3	4.0	1.7	40	67	44	2.0	2.3	3768A
78. RS-1 Hybrid R	3.0	3.0	1.7	53	64	38	2.0	3.0	3434A
SMOOTH BROMEGRASS									
39. Magna	3.3	2.7	1.0	40	77	35	2.0	2.3	3999A
40. S-7133	3.0	3.7	2.0	37	66	34	2.0	3.7	2826A
41. Manchar	3.3	3.0	2.0	42	76	32	2.0	2.0	2888A
42. Rebound	3.7	2.7	1.3	44	80	31	2.0	3.3	2684A
43. Cottonwood	4.7	3.0	1.0	38	80	33	2.0	3.3	3190A
44. Lincoln	3.0	2.0	1.7	44	76	30	2.0	3.3	3033A
SMOOTH x MEADOW CROSS									
45. S-9183	3.7	2.7	1.7	38	64	34	2.0	2.7	2843A
MEADOW BROMEGRASS									
46. Fleet	1.7	2.0	1.0	53	76	34	2.0	4.0	3668A
47. Paddock	2.7	2.0	1.0	54	73	32	2.0	5.7	3139A
48. Regar	2.7	4.3	1.0	33	74	29	2.0	6.7	2855A
ORCHARDGRASS									
49. *Paiute	----	3.0	2.0	76	41	26	2.0	8.0	----
RUSSIAN WILDRYE									
50. Mayak	4.7	4.0	3.0	40	57	40	2.0	4.3	2105A
51. Swift	4.7	5.0	2.3	26	53	40	2.0	5.0	2439A
52. Cabree	4.3	3.3	1.7	36	63	37	2.0	3.0	2255A
53. Vinall	3.0	4.3	3.0	27	62	41	2.0	3.3	2101A
54. Mankota	5.7	5.3	3.0	41	56	42	2.0	3.0	2327A
55. MDN-1831	5.7	5.7	1.7	31	49	40	1.7	2.7	2356A
56. Bozoisky Select	5.3	4.0	1.7	40	56	46	2.0	2.0	2513A
57. PI-272136	4.3	2.3	1.7	29	56	43	2.0	4.0	2112A
58. Syn A NL	5.3	5.7	2.0	29	52	42	2.0	3.3	2571A

PROJECT: 38A339X Hettinger, North Dakota

SPECIES/ENTRY/NO.	(1) EMERGENCE 1992	WEED (2) COMPETITION 1992	1993	STAND (3) DENSITY 1992	1993	PLANT(4) HEIGHT 1993	(5) DISEASE 1993	SEED(6) PROD 1993	FORAGE(7) YIELD 1993
MAMMOTH WILDRYE									
59. ND-691	3.0	3.7	2.0	18	45	35	2.0	7.7	3301A
60. PI-478832	3.3	4.0	2.0	30	50	38	2.0	6.7	4234A
61. Volga	4.3	4.0	3.0	20	42	38	2.0	7.3	2779A
EUROPEAN DUNEGRASS									
62. ND-2100	7.0	7.3	7.7	6	19	20	1.3	9.0	1048B
ALTAI WILDRYE									
63. Prairieland	2.7	3.3	1.7	40	66	38	2.0	7.7	3137A
64. Pearl	3.0	4.0	2.0	33	66	38	2.0	6.7	3104A
65. Eejay	3.3	5.3	3.0	31	62	38	2.3	8.0	3507A
BEARDLESS WILDRYE									
71. Shoshone	5.0	6.0	2.7	9	60	27	2.0	8.0	2223B
DAHURIAN WILDRYE									
66. Arthur	2.3	1.7	1.7	58	71	46	2.0	1.0	4049
BASIN WILDRYE									
67. M-718	6.0	5.3	4.0	9	33	43	7.0	7.7	2196A
68. PI-478831	2.7	2.0	2.3	32	72	40	7.0	7.3	1498A
69. Magnar	4.3	5.7	2.3	26	57	44	4.0	5.7	2431A
CANADA WILDRYE									
70. *Mandan	----	2.0	1.0	59	51	41	2.0	1.0	----
BEARDLESS BLUEBUNCH									
72. *Whitmar	----	3.0	3.0	69	59	26	2.0	5.0	----

PROJECT: 38A339X Hettinger, North Dakota

SPECIES/ENTRY/NO.	(1) EMERGENCE 1992	WEED (2) COMPETITION 1992	1993	STAND (3) DENSITY 1992	1993	PLANT(4) HEIGHT 1993	(5) DISEASE 1993	SEED(6) PROD 1993	FORAGE(7) YIELD 1993
BLUEBUNCH WHEATGRASS									
73. PI-232127	1.3	3.0	2.0	45	58	27	3.0	6.7	1933A
74. PI-232128	2.0	3.7	2.0	32	50	28	2.0	7.3	2262A
75. Goldar	1.0	3.7	2.0	57	79	27	2.0	6.7	2332A
76. Secar	1.3	3.0	2.0	61	80	28	3.3	6.3	1975A
SHEEP FESCUE									
79. *Covar	---	4.0	7.0	9	22	20	1.0	3.0	---
HARD FESCUE									
80. *Durar	---	3.0	5.0	16	38	28	1.0	2.0	---
INDIAN RICEGRASS									
81. Mandan 57-2	5.0	6.3	5.3	26	37	24	2.0	3.0	2160A
82. Nezpar	5.0	4.0	3.7	19	49	28	2.0	2.3	1960A
83. *Paloma	---	6.0	8.0	24	24	20	2.0	3.0	---
CANBY BLUEGRASS									
84. *Canbar	5.0	6.0	8.0	2	25	16	5.0	3.0	---
GREEN NEEDLEGRASS									
85. Lodorm	3.7	5.7	2.3	45	67	36	2.0	2.3	3322A
86. SD-93	3.0	4.0	2.3	23	56	35	2.0	3.0	2196A
GREEN NEEDLEGRASS x RICEGRASS CROSS									
87. *Mandan	---	6.0	6.0	24	54	31	2.0	3.0	---
STREAMBANK WHEATGRASS									
88. *Sodar	---	6.0	5.0	54	73	26	5.0	5.0	---

PROJECT: 38A339X Hettinger, North Dakota

SPECIES/ENTRY/NO.	(1) EMERGENCE 1992	WEED (2) COMPETITION 1992	1993	STAND (3) DENSITY 1992	1993	PLANT(4) HEIGHT 1993	(5) DISEASE 1993	SEED(6) PROD 1993	FORAGE(7) YIELD 1993
THICKSPIKE WHEATGRASS									
89. Elbee	2.0	3.0	1.7	48	71	28	2.0	3.0	2046B
90. Critana	3.7	4.0	2.0	43	68	26	3.7	4.3	2480A
WESTERN WHEATGRASS									
91. Walsh	3.7	4.3	2.3	50	74	24	2.0	7.0	2253A
92. Rodan	3.3	4.0	1.3	53	79	26	2.0	6.0	3780A
93. *Rosana	---	6.0	3.0	54	57	22	2.0	6.0	---
94. Flintlock	3.0	4.0	2.0	36	54	31	2.0	5.7	3575A
95. *Barton	---	6.0	3.0	24	50	26	2.0	5.0	---
96. *Arriba	---	6.0	3.0	53	49	30	2.0	4.0	---
SLENDER WHEATGRASS									
97. Revenue	2.7	1.7	2.0	71	64	39	2.0	1.0	4146A
98. Adanac	1.7	2.0	2.3	69	62	37	2.7	1.3	2559B
99. Pryor	4.0	2.7	2.3	35	50	33	2.7	1.7	2082B
100. *San Luis	---	6.0	3.0	36	59	35	3.0	1.0	---
101. Primar	2.0	2.0	2.3	40	62	36	2.3	1.7	2831B

Dahurian Wildrye: Arthur Dahurian wildrye has performed well with excellent emergence, vigor and a forage yield of more than 4,000 lbs/A. Seed production has also been good with some volunteer seedlings in 1993.

Basin Wildrye: Three entries were compared. PI-478831 had the best emergence, but the lowest forage yield, although not significantly less. Magnar had the highest forage yield, 2,431 lbs/A. Leaf and stem rust was rated high for M-718 and PI-478831.

Canada Wildrye: Mandan Canada wildrye has performed well with excellent vigor and seed production. It was not included in the replicated study.

Beardless Bluebunch Wheatgrass: Whitmar beardless bluebunch wheatgrass has excellent stand densities and appears to be performing well on the site.
Bluebunch Wheatgrass: Four entries were evaluated. Emergence was excellent as were stand densities. Forage yield ranged from 1,933 lbs/A to 2,332 lbs/A with no significant differences. Seed production was rated low for all entries.

Sheep/Hard Fescue: Two entries were included in the evaluation array. Emergence and stand were poor, possibly because the small seed was planted too deep. Durar hard fescue was also included as part of a mix seeded on the plot borders. A different drill was used and the borders were also packed hard because of turning with the tractor and drill when seeding the plots. An excellent stand of Durar has developed on the borders.

Indian Ricegrass: Three entries were compared, two of which were included in the replicated study. Emergence was fair, but good stand densities have developed. Forage yield averaged about 2,000 lbs/A for Mandan 57-2 and Nezpar. Seed production was rated good for all entries.

Canby Bluegrass: Canbar canby bluegrass was included only in the evaluation array. Emergence and densities have been poor.

Green Needlegrass: Two entries were compared. Emergence and stand densities were good for both Lodorm and SD-93. Lodorm was higher in average forage yield.

Green Needlegrass/Ricegrass Cross: This entry was only included in the evaluation array. Performance has been fair, similar to the Indian ricegrass entries, but not as good as the green needlegrass.

Streambank Wheatgrass: Sodar was included only in the evaluation array. Performance has been good. This entry did have moderate leaf and stem rust in 1993.

Thickspike Wheatgrass: Both entries have performed well. Critana was significantly higher in forage yield, 2,480 lbs/A, compared to Elbee, 2,046 lbs/A.

Western Wheatgrass: Six entries were compared, of which three were included in the replicated study. Emergence and densities were good for all entries. Rodan had the highest average forage yield, 3,708 lbs/A compared to Flintlock, 3,575 lbs/A and Walsh, 2,253 lbs/A. The yield differences were not significant.

Slender Wheatgrass: Five entries were evaluated, of which four were included in the replicated study. Stand densities were excellent for all entries. Revenue (4,146 lbs/A) was significantly higher in average forage yield compared to the other three entries.

SECTION II
MANAGEMENT SECTION

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36TH ANNUAL SHEEP DAY

HETTINGER RESEARCH EXTENSION CENTER
HETTINGER, NORTH DAKOTA

FEBRUARY 8, 1995

FINANCIAL RECORDS FOR THE YEAR 2000

Dan Nudell

Financial and performance records are not usually the first thing agricultural producers think about as we plan for the next century. Exciting new advances in other technologies occupy our thoughts. Biotechnology offers the possibilities of new disease resistant crops, higher yields, and drought resistance. Big iron just keeps getting bigger, with more horsepower, maybe tracks instead of wheels, bigger and faster tillage units. We can now position ourselves on a field to a very precise spot using satellite technology. Today, you will see a demonstration of electronic identification for livestock. The list goes on and on.

Records are far from our minds. But new technologies are developing here as well. Recently, agricultural bankers have developed standard national guidelines for farm producers to record financial results. New computer technology makes record keeping less burdensome. Even more important, this same technology makes interpretation of the results easy and allows us to quickly put the new knowledge our records give us to work on the farm.

Some advantages of good financial accounting practices are:

IDENTIFICATION OF PROFIT CENTERS

The days of checkbook accounting on farms are rapidly passing. Knowing if you have a profit or loss is not enough; the astute producer also knows the sources of his profit and loss. He works to increase the number of profit centers on the farm and decrease the losers. The same astute producer also knows that profits are often cyclical in farm production, and so has historical records of farm enterprise performance. He does not make hasty decisions based on one years information. Computer technology makes long-term historical record keeping a snap, and allows easy access to past information.

COST CONTAINMENT

Today narrow margins make cost containment crucial to success. Potential reductions in the 1995 farm bill will squeeze high cost producers. Extra effort expended in managing costs will pay good dividends.

Business analysts typically use benchmark financial performance figures to tell if a firm is meeting industry standards for financial performance. Expense categories that are higher than the industry raise a red flag and allow the manager to take corrective action. In the same way, expense categories that are too low may also raise a red flag; for example maintenance may have been deferred and the manager faces problems in the future. Today we have financial databases for sheep production that allow producers to do this type of analysis.

ACCESS TO CAPITAL

Credit is a large component in agriculture today. Accessing credit today, however requires a much more technical approach than in the past. Bankers require more detailed records which conform to accepted accounting procedures. This trend will continue, and the producer who is well-versed in this field and uses his knowledge will have a much easier time accessing the capital he needed to run his business.

COMPARISON TO OTHER ENTERPRISE

Today farmers are looking at more investment outside the family farm. North Dakota currently has several emerging cooperative ventures designed to put more control of the food and fiber business in the producers hands. This will require farmers to invest some of their hard-earned dollars in ventures that are not traditional. To make an astute investment in a new venture requires experience with financial data. The investor must determine if the venture is worthy of investment and if the investment will have returns at least equal to returns from other investment on the farm. Good farm records will give the producer confidence in his or her ability to analyze financial data, and allow a comparison of on and off farm investment.

Shepherds now have access to a financial reporting system that meets the industry standards for financial reporting. This program is called SHEEPBUD and is available at the NDSU RESEARCH AND EXTENSION CENTER in Hettinger.

A second component of this program is a historical database with results and information from many producers. This allows industry comparisons that other types of business take for granted. This database is called SHEPHERD IMS and is also serviced at the Research Center in Hettinger.

Be an astute producer. Take advantage of all the technologies that are available. Prepare yourself to compete in the 21st century.

SHEARING MANAGEMENT

Timothy C. Faller

Hettinger Research Extension Center

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

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

ADVANTAGES

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

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

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

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

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

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

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

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

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

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

DISADVANTAGES

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

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

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

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

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

FLOCK CALENDAR OUTLINE

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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 do not meet requirements.

2. Replace culled ewes with top-end yearlings or ewe lambs.

3. Keep replacement ewe lambs on growing ration.

4. Evaluate sires:

    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 (preferably three) or four buck lambs per 100 ewes.

    d. Use production records if available.

5. Flush ewes:

    a. 1 pound grain/day two weeks to five weeks before breeding (usually 17 days).

    b. If ewes are over-conditioned, 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 roughage 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 roughage 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 Formaldehyde 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 toxoids (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.

SHEEPBARNS AND EQUIPMENT PLANS

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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 90 page booklet was revised in 1994. It includes barn and layout planning plus plans for fences and sheep equipment.)	10.00
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, 1500 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