ND 1709 Objective: 1

OUT OF SEASON REPRODUCTIVE POTENTIAL OF WESTERN WHITE FACED RAMBOUILLET TYPE SHEEP UNDER NORTH DAKOTA CONDITIONS

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Introduction

The seasonal fertility of sheep continues to be a biological puzzle. Unlocking the puzzle offers much opportunity to the sheep industry. Many earlier studies indicate acceptable levels of success in getting sheep to conceive and lamb in non-traditional seasons, however, it usually has involved light control and or hormonal therapy. Many times there still has been some level of failure. Occasionally the level of management employed has confused the level of success of or predictability of out of season lambing schemes. The inability of sheep to consistently lamb according to chosen season severely restricts the development of a constant, dependable supply of lamb meat to consumers. If sheep were able to conceive consistently in April and subsequently lamb in mid to late September it would reduce necessity of quality facilities to maintain a breeding sheep operation under North Dakota climatic conditions . This production scheme would open opportunity to the most economically attractive markets for North Dakota producers as well. Similarly mature ewes involved in a fall lambing scheme would be available as leafy spurge grazers during typical summer months without the presence of lambs to reduce potential of predation. This would be extremely attractive insight of the level of problems associated with the presence of leafy spurge in North Dakota.

Procedure

Starting in 1986, Rambouillet ewes were randomly mated to Rambouillet rams and evaluated in a lambing system that anticipated the ewes to lamb three times in a two year period. In the spring of 1992 the flock was closed and the ewes were being evaluated based on the anticipation of breeding in April with a July clean up mating. The ewes were exposed each time with a 51 day breeding period starting April 4 and July 15. Ram to ewe ratios were one ram to twenty ewes. This closed flock was able to maintain consistent breeding success in April of 80-90 percent of the mature ewes. Replacement ewes were selected randomly from the September born ewe lambs similar to the selection of replacement rams. Poor growth or structurally incorrect individuals were removed from the population prior to making random selections. A control set of similar background ewes mated in November for April lambing has been maintained for the duration of the trials. Replacement ewes were exposed their first time in July along with the mature ewe flock and then re-exposed the following April regardless if they had conceived in the previous July. Ewes that did not maintain a lambing sequence that included every twelve month period starting with their first anticipated lambing time were eliminated from the flock.

In the fall of 1997 one hundred May born ewe lambs, of similar wool grade and structural size, were selected from a commercial sheep operation in Wyoming. The purpose was to compare breeding success when subjected to the exact same breeding strategy as the one hundred ewe lambs selected from the September born closed flock ewes. Similar selections were made in the fall of 1998 and 1999 with the same intent. Rams from outside flocks were also purchased each year to service a 2x2 factorial design that included closed flock ewes mated to closed flock rams, closed flock ewes mated to purchased rams, purchased ewes mated to closed flock rams and purchased ewes mated to purchased rams. Ram to ewe ratios was maintained to be similar for all breeding groups. All ewes included in the project will be weighed and condition scored annually in the month of April. A five point condition scoring system will be employed with 1 being emaciated and 5 being obese. Routine performance measures will be recorded for the duration of the studies. A strict regimen of isolation of ewes from rams will be maintained other than during the desired mating periods to take advantage of any positive effects of the presence of the ram in enhancing the onset of estrus. Similar data will be collected for the original closed ewe flock that originated in 1986.

Results and Discussion

(Progress Report)

Table 1 indicates performance of the mature brood ewe flock that has been maintained as a closed fall lambing flock since 1986. All ewes were exposed to mate in April with clean-up mating in July-August. Table 1 indicates success of mating naturally without light control or hormonal therapy. Success would be categorized to be quite similar to traditional fall mating for spring lambing.

Table 1. Mature flock lambing performance for 1999 and 2000.

Ewe Birth Year	**1993**	**1994**		**1995**		**1996**	
Lambing Season	1999	1999	2000	1999	2000	1999	2000
Ewe Exposed	55	56	42	62	51	96	84
Ewes Lambing	55	53	38	60	50	87	81
Percent Bred to Fall	100	95	90	97	98	91	96

Table 2 and 3 indicates ewe body condition scores and mean weights for ewes exposed to lamb their first time in the fall. These measures would represent purchased ewes at 22 months of age and those from the closed flock being 17 months of age at breeding time in April. The data would indicate that the purchased ewes perform very similar to the ewe flock that has been selected for fall lambing.

Table 4 compares mean weights for ewes going into the breeding season as two year olds. Results showed that were no differences ($P>0.05$) among 1997, 1998, and 1999 class ewes in the closed ewes and closed ram (CECR), and the closed ewes and purchased ram (CEPR) treatment as two year olds. In both the purchased ewes and closed ram (PECR)

and purchased ewes, and purchased ram (PEPR) treatments there were differences ($P \leq 0.05$) in mean weights as two year olds going into the breeding season. Results also showed that in both the 1998 and 1999 class ewes, as two year olds, in the PECR and PEPR were significantly higher ($P \leq 0.05$) in mean weights going into the breeding season than the CECR and CEPR treatments. In both the PECR and PEPR the 1999 class ewes were significantly higher ($P \leq 0.05$) than the 1997 class of ewes, as two year olds (Table 4).

Table 5 shows mean weights of ewes as three year olds going into the breeding season. There were no differences ($P > 0.05$) among treatments in the 1997 class ewes going into the breeding season as three year olds. Differences were found among treatments in the 1998 class ewes going into the breeding season. The CEPR treatment was significantly ($P \leq 0.05$) lower in mean weights than the PECR and PEPR treatments going into the breeding season. Results also showed that there were in differences ($P \leq 0.05$) among the 1997 and 1998 class ewes going into the breeding season as three year olds. The 1997 class ewes in the CEPR and PEPR treatments had a higher ($P \leq 0.05$) mean weight going into the breeding season (Table 5).

Table 6 indicates reproductive performance of the four breeding schemes described in the procedure. Numbers of ewes available at time of breeding were reduced from the original one hundred closed flock ewes and one hundred purchased ewes because of predation, loss of ear tags and other natural causes. Early indications are that the purchased ewes and rams performed at a level higher than anticipated for first exposure for fall lambing. Initially there appeared to be a positive influence when using closed flock rams on purchased ewes, this effect diminished in the second year of production.

Table 2. Body condition score and percentage of ewes in the condition score categories going into the 1999, 2000, 2001, and 2002 breeding season.

	1999	**2000**		**2001**			**2002**			
Ewe Birth Year	1997	1997	1998	1997	1998	1999	1997	1998	1999	2000
Closed Ewes X Closed Ram										
Condition Score & % of Ewes	2=34% 3=66%	2=22% 3=78%	2=55% 3=45%	2=09% 3=82% 4=09%	2=24% 3=76%	2=79% 3=21%	2=03% 3=76% 4=21%	2=11% 3=82% 4=07%	2=39% 3=57% 4=04%	2=37% 3=63%
Closed Ewes X Purch Ram										
Condition Score & % of Ewes	1=02% 2=31% 3=67%	2=29% 3=68% 4=04%	2=50% 3=45% 4=05%	2=09% 3=91%	2=24% 3=76%	2=47% 3=53%	2=07% 3=79% 4=14%	2=19% 3=70% 4=11%	2=39% 3=57% 4=04%	2=55% 3=42% 4=03%
Purch Ewes X Closed Ram										
Condition Score & % of Ewes	2=04% 3=92% 4=04%	2=06% 3=91% 4=03%	2=24% 3=76%	3=92% 4=08%	2=03% 3=97%	2=33% 3=67%	2=10% 3=69% 4=21%	2=25% 3=64% 4=11%	2=18% 3=76% 4=04%	-----
Purch Ewes X Purch Ram										
Condition Score & % of Ewes	2=27% 3=73%	2=08% 3=92%	2=08% 3=92%	2=11% 3=75% 4=14%	2=05% 3=95%	2=40% 3=60%	2=03% 3=80% 4=17%	2=11% 3=82% 4=07%	2=33% 3=52% 4=15%	-----

Table 3. Mean weight of ewes going into the 1999, 2000, 2001, and 2002 breeding season.

	1999	**2000**		**2001**			**2002**			
Ewe Birth Year	1997	1997	1998	1997	1998	1999	1997	1998	1999	2000
Closed Ewes X Closed Ram lbs (Standard Error)	112 (2.5)	137 (2.8)	111 (2.8)	145 (3.3)	131 (2.3)	103 (2.2)	152 (3.2)	135 (3.5)	127 (3.8)	120 (3.3)
Closed Ewes X Purch Ram lbs (Standard Error)	115 (3.1)	141 (3.7)	113 (3.1)	144 (2.7)	124 (2.5)	109 (3.9)	144 (3.1)	135 (3.9)	129 (3.4)	114 (4.2)
Purch Ewes X Closed Ram lbs (Standard Error)	117 (2.8)	143 (3.3)	120 (3.2)	153 (2.8)	138 (2.5)	125 (2.6)	146 (3.7)	136 (2.9)	135 (2.4)	-----
Purch Ewes X Purch Ram lbs (Standard Error)	111 (2.0)	145 (2.9)	122 (3.6)	149 (3.9)	136 (2.2)	120 (2.5)	143 (3.6)	140 (2.7)	133 (3.6)	-----

Table 4. Mean weight of ewes as two year olds going into breeding season.

Ewe Birth Year	1997 [1]	1998 [1]	1999 [1]	2000 [1]
Closed Ewes X Closed Ram [2] lbs (Standard Error)	112 (2.5)^{ax}	111 (2.8)^{ax}	103 (2.2)^{ax}	120 (3.3)^{ay}
Closed Ewes X Purch Ram [2] lbs (Standard Error)	115 (3.1)^{ax}	113 (3.1)^{ax}	109 (3.1)^{ax}	114 (4.2)^{ax}
Purch Ewes X Closed Ram [2] lbs (Standard Error)	117 (2.8)^{ax}	120 (3.2)^{aby}	125 (2.6)^{by}	-----
Purch Ewes X Purch Ram [2] lbs (Standard Error)	111 (2.0)^{ax}	122 (3.6)^{by}	120 (2.5)^{by}	-----

[1] Mean weights within the ewe birth year with the same letter are not significantly different (P>0.05) (a and b).
[2] Mean weights within the same treatment with the same letter are not significantly different (P>0.05) (x and y).

Table 5. Mean weight of ewes as three year olds going into breeding season.

Ewe Birth Year	1997[1]	1998[1]	1999[1]
Closed Ewes X Closed Ram[2]			
lbs (Standard Error)	137 (2.8) [ax]	131 (2.3) [abxy]	127 (3.8) [ay]
Closed Ewes X Purch Ram[2]			
lbs (Standard Error)	141 (3.7) [ax]	124 (2.5) [ay]	123 (3.4) [ay]
Purch Ewes X Closed Ram[2]			
lbs (Standard Error)	143 (3.3) [ax]	138 (2.5) [bxy]	135 (3.4) [by]
Purch Ewes X Purch Ram[2]			
lbs (Standard Error)	145 (2.9) [ax]	136 (2.2) [by]	133 (3.6) [by]

[1] Mean weights within the ewe birth year with the same letter are not significantly different (P>0.05) (a and b).
[2] Mean weights within the same treatment with the same letter are not significantly different (P>0.05) (x and y).

Table 6. Fall Lambing Performance of Purchased versus Closed Flocks during the 1999, 2000, and 2001 lambing season.

	1999			**2000**				**2001**
Ewe Birth Year	1997	1997	1998	1997		1998		1999
Closed Ewes X Closed Ram								
Ewes Exposed	42	38	35	32		36		31
Ewes Pregnant	33	30	34	29		35		12
Fall Breeding %	79%	79%	97%	91%	***83%[1]***	97%	***97%[1]***	39%
Closed Ewes X Purch Ram								
Ewes Exposed	43	40	31	29		33		31
Ewes Pregnant	28	32	27	26		30		15
Fall Breeding %	65%	80%	87%	90%	***78%[1]***	91%	***89%[1]***	48%
Purch Ewes X Closed Ram								
Ewes Exposed	43	37	34	32		29		38
Ewes Pregnant	33	31	31	29		26		31
Fall Breeding %	72%	84%	91%	91%	***82%[1]***	90%	***91%[1]***	82%
Purch Ewes X Purch Ram								
Ewes Exposed	44	39	35	32		34		36
Ewes Pregnant	23	31	33	30		26		22
Fall Breeding %	52%	79%	94%	94%	***75%[1]***	76%	***85%[1]***	61%

[1]***Indicates a percentage of fall breeding over three breeding seasons for the 1997 class ewes and two breeding season for the 1998 class ewes.***

Summary
This being the second year of a multiple year trial no attempt was made to analyze the data for differences. It will be especially important to evaluate year two through four and to see if the purchased ewes breeding performance improves at similar rates as closed flock individuals as they mature in the system. They will continue to be measured as a comparison to the base closed flock.