RATIONS
for wintering ewes

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Contents

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Ewes grazed this fescue into the first week of February.

RATIONS FOR WINTERING EWES

by C. V. Ross, A. J. Dyer, K. L. Krieg

The gestation and lactation periods are the most expensive phases of early and late lamb production. In spring lamb production, these occur during the winter when nutritional requirements of ewes are highest and expensive concentrates and hays are usually necessary to supply the needs.

A low cost ration that is nutritionally adequate should result in greater profits. Usually, the cheapest source of nutrients is pasture, followed by harvested forage. In Missouri, a long grazing season is possible using grasses in the spring, legumes or mixtures of legumes and grasses through the summer, and bluegrass and fescue to extend the season through December. Missouri also can produce an abundance of high quality hay and a tremendous tonnage of corn silage. Can top quality lambs be produced largely on the high quality forages, hays, and silages that are produced in such abundance in Missouri? If so, it can mean greater profits for sheepmen.

Meeting the requirements of pregnant ewes at low cost has long been a problem for midwest sheepmen. As early as 1912, Hackedorn at the Missouri Station wintered ewes on timothy hay, clover hay, corn stover, and corn silage. Of the feeds compared, only those fed clover hay during gestation produced satisfactory lambs. Timothy hay was so inadequate that he discontinued using it as a winter feed for ewes.

During the past 20 years, experiments have been conducted at the University of Missouri to determine the following:

1. The value of winter pasture for pregnant ewes.
2. The effect of supplementing winter pastures with concentrate mixtures.
3. The effect and adequacy of various supplements for corn silage.

The results of these experiments are reported in this bulletin.

Typical group of the ewes and lambs on pasture.

Winter Pasture Valuable

Two experiments conducted in 1946-48 were designed to study the importance of pasture for wintering pregnant ewes.

A group of two and three-year old Northwestern ewes bred for early lambs was divided equally; half was fed roughage in drylot and the other half was pastured on bluegrass. In the first test ewes in drylot were limited to three pounds clover hay plus oat straw *ad libitum.* The other group grazed bluegrass pasture and received clover hay only when snow prevented grazing. Oat straw was not fed in the second test but the roughage allowance was increased to 4.5 pounds of mixed legume-grass hay per ewe daily until the last of December. From then on the allowance was increased to 5 pounds daily until the ewes lambed. In both test all ewes and lambs were fed grain and hay in drylot after lambing until the first of April when they were turned to small grain pasture, and later to bluegrass. Suckling lambs had access to shelled corn in creeps.

The combined results are shown in Table 1.

One case of pregnancy disease and three abortions in the group fed hay in drylot in Trial I were indications of possible nutritional inadequacies of the ration fed in drylot, but other ewes in the same group and all of those on pasture produced strong lambs which gained well. Better results were obtained in the second test with ewes fed hay in drylot. Considering both experiments, there was apparently little advanage to feeding hay to ewes in drylot and they required 86 percent more harvested forage than those on pasture. Winter pasture was of value for pregnant ewes both in reducing the amount of harvested roughage and in maintaining health of the ewes.

TABLE 1--A COMPARISON OF EWES WINTERED ON PASTURE VS. EWES WINTERED IN DRYLOT ON CLOVER HAY AND OAT STRAW
(TWO YEAR'S RESULTS 1946-48)

	Dry forage in drylot	Bluegrass pasture
No. of ewes	50	52
Avg. feed per ewe (Wintering phase) (lbs.)		
Dry hay[a]	376.5	52.7
Oat straw[b]	9.5	1.0
Winter pasture days on bluegrass (beginning Nov. 15 until lambing)	0	66
Avg. gain during gestation	18.3	11.5
Fleece wts. (lbs.)	10.36	10.95
No. of lambs dropped	63	61
Avg. birth wts. per lamb (lbs.)	8.37	9.60
No. of lambs saved	51	52
No. of ewes aborting	3	0
Incidence of pregnancy disease	1	0
Suckling phase (one year's results March 13, 1947 - June, 1947)		
Avg. feed per ewe (suckling phase) (lbs.)		
Dry hay	276.7	275.0
Grain mix[c]	84.5	83.1
Avg. total grain of lambs (lbs.)	47.0	49.1
Avg. daily gain of lambs (lbs.)	.48	.50

[a] Clover hay used in the 1946-47 test, mixed hay used in the 1947-48 test.
[b] Fed only in the 1946-47 test.
[c] The grain mix consisted of 6 parts corn, 3 parts bran, and 1 part soybean oil meal by weight.

Supplementing Winter Pastures with Concentrates

Experiments in 1948-1953 were a natural follow-up of those conducted earlier in which pasture adequately replaced hay in wintering rations of pregnant ewes.

These experiments were conducted to determine the value of feeding concentrates to pregnant ewes on pasture. In each of the two trials, four and five year old western ewes bred for early or late lambs were grazed on bluegrass pasture until parturition. Half of each group received no supplemental concentrates during gestation. The other half was fed concentrates during the last six weeks of pregnancy. The daily allowance per ewe was 1.5 pounds of a concentrate mixture composed of 6 parts corn, 3 parts bran, and 1 part soybean oil meal by weight plus two pounds of Korean lespedeza hay. The early lambs grazed with their dams on mixed pasture and were fed shelled corn in creeps until they were weaned and put in drylot July 4. The late lambs were not creep fed while on pasture. They were weaned and put in drylot August 16. Both the early and late lambs were finished in drylot on dry hay and shelled corn.

The combined results are shown in Tables 2 and 3.

In each of the comparisons ewes fed concentrates during the last part of pregnancy gave birth to stronger, heavier lambs, and 14% more lambs were

TABLE 2--THE EFFECTS OF FEEDING CONCENTRATES TO EARLY LAMBING MATURE EWES DURING THE LAST SIX WEEKS OF GESTATION (TWO YEAR AVERAGE 1948-49, 1949-50)

Treatment	No concentrates fed during gestation	Concentrates fed last six weeks of gestation
No. of ewes per group	28	29
Feed consumed per ewe during the last six weeks of pregnancy (lbs.)		
Concentrates[a]	--	38.7
Korean lespedeza hay	75.1	78.9
Avg. fleece wt. per ewe (lbs.)	9.8	9.4
No. of lambs born	41	41
Birth wts. (lbs.)		
Singles	9.2	11.7
Twins	8.2	9.3
Triplets	7.1	7.7
Percent of weak lambs at birth	26.8	0
Feed consumed per ewe after lambing (late Jan.-mid April) (lbs.)		
Concentrates[a]	119.4	121.3
Korean lespedeza hay	189.5	184.5
Total feed fed per ewe		
Concentrates[a]	119.4	160.0
Korean lespedeza hay	250.8	254.4
Pasture days per year (ewes)	325.0	327.0
No. of lambs marketed	32	38

[a]Consisted of 6 parts shelled corn, 3 parts bran and 1 part soybean oil meal by weight.

TABLE 3--THE EFFECTS OF FEEDING CONCENTRATES TO LATE LAMBING EWES DURING THE LAST SIX WEEKS OF GESTATION (TWO YEAR AVERAGE 1948-50)

Treatment	No concentrates fed during gestation	Concentrates fed last six weeks of gestation
No. of ewes per lot	27	27
Feed consumed during pregnancy (lbs.)		
Total concentrates[a]	--	44.5
Korean lespedeza hay[b]	139.0	154.5
Avg. fleece wt. (lbs.)	9.8	10.0
No. of lambs born	37	43
Birth wts. (lbs.)		
Singles	10.4	11.2
Twins	8.2	9.0
Triplets	--	8.9
Percent of weak lambs at birth	13.5	4.7
No. of lambs marketed	34	39
Avg. age when marketed (wks.)	33.8	33.8
Avg. wt. when marketed (lbs.)	102.0	100.0
Avg. USDA carcass grade		
% "choice"	35.3	29.7
% "good"	61.7	45.9
% "commercial"	2.9	24.3

[a]Six parts shelled corn, 3 parts bran and 1 part soybean oil meal by weight.
[b]Does not include hay fed after lambing.

marketed from this group than from those supplied with pasture alone. On the other hand, ewes wintered on pasture consumed 40.6 pounds less concentrates per ewe and had slightly heavier fleeces. In these experiments, good bluegrass pasture with legume hay fed only when weather conditions made grazing impossible was satisfactory for mature ewes during pregnancy.

Results with early and late lambing ewes were similar in that ewes fed concentrates produced lambs that were stronger, thriftier, and heavier at birth. However, in this experiment lambs from ewes that weren't fed concentrates prior to lambing were 2.0 pounds heavier when marketed. More of them than of those from the ewes that received concentrates graded "choice" and "good."

The two experiments of 1948-49 and 1949-50, using early and late lambing mature ewes, were repeated in 1950-51 with yearlings bred for early and late lambs. All the ewes were again grazed on good quality bluegrass and the same concentrate mixtures were fed for the same period of time prior to lambing.

Results of the repeat test are shown in Table 4.

Marketing the lambs at approximately the same time was somewhat detrimental to performance records of the group from ewes which received concentrates. These ewes were raising more lambs per ewe and furnished somewhat less milk per lamb, resulting in the lambs' being not quite as fat as those from ewes which were not fed concentrates.

Both the early and late lambing yearling ewes that were fed concentrates in the 1950-51 tests made greater gains during pregnancy and produced heavier, stronger, and thriftier lambs at birth that were heavier when marketed. Early lambs from yearling ewes which were fed concentrate during late pregnancy reached market condition nine days sooner than those from the group fed none. The colostrum from yearling ewes that didn't receive concentrates was thin and watery, compared to the thicker, richer consistency of that from ewes that were fed concentrates.

TABLE 4--EFFECTS OF FEEDING CONCENTRATES DURING THE LAST SIX WEEKS OF GESTATION TO EARLY AND LATE LAMBING YEARLING EWES
(ONE YEAR RESULTS 1950-51)

Treatment	Early Lambs		Late Lambs	
	No concentrates fed	Concentrates fed	No concentrates fed	Concentrates fed
No. of ewes	17	14	16	16
Feed consumed per ewe before lambing (lbs.)				
Concentrates[a]	--	44.5	--	48.0
Lespedeza hay[b]	14.3	21.2	103.0	116.3
Gains during pregnancy (lbs.)	31.5	43.9	29.3	38.5
Percent of lamb crop raised	82.3	78.6	94.0	94.0
Avg. birth wts. (lbs.)				
Singles	9.3	10.4	8.8	10.1
Twins	6.8	7.6	6.1	6.8
Feed consumed per ewe after lambings (lbs.)				
Concentrates[a]	86.6	83.3	9.5	9.8
Lespedeza hay[b]	173.7	175.5	23.3	27.8
Total feed consumed per ewe (lbs.)				
Concentrates[a]	86.6	127.8	9.5	57.8
Lespedeza hay[b]	188.0	196.7	126.3	144.1
Avg. date mktd.	July 10	July 1	Jan. 5	Jan. 5
Avg. wt. when marketed (lbs.)	86.1	90.8	101.3	109.4
Avg. amt. of concentrates fed per lamb[c] (lbs.)	104.4	80.3	77.0	77.0

[a] [b] Consisted of 9 parts shelled corn, 3 parts bran, and 1 part soybean oil meal by weight.
[b] Good quality lespedeza hay.
[c] Consisted of mostly shelled corn, with traces of bran and oats.

Since no such observations on colostrum consistency were made on mature ewes, this result may indicate higher gestation and lactation requirements for yearlings than mature ewes. Most yearlings are still growing and thus need extra nutrients during gestation and, especially, during lactation. In this experiment, feeding concentrates six weeks prior to lambing to immature pregnant ewes wintered on good bluegrass pasture resulted in improved performance.

While it is true that ewes fed 1.5 pounds of concentrates daily in 1950-51 were healthier and thriftier, gained more during pregnancy, and produced heavier lambs, they weighed less after parturition than at six weeks prior to that time. This indicated that the concentrate allotment was inadequate for ewe growth, maintenance, and fetus development. Further experiments were conducted to study the effects of concentrate feeding at increased levels.

The seventh test in the series was conducted during 1951-52 using 63 Northwestern yearling ewes wintered on bluegrass. It was repeated during 1952-53, using the same ewes, but wintering them on bluegrass and tall fescue-ladino pasture. The experiment was similar in design to that of 1950-51, except that ewes fed concentrates received 2.0 pounds instead of 1.5 pounds per head daily, they were fed for 60 days prior to lambing instead of the 40 days and milk yields were measured. All ewes received a liberal al-

TABLE 5--EFFECTS OF FEEDING LIBERAL AMOUNTS OF CONCENTRATES TO PREGNANT EWES WINTERED ON PASTURE
(TWO YEARS AVERAGE 1951-53)

Treatment	No concentrates fed the last 60 days of gestation	Concentrates fed the last 60 days of gestation
No. of ewes	30	31
Total feed provided		
Concentrates (lbs.)[a]	134.8	259.0
Legume hay (lbs.)[b]	197.3	198.3
Pasture (days per year)[c]	332.1	331.3
Gain during pregnancy[d] (lbs.)	26.0	37.2
Loss at parturition (lbs.)	30.9	28.5
Gain or loss from conception to first weight following partutition (lbs.)	-1.47	+10.48
Condition of ewes at lambing	Thin but thrifty-medium	Medium to high
Fleece wt. (lbs.)	9.12	9.72
No. of ewes lambing[d]	29	30
No. of lambs born	45	50
No. of lambs raised to market	41	44
Birth wt. of live lambs (lbs.)	9.2	9.7
Percent weak lambs	7.2	5.2
Avg. daily milk yield (lbs.)	3.84	4.21
Avg. total milk yield (lbs.)	241.9	265.0
Avg. daily gain of lambs from birth to weaning (lbs.)	.49	.47
Total creep feed consumed per head (lbs.)[e]	68.37	61.51
Avg. selling price (cwt.)	$26.45	$26.71
Avg. carcass grade	Low choice	Low choice

[a] Consisted of 6 parts shelled corn, 3 parts bran, and 1 part soybean oil meal by weight.
[b] Good quality lespedeza or red clover hay.
[c] Bluegrass in 1952; bluegrass to November 21 and then tall fescue-ladino throughout the remainder of gestation in 1953.
[d] Does not include ewes that died shortly after lambing.
[e] Shelled corn.

lowance of concentrates during lactation until lush pasture was available. Good quality legume hay was fed at the following times: when inclement weather prevented grazing, during a three to five day period after parturition, and when ewes were confined to secure data on milk yields. The lambs had access to shelled corn in creeps from about three weeks after birth until marketed.

The combined results of these experiments are shown in Table 5.

Ewes fed concentrates gained more during pregnancy, produced heavier fleeces, lost less at parturition, and were in slightly better condition at lambing than those receiving no concentrates. They produced 9 percent more milk and 10 percent more lambs that were both heavier and stronger. Iambs from ewes receiving no concentrates consumed more feed, gained faster, and graded equally as high as those from the other group, but sold for slightly less per hundredweight. Both groups of ewes produced strong lambs with a minimum of difficulties. The consistency of the colostrum from yearling ewes fed concentrates was thicker and richer in the first test but there was little difference in the second test when the ewes were two-year-olds.

Supplementing Corn Silage for Pregnant Ewes

Periods of drouth are critical for the sheepman. Not only is the supply of forage limited, but the quality is generally low. Emergency sources of forage are needed. One possible solution is to ensile crops such as corn or wheat, but the resulting silages are usually of low quality in drouth periods and sometimes they contain harmful compounds such as nitrates. The dry summer of 1954 in central Missouri provided the opportunity to measure the value of drouth corn and wheat silage as roughages in wintering rations for pregnant ewes.

Twenty-four small ewes and 47 large ewes bred for the late lambs were grazed on bluegrass pasture four months during the fall and winter before being divided equally into two groups and placed on test in drylot. Group I received 5.0 pounds of drouth corn silage which contained 1.4% nitrate (dry matter basis) and two pounds of poor quality oat hay per ewe daily. Group II received 5.0 pounds of drouth wheat silage and two pounds of poor quality oat hay per ewe daily. The ewes were turned on wheat pasture April 2 where they lambed. They remained on wheat until the end of the test, May 21. Gains of lambs during the first four weeks of their lives were used as criteria to compare milking ability of ewes.

The feeds used were analyzed and the results are shown in Table 6.

The results are shown in Table 7.

TABLE 6--AN ANALYSIS OF 1954 DROUTH CORN AND WHEAT SILAGE EXPRESSED AS A PERCENT OF THE NORMAL VALUES[a,b]

Feed Used	H_2O	Fat	Fiber	Ash	Protein	Cellulose	Ca	P
Oat hay[a]	77	47	115	105	92	79	138	158
Corn silage[a]	94	195	149	136	91	45	50	100
Wheat silage[b]	79	191	112	104	154	168	70	90

[a]Expressed as a percentage of the normal chemical analysis found in Morrison's Feeds and Feeding, 22nd Edition.
[b]Expressed as a percentage of the normal chemical analysis found in the National Research Council's 1964 Feed Composition Tables.

TABLE 7--A COMPARISON OF HIGH NITRATE DROUTH CORN SILAGE AND DROUTH WHEAT SILAGE FED IN WINTERING RATIONS TO LARGE AND SMALL EWES

Daily ration	5 Lbs. Drouth Corn Silage plus 2 Lbs. Poor Quality Oat Hay		5 Lbs. Drouth Wheat Silage plus 2 Lbs. Poor Quality Oat Hay	
	Small Ewes	Large Ewes	Small Ewes	Large Ewes
No. of ewes	12	23	12	24
Avg. gain in drylot (lbs.)	22.9	35.8	26.9	36.9
Avg. gain or loss from 6 weeks prior to the first weight after lambing (lbs.)	+1.2	-1.2	-1.9	-2.3
Avg. fleece wt. (lbs.)	8.0	8.3	8.1	9.0
Avg. birth wt. of lambs (lbs.)				
Singles	11.4	11.8	10.0	12.8
Twins	8.9	10.3	10.8	10.3
Avg. lamb gain in first 4 weeks (lbs.)				
Singles	18.0	20.9	17.9	20.4
Twins	9.7	15.0	11.1	14.8

There were no apparent adverse effects from feeding either drouth wheat silage or drouth corn silage containing 1.4% nitrates on a dry matter basis.

Protein Supplements for Corn Silage

High quality corn silage is an excellent source of carbohydrates that can be stored and handled easily and efficiently. Thus, it is one of our most economical sources of winter roughage. However, since corn silage is deficient in calcium, protein, and phosphorus, supplementation by other feedstuffs is required.

One of the most commonly used sources of protein is soybean oil meal. It has a high content of easily digested protein and is very palatable to sheep. These features, plus the fact that soybean oil meal is generally produced in the midwest in abundance, make it the protein supplement chosen by most farmers.

Two experiments were conducted in the wintering seasons of 1956-57 and 1957-58 to compare two levels of soybean oil meal as protein supplements for pregnant ewes being full fed corn silage. In the first experiment, 63 three-year-old Northwestern ewes bred for late lambs were grazed on good bluegrass pasture during November and December, then divided into two similar groups January 12. They were fed corn silage *ad libitum* in drylot until they went to pasture March 20. In addition to the corn silage, one group received 0.3 pounds of soybean oil meal per ewe daily while the other received 0.1 pound. On February 22 the allotment of soybean oil meal was increased by 0.1 pound for each group. The lambs were not creep fed and were weaned July 30.

The test was repeated in 1957-58 with the same ewes reversed on treatment. They were put in drylot December 22. The increase in the soybean oil meal allotment was delayed until February 26, compared to February 22 in the first test. The ewes and lambs were turned to rye pasture April 4. Then the lambs were creep fed grain until weaning July 19.

The combined results are shown in Table 8.

Both groups of ewes produced strong, healthy lambs and heavy fleeces. However, the ewes fed 0.33 pounds of soybean oil meal daily gained 9.2 pounds more during pregnancy than those receiving 0.13 pounds. They also sheared slightly heavier fleeces and produced slightly heavier lambs at weaning. In this experiment with mature ewes bred for late lambs, both levels of protein were apparently adequate for supplementing corn silage.

In the second trial an outbreak of nitrate poisoning occurred when a change in the source of silage was made. It was observed that the ewes fed the higher rate of soybean oil meal resisted the nitrate poisoning much more than those on the lower rate.

TABLE 8--A COMPARISON OF LEVELS OF SOYBEAN OIL MEAL FOR SUPPLEMENTING CORN SILAGE RATIONS FOR WINTERING PREGNANT EWES (TWO YEARS RESULTS 1956-57, 1957-58)

Treatment	Corn Silage Ad Lib. Plus .33 Lbs. SBOM	Corn Silage Ad Lib. Plus .13 Lbs. SBOM
No. of ewes	60	59
Gain of ewes during pregnancy (lbs.)	26.0	16.8
Average daily ration (lbs./day - 80 days)		
Corn silage	10.49	10.30
Soybean oil meal	.33	.13
Steamed bonemeal[a]	Yes	Yes
Average fleece wt. (lbs.)	10.51	10.04
No. of lambs born	89	94
Average birth wt. (lbs.)		
Singles	11.6	11.4
Twins	8.7	8.4
Triplets	----	7.33
No. of lambs living June 28	82	79
Average wt. of lambs June 28 (lbs.)	58.97	57.73
Number of ewes not raising lambs	5	8
No. of lambs living per ewe June 28	1.37	1.34

[a]Mixed with soybean oil meal beginning February 22 (first trial) and February 26 (second trial), free choice prior to that.

Otherwise all ewes produced strong lambs which made satisfactory gains.

A further study of the effects of various levels of protein in wintering rations for pregnant ewes was conducted during the 1959-60 season. Following a two and one-half month period on rye and bluegrass pastures, 80 Texas yearling ewes bred for late lambs were divided evenly January 10 into three groups which were full fed corn silage in drylot. In addition to corn silage, the groups were fed supplements which varied in protein but were equal in energy. The following supplements were fed per ewe daily: Group I, 0.42 pounds of soybean oil meal; Group II, 0.24 pounds of soybean oil meal plus 0.18 pounds of ground corn; Group III, 0.05 pounds of soybean oil meal plus 0.37 pounds of ground corn. The ewes and lambs were put on bluegrass pasture April 16, where they remained until the lambs were weaned.

The results of this experiment are shown in Table 9.

The ewes in lots I and II gained 64 per cent more than those in lot III and were in better condition prior to lambing. In general, strong vigorous lambs were produced by ewes on all three treatments. Ewes on the low protein level produced the lightest lambs; their lambs also weighed slightly less at 10 weeks of age. All lambs gained well during the suckling phase with those from ewes on the high and medium levels of protein outgaining those from ewes on the low level by 0.04 pounds per head per day.

The ewes on the intermediate level of protein produced 0.5 and 1.1 pounds more wool per ewe than those on the high or low level, respectively. Ewes in lot III began to lose wool from their back approximately 30 days after they were placed in drylot. Since this was the only lot to be affected this way, it appeared to be another indication that the level of protein fed was inadequate.

Soybean oil meal, when fed at a level of 0.35 pounds or more per ewe daily was a satisfactory protein supplement for corn silage in rations for pregnant ewes in the tests of 1958-60. However, since soybean oil meal is sometimes expensive and invariably is an "out of pocket" expense, other protein sources were studied. Some home grown feeds such

TABLE 9--EFFECTS OF THREE LEVELS OF SOYBEAN OIL MEAL AS SUPPLEMENTS TO CORN SILAGE FOR PREGNANT YEARLING EWES
(1959-60 Trial)

Treatment	Lot I	Lot II	Lot III
Level of soybean oil meal per ewe daily (lbs.)	.42	.24	.05
No. of ewes	27	26	27
Avg. daily ration per ewe (lbs.)			
Corn silage	10.6	11.0	9.7
Soybean oil meal	.42	.24	.05
Shelled corn	---	.18	.37
Gain on winter pasture (lbs.)	10.0	10.1	12.5
Gain in drylot (lbs.)	24.7	24.8	15.1
Condition just prior to lambing	Good	Good	Thin
Fleece wts. (lbs.)	9.3	9.8	8.7
No. of lambs born	32	34	35
No. of lambs alive at 10 weeks	27	25	32
Av. birth wts. (lbs.)			
All lambs	10.0	9.9	9.4
Singles	11.0	11.1	10.3
Twins	9.0	8.6	8.4
Avg. daily gain of lambs to 10 weeks (lbs.)	.51	.51	.47
Avg. weight at 10 weeks (lbs.)			
Singles	53.4	51.7	47.9
Twins	34.1	36.8	36.0

as alfalfa hay are rich in protein and are usually available on the farm.

Two experiments were conducted to compare soybean oil meal and a ground mixture of alfalfa hay and shelled corn fed at a level to equalize the two supplements in their protein and energy content.

In the first experiment, 51 aged Northwest ewes bred for late lambs were divided into two groups on January 10 and fed corn silage *ad libitum* in drylot. In addition to corn silage, one group received 0.35 pounds of soybean oil meal per ewe daily. The other group received a ground mixture composed of 0.87 pounds of alfalfa hay plus 0.35 pounds of shelled corn. The ewes remained on these rations until the first part of April when they and their lambs were turned to small grain pasture. This experiment was repeated in 1959-60 using 32 six-year-old Northwest ewes and 24 Texas yearling ewes.

The combined results are shown in Table 10.

Ewes on both treatments made good gains, yielded heavy fleeces, and produced strong healthy lambs. Ewes receiving soybean oil meal gained 4.1 pounds more per ewe during pregnancy. They gave birth to lambs that were 0.35 pounds heavier at birth but were 0.8 pounds lighter at 10 weeks than those of the other group. Both supplements appeared to be adequate for both mature and immature ewes when the ewes were wintered on corn silage.

Since a ground mixture of alfalfa hay and shelled corn appeared equal to soybean oil meal for supplementing corn silage in rations for pregnant ewes in 1958-60 tests, further studies were made to determine the effects of various levels of alfalfa in the form of dehydrated pellets for supplementing corn silage in rations fed to pregnant ewes. Three levels of dehydrated alfalfa pellets were compared, with shelled corn added to the rations containing the lower levels of protein to equalize the energy content of all three. Seventy-five two-year-old Texas ewes bred for late lambs were evenly divided into three groups and put in drylot January 14. They were fed corn silage *ad libitum* until May 6 when they were turned to pasture with their lambs. In addition to corn silage the groups received the following per ewe daily: group one, 0.99 pounds of dehydrated alfalfa pellets; group two, 0.58 pounds of dehydrated alfalfa pellets plus 0.24 pounds of shelled corn; group three, 0.12 pounds of dehydrated alfalfa pelleted plus 0.51 pounds of shelled corn. The lambs were not creep fed and were weaned at approximately 10 weeks of age.

TABLE 10--ALFALFA HAY PLUS SHELLED CORN VERSUS SOYBEAN OIL MEAL FOR SUPPLEMENTING CORN SILAGE IN WINTERING EWE RATIONS.
(TWO YEARS RESULTS 1958-60)

Treatment	Soybean oil meal	Ground alfalfa hay shelled corn mixture
No. of ewes per group	54	53
Avg. daily ration per ewe[a]		
Corn silage	12.80	10.66
Soybean oil meal	.35	-----
Alfalfa hay	-----	.88
Shelled corn	-----	.35
Avg. gains during pregnancy (lbs.)	31.0	26.9
Avg. fleece wt. (lbs.)	9.79	9.84
No. of lambs born	78	75
Avg. birth wt. of lambs (lbs.)	10.20	9.85
Avg. lamb wt. at 10 weeks (lbs.)[b]	45.9	46.7

[a]Fed for 78 days.
[b]One year's results (1959-60).

TABLE 11--EFFECTS OF THREE LEVELS OF ALFALFA PELLETS FOR SUPPLEMENTING CORN SILAGE AS RATIONS FOR WINTERING PREGNANT EWES
(1960-61)

Treatment	.99 lbs. Alfalfa pellets	.58 lbs. Alfalfa pellets + .24 lbs. shelled corn	.12 lbs. Alfalfa pellets + .51 lbs. shelled corn
Crude protein of ration (%)	10.2	8.7	6.9
No. of ewes	25	25	25
Avg. daily ration (lbs.)			
Corn silage	8.43	8.31	7.40
Dehydrated alfalfa pellets	.99	.58	.12
Shelled corn	----	.24	.51
Salt	.085	.105	.074
Avg. gain drylot period (lbs.)	28.5	24.7	14.0
Ewe condition prior to lambing	Good	Good	Thin
Avg. fleece wt. (lbs.)	9.52	9.16	8.84
No. of lambs dropped	30	24	29
No. of lambs living at 10 wks.	26	21	27
Avg. birth wt. of lambs (lbs.)			
Singles	12.15	11.06	11.13
Twins	8.96	9.85	8.42
Avg. lamb wt. at 10 weeks (lbs.)			
Singles	50.79	47.21	47.83
Twins	38.08	39.00	34.36

Ewes in all groups produced strong, thrifty lambs. Gains of group three during pregnancy were only 50 percent as much as group one and only 57 percent as much as group two. The single lambs of group one and the twins of group two were heaviest at birth and at ten weeks. Group one produced 8 percent and group two, 4 percent heavier fleeces than group three. Ewes of group three were not as thrifty and were thinner when handled but they still produced strong healthy lambs. There was apparently a close relationship between the level of protein fed and silage consumption. This caused the total energy and protein intake to be low for group three.

Ground alfalfa hay or dehydrated alfalfa pellets were apparently equal to soybean oil meal as a protein supplement for corn silage in the tests of 1958-61. However, these two forms of alfalfa require costly processing. An experiment was conducted to determine if unprocessed alfalfa hay could be used to supplement corn silage for pregnant ewes. Thirty-two seven-year-old Northwestern ewes and 22 two-year-old Texas ewes were bred for early lambs and grazed of lespedeza-rye and bluegrass pasture, supplemented with alfalfa hay during bad weather. January 7 they were divided evenly into two groups and put in drylot where they were fed corn silage *ad libitum*. In addition to the corn silage, group one received 1.02 pounds of long alfalfa hay plus 0.37 pounds of shelled corn. The other groups received 0.47 pounds of soybean oil meal plus 0.37 pounds of shelled corn. The supplements were formulated to be equal in crude protein and estimated net energy. The ewes remained in drylot until April 20 when they were turned on pasture with their lambs. The lambs were not creep fed.

The results are shown in Table 12.

Both groups of ewes produced strong healthy lambs and suckled them well. Ewes fed soybean oil meal gained twice as much as the other group, but long alfalfa hay appeared satisfactory for supplementing corn silage in rations for wintering pregnant ewes.

Soybean oil meal, ground alfalfa hay, dehydrated alfalfa pellets, and long alfalfa hay were all satisfactory supplements for corn silage in rations of pregnant ewes. Natural protein sources may at times be expensive compared with the protein equivalent furnished by urea.

Two experiments were conducted to determine the feasibility of replacing part of the protein with urea. In the first test, 93 three-year-old Texas ewes bred for late lambs were grazed on bluegrass until January 16 when they were divided evenly and put in drylot. All were fed corn silage *ad libitum*. As a supplement to the corn silage the control group received 0.33 pounds of soybean oil meal per ewe daily. Group two received 0.33 pounds of a mixture of 31.6 percent soybean oil meal, 10 percent urea, and 58.4

TABLE 12--COMPARISON OF ALFALFA HAY AND SOYBEAN OIL MEAL AS SUPPLEMENTS TO CORN SILAGE FOR WINTERING PREGNANT EWES; 1960-61.

Treatment	S.B.O.M. Plus Shelled Corn	Alfalfa Hay Plus Shelled Corn
No. of ewes	27	27
Avg. daily ration (lbs.)		
Corn silage	11.97	10.12
Soybean oil meal (44% C.P.)	47	----
Alfalfa hay (21% C.P.)	----	----
Shelled corn	.37	.37
Avg. gain in drylot (lbs.)	14.7	7.1
Avg. fleece wt. (lbs.)	8.61	8.68
No. of ewes lambing	27	27
No. of lambs dropped	38	38
No. of lambs alive at 10 weeks	26	26
Avg. birth wt. all lambs (lbs.)	10.24	10.03
Avg. wt. of all lambs at 10 weeks (lbs.)	44.1	45.4

percent shelled corn per ewe daily. Group three received the same ration as group two plus 50 mg. of vitamin A per ewe daily. The ewes were turned to rye pasture with their lambs of April 7. The experiment was concluded when the lambs reached 70 pounds.

The second experiment was the same as the first, using 88 of the same ewes. They were put in drylot on January 9 and turned to pasture on March 30. The rations were equal in protein and energy in the two experiments.

The combined results are shown in Table 13.

Ewes in all lots produced strong healthy lambs that were approximately equal in weight. Ewes in Lot I consumed slightly more silage and made greater gains then ewes in either Lot II or III. In these experiments, satisfactory production was achieved when 70 percent of the soybean oil meal was replaced by urea as a supplement to corn silage. There appeared to be no advantage to adding vitamin A (Lot three).

Mineral Supplements

Available calcium and phosphorus in adequate amounts and balance are essential. The exact ratio between calcium and phosphorus required by pregnant ewes is not known, but the range is apparently between 1:1 and 2.5:1. However, in high quality legume hay, such as alfalfa, the ration may be as high as 10:1. This ration apparently is not harmful because factors in legumes, which at present are unknown, allow the ewe to metabolize this excess calicum without complication.

Experiments conducted during the wintering seasons of 1963-64 and 1964-65 were designed to study the effects of various ratios of calcium to phosphorus in corn silage-soybean oil meal rations for pregnant ewes.

Seventy-three five-year-old Texas ewes bred for late lambs were grazed on bluegrass until the first part of January, then divided into four similar groups. They were fed corn silage *ad libitum* plus supplement in drylot until the last of March, then turned to rye pasture where they lambed. Supplemental additions to corn silage per ewe daily were: Group I, 0.38 pounds of a mixture composed of 93.58 per cent soybean oil meal and 6.42 percent iodized salt with a calcium phosphorus ratio of 1:1; Group II, 0.46 pounds of a mixture composed of 90.4 percent soybean oil meal, 6.2 percent iodized salt, 3.1 percent steamed bone meal, and .3 percent limestone with a calcium phosphorus ratio of 1.25:1; Group II, 0.46

TABLE 13--SOYBEAN OIL MEAL VERSUS SOYBEAN OIL MEAL PLUS UREA, WITH AND WITHOUT VITAMIN A FOR WINTERING EWES ON CORN SILAGE (TWO YEARS RESULTS (1961-63)

Treatment Protein Supplement	Lot I 100% SBOM	Lot II 31.6% SBOM 58.4% Corn 10.0% Urea	Lot III 31.6% SBOM 58.4% Corn 10.0% Urea + Vit. A[a]
No. of ewes	61	60	60
Days in drylot	81	81	81
Avg. daily ration per ewe (lbs.)			
Corn silage	10.8	10.6	10.5
Supplement	.33	.33	.33
Avg. gain in drylot (lbs.)	20.68	17.80	11.92
Avg. fleece wt. (lbs.)	9.14	9.24	8.99
No. of ewes lambing	58	57	58
No. of lambs born	94	92	91
Livability to 10 weeks %	80.84	82.8	76.93
Avg. birth wt. all lambs (lbs.)	9.65	9.53	9.64
Avg. wt. at 10 weeks (lbs.)[b]	47	55.3	50.7

[a] Fifty mg. of Vitamin A per head per day. Silage free choice to all lots.
[b] 1962-63 lambs only.

pounds of a mixture composed of 91.4 percent soybean oil meal, 6.4 percent iodized salt, and 2.3 percent limestone with a calcium phosphorus ratio of 1.5:1; Group IV, 0.34 pounds of soybean oil meal plus a mixture of equal parts iodized salt and steamed bone meal fed free choice. This allowed the fourth group to regulate its own calcium phosphorus ratio.

The second experiment was similar in design, using 61 of the same aged Texas ewes. After they lambed in drylot, they were fed 8 pounds of corn silage plus 0.5 pounds of soybean oil meal per ewe daily and had free access to a mixture of equal parts salt and bone meal. In this experiment the ewes were turned to orchard grass pasture on April 10.

The calcium:phosphorus ratios of the feed consumed by groups I, II, III, and IV were 1.05:1, 1.30:1, 1.53:1 and 2.04:1 respectively. The changes occurred as a result of the failure of ewes to consume the exact amount of silage calculated in the original rations.

The combined results are shown in Table 14.

All groups of ewes gained well, and produced heavy fleeces and strong, healthy lambs that gained well. All of the ratios were apparently adequate for high production from aged ewes wintered on a corn silage-soybean oil meal ration which was supplemented with minerals.

Antibiotic additives

Antibiotics, when added to feedlot rations of lambs, have been shown to increase gains and reduce death loss, especially in times of stress. Also, some benefit has been realized from the addition of antibiotics to creep rations for suckling lambs. Much less is known about the effect of feeding antibiotics to pregnant ewes.

Four experiments using 223 western ewes were conducted over a three-year period to determine the effects of adding aureomycin to a corn silage-soybean oil meal ration for wintering pregnant ewes. Ewes in all tests were grazed on either bluegrass or fescue pasture until January. Then they were assigned to groups and full fed corn silage plus soybean oil meal supplement in dry lot until early April. At that time the ewes and lambs were turned to pasture. The difference in the rations was the addition of 60 mg. of aureomycin per ewe daily to the protein supplement of one group.

The combined results are shown in Table 15.

No real periods of stress occurred during any of the tests. Thus, there may never have been an opportunity for Aureomycin to show its full benefit. However, some increase in production was realized. The antibiotic fed group gained 2.0 pounds more per ewe in drylot. Their lambs were stronger, thriftier, and more uniform than those of the other group.

TABLE 14--EFFECTS OF VARIOUS CALCIUM: PHOSPHORUS RATIOS ON PREGNANT EWES WINTERED ON CORN SILAGE SUPPLEMENTED WITH SOYBEAN OIL MEAL AND MINERALS (TWO YEARS RESULTS)

Treatment	I	II	III	IV
Calcium phosphorus ratio	1.05:1	1.30:1	1.53:1	2.04:1[a]
No. of ewes per group	34	34	32	34
Avg. daily ration per ewes (lbs.)				
Corn silage	8.09	8.33	8.17	8.00
Soybean oil meal	.35	.39	.38	.35
Bone meal	----	.009	----	.04
Limestone	----	.0012	.0014	----
Salt	.03	.02	.02	.02
Days in drylot	74	74	74	74
Avg. gain in drylot (lbs.)	33.47	26.59	26.47	29.47
Avg. fleece wt. (lbs.)	9.43	9.30	9.17	9.42
No. of lambs born	43	41	44	44
No. of lambs living at 12 weeks	38	34	36	42
Avg. birth wt. all lambs (lbs.)	10.93	11.27	9.84	11.13
Avg. wt. at 12 weeks (lbs.)	43.44	43.26	42.44	39.41

[a]First experiment - 1.94:1, second experiment 2.17:1.

TABLE 15--EFFECTS OF ADDING AUEROMYCIN TO PREGNANT EWES RATIONS
(THREE YEARS RESULTS 1961 to 1964)

Treatment	Control	60 mg. Aureo-mycin/hd./day
No. of ewes	110	113
Avg. gain in drylot (lbs.)	8.93	10.96
Avg. fleece wt. (lbs.)	9.77	9.24
No. of ewes lambing	98	103
No. of lambs born	130	137
No. of lambs weaned	104	102
Avg. birth wt. all lambs (lbs.)	10.87	11.01
Avg. lamb wt. at 10 weeks (lbs.)	45.12	47.39

This shed furnished adequate winter protection.

Summary

Wintering rations for pregnant ewes were studied from 1946 to 1965 in 23 experiments with 1,381 western ewes. The tests were designed to determine the value of winter pasture, the effects of supplementing winter pasture with concentrates, the adequacy of drouth silages, and the effects of various supplements for corn silage. The following conclusions were drawn:

1. High quality winter pasture is of real value for wintering ewes. It may reduce the harvested roughage by 86 percent and in good years with proper management will often suffice as the only winter feed for mature ewes.

2. Supplementing winter pasture with concentrates results in increased lamb and wool weights, ewe gains, and, in the case of immature ewes, a higher quality and quantity of milk. The greatest advantage was realized when concentrates were fed to immature rather than mature ewes.

3. Drouth corn and wheat silages, fed with poor quality oat hay, were satisfactory as the only feed for mature pregnant ewes. A nitrate content of 1.4 percent in the drouth corn silage was tolerated by the ewes and apparently not harmful to them or their lambs.

4. Soybean oil meal was an excellent supplement for corn silage. Immature ewes require higher levels of soybean oil meal than do mature ewes. When fed at the rate of 0.35 to 0.43 pounds per ewe daily, the oil meal gave very satisfactory results.

5. Soybean oil meal, alfalfa as unprocessed hay, ground meal or dehydrated pellets, and a corn, soybean oil meal, urea mixture all gave good results when fed with corn silage to pregnant ewes. This indicates that neither the form nor the source of protein was as important as the level of protein fed.

6. A wide range of calcium:phosphorus ratio can be tolerated by pregnant ewes on a corn silage-soybean oil real ration.

7. Feeding aureomycin to pregnant ewes on corn silage-soybean oil meal ration resulted in stronger, thriftier, and more uniform lambs, but the differences were small.

Greater response should be expected under more critical conditions of stress than were present in these investigations.

Ewes were fed hay only when snow covered ground.