EXPERIMENT OUTLINE

Agricultural Experiment Station
Utah State Agricultural College

Project No. 423
Experiment No. 54-14

TITLE

The effect of the level of nutrition on the pathology and productivity of range sheep.

PERSONNEL

Donald C. Clanton, Lorin E. Harris, and David O. Williamson of the Animal Husbandry Department; Wendell Brooksby and LeGrande Shume of the Veterinary Science Department; and Max Robinson, L. A. Stoddart, and C. Wayne Cook of the Range Management Department.

COOPERATION

The Animal Husbandry, Veterinary Science, and Range Management Departments of the Utah Agricultural Experiment Station will conduct the experiment in cooperation with the Atomic Energy Commission, which has furnished a grant-in-aid to assist in conducting the research. Wendell Brooksby, Max Robinson, and Donald C. Clanton will be responsible for carrying out the research in the field. These men will work cooperatively on the survey, disease, and nutrition phases.

Lorin E. Harris, LeGrande Shume, L. A. Stoddart, and C. Wayne Cook will meet at various times to make recommendations.

Arrangements will be made for the cooperation and assistance of livestock operators, ranchers, the Bureau of Land Management, and certain services of the Atomic Energy Commission to facilitate the achievement of the objectives of this research. In cases where such cooperation is developed, detailed written agreements will be made to outline the basis of cooperation.

OBJECTIVES

1. To obtain from ranchers information in relation to their present practices in raising sheep, including lamb crop, weight of wool, management practices, and other factors which affect their production.

2. To determine how the level of nutrition in range ewes affects the maintenance of body weight, lamb crop, and weight and quality of wool.

3. To obtain clinical symptoms and gross and histological pathology of sheep grazed under different levels of nutrition.

JUSTIFICATION

After atomic blasts in southern Nevada, Utah ranchers reported unusual lesions on sheep having grazed in the vicinity. The causes of these conditions are unknown and atomic radiation came under suspicion as the causative agent, hence this project

was established to determine what role management and nutrition level may have upon the condition and pathology of animals observed in the area.

PREVIOUS WORK AND PRESENT OUTLOOK

Some 50,000 head of sheep owned by Iron County, Utah, sheepmen are grazed during the winter on Bureau of Land Management controlled lands. The major part of this land is in Nevada with the remainder in Utah. The range is a saltbush-type range.

Meldrum et. al. (1948), Whitcomb et al. (1951), and Harris et al. (1952) have demonstrated that winter range forage on this type range is deficient in protein, phosphorus, and energy. Supplementary feeding has increased the lamb crop about 10 percent and the wool production about one pound per ewe.

Recent research by the Atomic Energy Commission and General Electric would seem to show conclusively that such damage could not have resulted from atomic radiation.

There is the possibility that poor management, nutritive imbalance, a diseased condition, or a combination of the three, may have caused trouble. In view of the above findings it appears that the experiment should aid in pointing out the trouble.

PROCEDURE

The experiment will be conducted southwest of Cedar City, Utah, in areas where the range is in a depleted condition.

Phase I. Survey of Factors which Influence Sheep Production

Herds of sheep which summer in the vicinity of Cedar City and winter on the desert ranges west of Cedar City will be visited periodically by a veterinarian and an animal husbandman. These visits will start in October and continue through the winter and spring each year the experiment is conducted. These men will check the herds for disease, note the methods of feeding and management, and check the condition of the range; also, any other practice that might affect production. These factors will be related to wool and lamb production to determine the factors which are causing poor performance in some of the herds.

Each operator in the vicinity will be required to fill out a questionnaire pertaining to his production, management, and death losses during the last three years. This questionnaire will be mailed out and returned in the fall of 1954. As the veterinarian and animal husbandman make their visits they will use the questionnaires as guides for discussion topics and will add to the questionnaires any new information acquired. Each year of the experiment the new information will be added to the questionnaire. At the end of each year and at the conclusion of the experiment it is planned to code some of the information from the questionnaires and set it up on IBM cards for analysis to determine correlations of certain practices and production.

Phase II. Supplementary Feeding Trials

1. Determination of the range conditions. A survey of the range to be used by the experimental band of sheep will be made in October, 1954. The purpose of the survey would be to determine the condition of the range, study the types of vegetation, and acquire a basis for formulating supplemental rations. Samples will be

collected for chemical analyses. Range utilization will be observed closely.

2. Design for supplementary feeding trials. Based on the condition and type of range, supplements will be selected and fed during the periods as outlined in table 1 for the years 1954-55, 1955-56, and 1956-57. The analyses of variance are outlined in table 2. It will be noted that for the various possible comparisons there are several sheep to compare.

Table 1. Experimental design for feeding three supplements during three periods while ewes are on the winter range

Supplement	Age of ewes in years	Season* 1	2	3	Total	Control ewes**	Replacements
Corn	Lambs	13	13	13	39	13	10
	1	13	13	13	39	13	10
	2	13	13	13	39	13	10
	3	13	13	13	39	13	10
	4	13	13	13	39	13	10
	5 and over	13	13	13	39	13	10
Alfalfa, suncured plus phosphorus (pellet)	Lambs	13	13	13	39		
	1	13	13	13	39		
	2	13	13	13	39		
	3	13	13	13	39		
	4	13	13	13	39		
	5 and over	13	13	13	39		
Complete pellet including phosphorus, protein, and energy sources	Lambs	13	13	13	39		
	1	13	13	13	39		
	2	13	13	13	39		
	3	13	13	13	39		
	4	13	13	13	39		
	5 and over	13	13	13	39		
		234	234	234	702	78	60

* The ewes in season 1 will be fed from November 1 to about April 15; the ewes in season 2 from about January 15 to April 15; and those in season 3 only when climatic conditions seem to indicate that feed is necessary.

** These ewes will receive range forage only.

3. Acquiring of sheep. Approximately equal numbers of the six age groups in table 1 will be selected from two privately owned bands of sheep. This will be done around October 10, 1954. At this time the sheep will be double ear tagged according to age, weighed, and scored for condition. In selecting ewes attention will be given to condition of mouths and udders. These same ewes will be used for three years, the cull ewes being replaced with lambs from the experimental band. This selection will take place at the ranches near Cedar City. The sheep will be trailed to the desert range about October 20. They will be observed closely while on the trail.

The IBM machine will be used to group the sheep into the various treatment classes. At this time four sheep from each age group by season by treatment will be identified for blood sampling. These lotting procedures will be done at random. The tag numbers for the ewes on the different treatments and those to be blood sampled

will be sent to the man in charge of the band and he will identify the sheep with brands at the first weigh day on the winter range.

Table 2. Analyses of variance

Source of variation	Degrees of freedom	Number of animals to compare
Replication	12	54
Age	5	117
Season	2	234
Supplements	2	234
Age x season	10	39
Age x supplement	10	39
Season x supplement	4	78
Age x season x supplement	20	13
Control vs. treated	1	
Control vs. treated x age	5	
Age within control	5	
Error	703	
Total	779	

4. Herding and winter range feeding plan. The sheep will be herded rather carefully with general management similar to that practiced by sheepmen in the area. Perhaps water will be hauled every other day and camp moved once every two or three weeks. Temporary corrals and chute will be set up at camp sites so that the sheep can be separated for group feeding. Experiments in Australia (Belschner 1951) have shown that daily supplementary feeding is not necessary to obtain satisfactory results. Because of this fact the ewes will be fed supplements every third day. The feeding will be in troughs. A sheepherder and camp tender will be with the sheep at all times and the animal husbandman will supervise their work, the feeding, and general management. Some weather equipment (thermometer, wind gage, and snow depth indicator) will be used to determine whether the season 3 sheep will be fed.

5. Supplements. Supplements will be made up to satisfy the treatments as outlined in table 1, or other supplements, such as the including of viramin A, will be devised if the survey of the range shows that this is justified. The supplements will be checked by chemical analysis to see that they are of the correct composition The supplements will be fed at the rate of 3/4 of a pound or one pound every third day, as discussed above. The pellets will be formulated in or near Logan and trucked to the experimental area.

6. Weighing of sheep. The ewes will be weighed when they are tagged and as soon as they arrive on the winter range and approximately every 28 days thereafter. They will be weighed in the spring just before they are trailed back to Cedar City and as soon as they arrive at the lambing corrals. The lambs will be weighed at birth and before going on summer range and at weaning time, which will be the duration of each year's study. All weights will be recorded on mark sense cards and coded on IBM cards as follows:

1 - 3	Project No.	423
4 - 5	Year	54
6 - 7	Experiment	14
8	Card or deck number	1

9	Owner of sheep	Clark 1 Seegmiller - Higbee 2
10 - 13	Eartag number	0000
10	Year of birth	0
11 - 13	Number of ewe	000
14	Age group	0
15 - 16	Treatment	00
17	Condition October 10 (1 to 5)	
18 - 20	Weight October 10	
21 - 23	Weight November 1	
24 - 26	Weight December 1	
27 - 29	Weight January 1	
30	Condition January 1	
31 - 33	Weight February 1	
34 - 36	Weight March 1	
37 - 39	Weight April 1	
40 - 42	Weight April 20	
43	Condition from lambing book	

79 - 80	Card No.	

Condition (1 - excellent; 2 - good; 3 - fair; 4 - poor; 5 - very poor)

7. Wool data. The sheep will be sheared on the winter range just prior to trailing to the lambing pens (about April 1). Side samples will be taken a week prior to shearing. Fleece weights will be taken at shearing time and all information recorded on mark sense cards and coded on IBM cards as follows. The first 17 spaces will be the same for all cards except the card or deck number in this case will be 2.

17 - 19		Fleece weight
20 - 27		Staple length (side sample)
	20 - 21 First measure	
	22 - 23 Second measure	
	24 - 25 Third measure	
	26 - 27 Average length	
28 - 30		Grease weight of side sample
31 - 33		Dusted weight of side sample
34 - 36		Scoured weight of side sample
37 - 39		Dusted weight of scoured sample
40 - 42		Clean weight of fleece
43 - 44		Fiber diameter (side sample)

8. Lambing data. The ewes will be shed lambed at the Iron Springs corrals about 15 miles from Cedar City. A lambing book will be kept in a coded manner so that the information can be transferred to IBM cards for analyses. The deck number will be 3.

18 - 21	Ear tag number of lamb
22 - 24	Birth date
25 - 27	Birth weight

28	Number lambs born
29	Sex
30	Strength of lamb (1 to 5)
31	Condition of ewe (1 to 5)
32	Milking quality of ewe (1 to 9)
33 - 35	Lambing brand
36 - 37	Cause of death (1 to 7)
38	Docked (0 if not and 1 if docked)
39 - 41	On summer range weight
42 - 44	Weaning weight
45 - 47	Date weaned

Codes:

Strength of lambs	1 - strong
	2 - medium
	3 - weak
	4 - dead
	5 - abnormal
Milking quality of ewe	1 - normal
	2 - insufficient
	3 - mastitis
	4 - pendulous
	5 - large teats
	6 - one-half function
	7 - caked
	8 - bloody milk
	9 - other
Cause of death	0 - unknown
	1 - starvation
	2 - dirt eating
	3 - docking
	4 - pneumonia or chilled
	5 - aborted
	6 - accident
	7 - other
	8 -

9. Blood data. Blood samples will be taken from the designated ewes on the first weigh date on the winter range and again from the same ewes on the March 1 weigh date. These samples will be analyzed in the field for inorganic phosphorus, plasma carotene, and plasma vitamin A. Possibly mark sense cards will be used to collect this data and then coded on IBM cards for analyses. It will be coded as follows: The diet number will be 4.

18 - 19	Inorganic phosphorus
20 - 22	Plasma carotene
23 - 25	Plasma vitamin A

Phase III. Disease and Pathology

Clinical examinations will be made routinely of all sick sheep and those animals on the different levels of nutrition. A complete and thorough post-mortem will be performed on all animals in the experiment which die or become severely diseased.

Complete bacteriological cultures will be made of all animals autopsied. Tissue sections will be taken at time of autopsies and prepared for microscopic examination to determine the histopathology present.

These same procedures will be followed with sheep from other bands in the area. A complete record will be kept on all sheep worked with.

Reports

Each year a complete report will be made and submitted to all cooperators.

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