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SENIOR THESIS.

AGRICULTURAL COURSE.

COMPARATIVE COST OF WINTERING SHROPSHIRE AND MERINO GRADE EWES.

--:--by:--:-

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(Class of 1900)
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of the

MICHIGAN AGRICULTURAL COLLEGE.

Agricultural College,

Michigan.

1900

THESIS

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I N T R O D U C T I O N .

Sheep are associated with man in the earliest records of the human race. At first they were raised for their milk, and their skins were used for clothing and the making of many useful utensils. They were offered as sacrifices in religious worship and many rich men counted their wealth in the number of sheep they had in their flocks. From then until now the sheep have increased in utility. There has been great improvement in the animals themselves. Many men of history have taken it upon themselves to improve the sheep and fit them for special uses of mankind. We might name a score or more of men, well known to sheep breeders, who have been more or less directly instrumental in making the sheep what it is to-day. Different men have developed the sheep along different lines. Some have seen in them a source of food for the multitudes and have selected only those for breeding which possessed his ideal form of leg, loin, and shoulder. He has tested the flavor of mutton in the different families of his flock and has retained only those which produce the best. He does not care so much for the wool that grows on their backs. His one aim is to get a sheep that will weigh the most, dress the greatest per cent, and sell for the highest price in the open market. Other men have seen on the sheep clothing for the world and have endeavored to perfect this quality. They breed only those that have the most wool of the finest fiber. This, also, has developed to a remarkable

degree. The amount of wool has increased eight and ten fold from a single sheep over the sheep of a hundred years ago. Out of this attempt to develop the sheep for different purposes have sprung a great number of breeds such as the Southdowns, Oxfords, Shropshires, Suffolks, Lincolns, Leicesters, Cotswolds, Dorsets, Delains, Rambouillets, Black Tops, Merinos, and a few other breeds. Each of these have good qualities peculiar to themselves and are raised in their respective sections as the leading sheep where these special qualities are considered most valuable. It is very fortunate that breeds possessing varied characteristics have been developed so that there are breeds adapted for all sections of the country.

Why sheep production in America is important.

At present, the supply of sheep products is not sufficient to satisfy the demands of our home markets. The average number of sheep on hand each year from 1891 to 1895, inclusive, was about 44000000. The years that followed this showed a decrease. This was probably due to a decline in prices of sheep products. Yet, with this apparently large number of sheep in the United States there is a large importation of mutton and wool. Canada alone ships into the United States each year mutton to the value of over a million dollars. We have also been importing twenty-five or thirty million dollars worth of wool annually during recent years. Our rich fields and great variety of food stuffs are well suited

for the growing of as good sheep at as small a cost as any other country in the world. The United States raises a great deal more food stuffs than it consumes and this surplus has to seek a market outside. Corn can be feed to sheep and make a return equal to forty or fifty cents a bushel for the grain consumed. Why not keep our corn, and feed our sheep at home, thus supplying our home market. This would be a great saving in transportation and also increase the magnitude of one of our already large industries. There are some other considerations worth mentioning. Whenever a crop of grain is taken from a field there is a large amount of fertility taken from the soil. In raising sheep as with raising other stock this fertility can be returned to the soil as farm yard manure. It would be far better for American farming and for our system of agriculture to convert our surplus grain products into mutton and wool, at least to the extent of supplying our own markets, rather than export them.

The Need of an Experiment.

In these days when competition is so keen and profits are so small, It is very desirable that production should be carried on as cheaply as possible. Many a man has started out in the sheep industry and failed, others have made fortunes. Why is it? Many times it is because those who have succeeded were able to produce more cheaply than others. In looking over the work of different experiment stations we find very little done on the feeding and raising of sheep. C. F. Curtiss of the Iowa station has published

a valuable bulletin on "Raising Sheep for Mutton". A few other bulletins have touched on the subject of sheep. But there has been nothing sent out, as far as we can find, that would assist a man starting out in the sheep industry to choose from the various breeds the one that would insure the greatest success. Therefore we have planned an experiment that might, to a limited extent, assist in choosing the kind of sheep to raise.

Plan of Experiment.

The plan of this experiment is to determine the comparative cost of maintaining through the winter two flocks of sheep that might be considered as extreme types most common in America. There was at this time a flock of five^{ty} Shropshire ewes at the College, so this was taken as one of the flocks as Shropshires are very common in the United States and a good example of the down or mutton breeds. A grade from the wool breeds was considered the other extreme, therefore, we took Merino grades. This latter class is most common among the farmers whose chief object is wool growing. Eleven grades were purchased through a buyer and with these were put four pure bred Merinos. This was to enable us to draw further conclusions between the Shropshires and Merino pure bloods. A maintenance ration was fed to these flocks in proportion to their respective weights, during a large part of the winter. The primary object was to determine which could be wintered the cheaper, and the secondary object was to determine the exact cost of wintering sheep.

The sheep were to be placed in pens in the same barn and each given the same care. They were to be fed at morning and night on clover hay, and grain consisting of equal parts of shelled corn, oats, and wheat bran. At noon, they were to be fed sugar beets. They were well bedded with wheat straw once or twice a week and well supplied with good, clean water. Weights of each sheep were taken every week. The average temperature of the atmosphere of the barn for each week was kept. Both flocks were kept inside in stormy weather and allowed to run outside in pleasant weather.

For a better understanding of the kind of sheep used in this experiment, a short history of the Shropshire and Merino breeds are given below; also a history of the Shropshires and Merino grades used in this experiment.

History of the Shropshire.

The origin of the Shropshire breed may be traced almost directly to the polled sheep of Cammock Heath, and the old black, or spotted faced breed of Morfe Common. In Volume XVI Journal of the Royal Agricultural Society, there is given this fragment of a report from the Bristol Wool Society (1792) regarding the breed last referred to:

"On Morfe Common, near Bridgnorth, there are about 10000 sheep kept during the summer months, which produce wool of a superior quality. They are considered a native breed, are black faced or brown, or spotted faced horned sheep, little subject to either rot or scab".

The sheep of Cammock Heath were hornless with grayish faces and legs, and are described by Youatt as attaining great weight. From these two hardy native breeds the Shropshire has been gradually improved, whether within itself or by further out-crossing with other breeds is difficult to determine - until now it stands the acknowledged rival of any of our modern middle-wool breeds.

This breed has been long and favorably known in England, but it is comparatively new in America. The first importation of any note was made in 1855 in Virginia, but it is only within the last ten or twelve years that the Shropshire sheep have attained any marked attention from breeders on this side of the Atlantic.

The Shropshires are described as follows: "The face is dark grayish or brown, wool coming well down to the eyes and with no traces of horns. The legs are darker than the face - almost black; head longer than in the Southdown and ears larger, while the wool is closer set, finer, and longer in staple. The weights vary all the way from one hundred fifty to two hundred twenty-five pounds in good animals". The Shropshires are especially fitted, by conditions under which they have been reared, for moist or even wet localities. It is doubtful whether they will do remarkably well on the dry ranges of the southwest but Shropshire rams, for the use of grading up the middle wools already on the ranges, are giving good satisfaction.

History of the Merino.

The oldest reliable records of the Merino breed goes back only to the early history of Spain.

Law (1842) says:

"Upon the whole, although authentic documents on the subject are wanting, there are presumptions that the sheep in Africa were employed to perfect the sheep of Spain with respect to the production of wool. The Merinos exhibit certain characteristics which seem to show them to have been derived from some country warmer than that in which they were naturalized, and it was during the dominion of the African possessors of the country that the wool of Spain arrived at its greatest excellence."

Let this be as it may, we have reliable records that the Merino existed as a distinct race two thousand years ago. For a long time Merino wool was famous all over Europe for its fine quality. Even the emperors desired their robes made from the wool of the Spanish flocks. It is probable that the fine wooled sheep that we read of in ancient history were the natural products of very favorable conditions of climate and soil, by which inferior races were greatly improved rather than any great effort to breed them up to any desired standard.

The Merino is certainly the oldest of surviving breeds and its history is co-existent with the history of Spain. These sheep were kept on the hill pastures and we find them in 1800 a hardy breed with many excellent characteristics and used to rough weather.

The sheep were guarded by the Spanish government with great care, but as early as 1765, Merinos were taken to France and Saxony from which sprang the Saxon Merino and Rambouillet. During the Napoleonic wars the flocks of Spain were scattered and it was at that time that importation to the United States began. The first importation of any importance was made in 1802 by Col. David Humphrey of Derby, Conn. then minister to Spain; and from the flocks then introduced the modern Atwoods, Dickinsons, Delains, and Black Tops have sprung.

The original Spanish Merino has been improved in this country by selection and crossing of different strains till the product of wool has been increased from 2 1/2 # to, in extreme cases, 52# from a single sheep; and the sheep itself has been so much modified and improved that there is not much resemblance between them and the original stock. We have now a distinct breed known as the American Merino. We can not go into a detailed description of the above mentioned strains. They may be found in any history of the American Merino. e. g. Power's American Merino.

History of the Shropshires used in the Experiment.

The Shropshires used in this experiment were pure bred and all registered in the American Shropshire Association. Therefore, they would answer more or less closely to the description of typical animals of their breed. The general characteristics of this flock are those of the Shropshire breed which have been given above.

These animals were all bred and raised at the Michigan Agricultural College. The selection, breeding, and care have been carried on with a considerable degree of skill. At the beginning of the experiment, January 13, 1900, all of the sheep were in good condition to all knowledge. They were hearty and well with the exception of a slight cold which lasted for some time. They were bred to a high class Shropshire ram; and were kept on a ground floor in a barn with good ventilation. The feeding before the experiment was about the same as during the experiment. They had free access to good clean water all the time supplied by a tank kept in the pen. Their ages range from three to five years. They had good fleeces of wool on them, the weights of their fleeces, the year before, averaging eight to ten pounds. These sheep are valued by good judges from fifteen to twenty-five dollars each. This alone would be an indication of their high quality. Their weights are to be found in the tables.

In this flock, we have fifteen good representative animals of the pure bred Shropshire down breed. After taking into consideration the above mentioned conditions we see no reason why results obtained from these would not be a fair average of their class.

History of the Merinos used in this Experiment.

The Merinos used in this experiment are made up of eleven grades and four registered Merinos. Of the latter, two are Delains and the other two American Merinos. The four Merinos spoken of

above are registered in American Associations. The conditions under which these last four were bred and kept were the same as the Shropshires mentioned above. The other eleven were purchased through a buyer and all that could be learned was that they were fed on clover hay and cornstalks with free access to straw. They were bred to a Lincoln ram.

At the beginning of the experiment they were in good condition to all appearance and knowledge, but somewhat thinner in flesh than the Shropshires used in this experiment. The ages of the four college sheep were five to seven years. Of the others it is not known only they were as near as could be estimated from four to ten years of age. The fleeces of the four college sheep averaged, last year, eleven pounds and nine ounces. The estimated weights of the others were eight to ten pounds. The eleven grades were purchased for four dollars and twenty-five cents a head. The other four were valued at much more. Their weights may be taken from the tables.

In this flock we have fifteen animals made up, first: of eleven that might be considered representative animals of the Merino grades found throughout the country. Second: of four good animals of the registered Merino stock. After taking into consideration the above mentioned conditions, we see no reason why results obtained from these would be representative of their class.

T A B L E I

Record of the Shropshires

Age of sheep	Weights at Beginning of Ex.	Weights of each sheep at the end of				
		1st wk.	2d wk.	3rd wk.	4th wk.	5th wk.
7	169#	166#	169#	170#	168#	165#
64	148#	150#	151#	156#	153#	157#
65	137#	139#	138#	140#	140#	139#
77	149#	151#	151#	152#	154#	153#
79	135#	136#	137#	141#	141#	142#
80	146#	146#	145#	150#	146#	149#
93	132#	133#	134#	140#	136#	137#
95	122#	122#	123#	127#	125#	128#
96	132#	132#	133#	134#	134#	136#
628	152#	152#	155#	155#	155#	158#
631	178#	177#	179#	180#	182#	183#
676	147#	147#	152#	154#	159#	160#
681	140#	141#	147#	151#	151#	154#
683	162#	162#	162#	166#	165#	166#
59399	148#	148#	145#	148#	148#	148#
	2197#	2202#	2221#	2264#	2257#	2275#
P. over before.		5# gain	19# gain	43# gain	7# loss	18# gain
er. tem. wk. F.		35 deg.	34 deg.	17 deg.	34 deg.	27 deg.

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during the Experiment.

				Total	Average
6th wk.	7th wk.	8th wk.	9th wk.	gain	wky. gain
169#	175#	174#	176#	7#	7/9#
157#	160#	162#	165#	17#	1 8/9#
141#	142#	145#	147#	10#	1 1/9#
155#	155#	154#	154#	5#	5/9#
141#	139#	141#	139#	4#	4/9#
148#	146#	140#	143#	- 3#	- 1/3#
141#	139#	141#	142#	10#	1 1/9#
130#	134#	132#	134#	12#	1 1/3#
138#	137#	139#	142#	10#	1 1/9#
155#	150#	157#	157#	5#	5/9#
189#	189#	190#	187#	9#	1 #
160#	165#	169#	165#	18#	2 #
154#	160#	160#	157#	17#	1 8/9#
164#	166#	170#	169#	7#	7/9#
151#	152#	156#	160#	12#	1 1/3#
2293#	2315#	2336#	2337#	140#	15 5/9#
18# gain	22# gain	21# gain	1# gain		
27 deg.	20 deg.	30 deg.	28 deg.		

In table I there is only one loss of weight in a sheep shown and that is in No. 80. This sheep was not well during the last few weeks of the experiment and the next week after the experiment closed she was entirely off her feed. This probably accounts for her loss.

There was a loss in the average weight during the fourth week of seven pounds. This week was characterized by sudden changes in the temperature. On February 8th, the thermometer went up to 65 degrees F. in the afternoon and the next morning it was down to 20 degrees F., also several other changes occurred. This might account for the loss. Nothing can be noticed in the average weekly temperature.

T A B L E II

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Record of the Merinos

College No	Weights at Beginning	Weights of each Sheep at the end of				
		1st wk.	2d wk.	3rd wk.	4th wk.	5th wk.
of sheep	of Ex.					
61	70#	68#	68#	69#	63#	59#
62	100#	104#	107#	110#	110#	113#
63	119#	119#	122#	124#	127#	127#
64	95#	98#	96#	98#	100#	96#
65	105#	106#	112#	114#	115#	115#
66	86#	89#	92#	93#	93#	92#
67	87#	84#	85#	85#	86#	87#
68	95#	95#	98#	100#	98#	98#
					Lamb	
69	87#	91#	95#	98#	97#	95#
70	91#	94#	96#	98#	83#	85#
				Lamb	9#	11#
71	88#	90#	93#	81#	79#	75#
544	109#	109#	112#	115#	115#	114#
646	119#	119#	122#	119#	121#	121#
680	110#	110#	112#	115#	115#	114#
1169	96#	96#	96#	96#	99#	95#
	1457#	1472#	1500#	1515#	1510#	1497#
Diff. over wk. before		15# gain	34# gain	9# gain	5# loss	13# loss
Aver. tem. of wk. F.		35 deg.	34 deg.	17 deg.	34 deg.	27 deg.

during the Experiment.

6th wk.	7th wk.	8th wk.	9th wk.		Total gain	Average gain
61#	65#	65#	61#		- 9#	- 1#
115#	116#	117#	121#		21#	2 1/3#
131#	134#	137#	137#		18#	2 #
100#	101#	102#	103#		8#	8/9#
120#	122#	123#	126#		21#	2 1/3#
97#	99#	100#	102#		16#	1 7/9#
87#	89#	91#	92#		5#	5/9#
86#	87#	85#	82#		- 13#	- 1 4/9#
10#	13#	16#	17#		7#	1 3/4#
101#	103#	106#	107#		20#	2 2/9#
86#	85#	86#	83#		- 8#	- 8/9#
13#	16#	17#	19#		10#	1 2/3#
79#	80#	82#	82#		- 6#	- 2/3#
115#	119#	118#	120#		11#	1 2/9#
121#	123#	123#	123#		4#	4/9#
116#	120#	121#	124#		14#	1 5/9#
98#	100#	101#	104#		8#	8/9#
1536#	1572#	1590#	1603#			
39# gain	36# gain	18# gain	13# gain		146#	16 2/9#
27 deg.	20 deg.	30 deg.	28 deg.			

In table II we notice four losses of weight. Three can be directly attributed to the birth of lambs which, when taken into consideration, will more than make up for the loss, except in No 71 where the lamb was born in the third week and died a few days afterwards. No 61 was a small sheep and probably not used to eating roots as she got choked often and after the first week or two would eat but few roots. This probably accounts for her loss in weight.

The loss during the fourth week is noted under the Shropshire table..

The loss in the fifth week can not be accounted for.

Comparing tables I and II we see that the Merinos gained 146 $\frac{1}{2}$ to the Shropshires 140 $\frac{1}{2}$. The gain was nearly the same while the ration of the Merinos was only two thirds as large as the Shropshires. Nothing can be learned from the average weekly temperature as the whole difference lies in the sudden changes rather than in the degrees of temperature.

T A B L E I I I

Cost of Food Consumed.

Amt. fed	Amt. fed To Shrops	Amt. fed To Merinos	Cost per hundred wt.	Total cost of Shrops	Total cost of Merinos
Corn	157 1/2#	105#	\$0.625	\$0.98	\$0.66
Oats	157 1/2#	105#	.78	1.23	.82
Bran	157 1/2#	105#	.625	.98	.66
Roots	2715#	1710#	.125	3.39	2.14
Hay	1830#	1225#	.45	8.34	5.51
				\$14.82	\$9.79

This is the cost of the food consumed. The total cost here does not take into consideration the labor of feeding and straw for bedding. The cost is taken from the prices of the hay, grain, and roots when it was purchased.

TABLE IV

Ration for Nine Weeks.

	Corn	Oats	Bran	Roots	Hay	Cost
Shrops	157 1/2#	157 1/2#	157 1/2#	2715#	1830#	\$14.82
Merinos	105#	105#	105#	1710#	1225#	9.79

TABLE V

Ration for One Day.

	Corn	Oats	Bran	Roots	Hay	Cost
Shrops	2 1/2#	2 1/2#	2 1/2#	45#	30#	\$0.242
Merinos	1 2/3#	1 2/3#	1 2/3#	30#	20#	.161 1/3

TABLE VI

Ration for One Sheep One Day.

	Corn	Oats	Bran	Roots	Hay	Cost
Shrops	1/6#	1/6#	1/6#	3#	2#	\$0.0162/15
Merinos	1/9#	1/9#	1/9#	2#	1 1/3#	.010 4/5

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To make a comparison between the Shropshires and Merinos kept at the college and under the same care and condition before the experiment began, we will take the average of the four college Merinos and the fifteen Shropshires. Merinos numbers 544, 646, 680 and 1169 gained 37 $\frac{1}{2}$ #. The average gain would be 9 1 $\frac{1}{4}$ # for the nine weeks. The average gain of the Shropshires was 9 1 $\frac{1}{3}$ # for the nine weeks. It will be seen that the gain is about the same while the ration was only two thirds as much for the Merinos as for the Shropshires.

The average of the grades that did not have lambs is 12 1 $\frac{1}{2}$ # gain as compared with 9 1 $\frac{1}{3}$ # in the Shropshires. Here the contrast is very striking because a much larger gain is derived from a much smaller ration. It cost just half as much to put one pound of flesh on the grades as on the Shropshires.

The actual cost of maintaining sheep the entire winter can be found by multiplying the cost for one week by the number of weeks.

This experiment shows several things. First: That the ration was a little too large for the exact maintainance of the sheep especially for the grades. Second: It shows the cost of maintaining although this would vary as the price of food stuffs varies. Third: It shows the comparative cost of feeding Shropshire and Merino grade ewes. Forth: In weighing every week we can see the loss of a ewe in lambing and , also, the growth of the lamb. Fifth: It is found that extreme and sudden changes of temperature make a marked difference in gains.

Great care was taken in this experiment to get accurate results. All of the work was done by the author, and we believe the results can be relied upon.

-:-:W. T. Parks:-:-

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